**REPUBLIC OF UZBEKISTAN**
**MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION**

**SAMARKAND STATE UNIVERSITY OF VETERINARY MEDICINE, ANIMAL HUSBANDRY AND BIOTECHNOLOGY**

**DEPARTMENT OF MICROBIOLOGY, VIRUSOLOGY AND IMMUNOLOGY**

**"APPROVED"**
Deputy-rector of education affairs,
professor_____A.A.Elmurodov
"___" _____ 2022

# "VETERINARY VIRIOLOGY"

## STUDY ON SCIENCE - METHODOLOGICAL COMPLEX

| | |
|---|---|
| **Field of expertise:** | 800000 - Agriculture, Forestry, Fisheries and Veterinary |
| **Sphere of education:** | 840 000 - Veterinary |
| **Course of study:** | 60840100 - Veterinary Medicine (by types of activity) |

**Samarkand – 2022**

The curriculum of the subject has been developed in accordance with the approved curriculum, working curriculum, syllabus and working curriculum.

**Developers:**

| | |
|---|---|
| **Shapulatova Z.J.** | SamSVMAHB, Docent of “Epizootology, Microbiology and Virology”. |
| **Khatamov A.Kh** | SamSVMAHB, Assistant Professor of “Epizootology, Microbiology and Virology”. |

**“VETERINARY VIRIOLOGY”**
**EDUCATIONAL-METHODICAL COMPLEX OF SCIENCE:**

Discussed at the meeting of the Department of “Microbiology, virology and immunology", approved by the Deputy-Rector for Academic Affairs and recommended for use in the educational process (Protocol №. “__” _____ 2022).

**Head of the department_____ D.D.Aliyev**

Discussed at the Faculty Council of "Veterinary Diagnostics and Food Safety" and approved by the Deputy-Rector for Academic Affairs and recommended for use in the educational process (Protocol №. “__” _____ 2022).

**Chairman of the Faculty Council, rofessor _____ R.B.Davlatov**

**Agreed:**

**Head of the educational and**
**methodical department, Docent _____ R.F.Ruzikulov**

**C O N T E N T S**

# I. SCIENCE EDUCATIONAL PROGRAM

# II.WORKING CURRICULUM OF SCIENCE

**Subject syllabus**
**Samarkand Institute of Veterinary Medicine**

**Item Details:**
Item code: VVM 2306
Name of the subject: **Veterinary virology**
Semester / year: **4-semester / 2021-2022 academic year**
**Department: Epizootology, microbiology and virology**
**Chassis / credit: 6.0 ECTS (90 auditor's hours, 90 self-study)**

| Lectures | Practical lesson | Laboratory lesson | Self-study | **Total** |
|---|---|---|---|---|
| **30** | **30** | **30** | **90** | **180** |

**Location of the lesson on the subject:**
**Classroom time:** based on the lesson schedule
Requirement:
Department responsible for the subject: Epizootology, Microbiology and Virology
**Information about the instructor:** Khatamov A,Kh.,

Location of the department: ICM itself, 2-educational building, room 207
Phone: + 99890-212-88-68, work phone, mobile: + 99897-576-02-55
E.mail. akbarjon.hatamov@gmail.com working hours: during the day

I. The purpose of the subject is to form students' knowledge, skills and qualifications corresponding to the direction of the profile in terms of the general characteristics of viruses, the role of various biological processes in nature, the body and various branches of industrial and agricultural production, causative agents of infectious diseases, diagnosis of diseases caused by them, according to modern effective methods of specific prophylaxis.

II. The task of the discipline - To achieve this goal, science provides students with theoretical knowledge, practical skills, a methodological approach to virological phenomena and processes, as well as the formation of a scientific worldview.

III. As a result of mastering the subject, the student must:

- have an idea of: taxonomy and morphology, physiology, ecology, beneficial and harmful properties of microorganisms, infections, immunity and their types, morphology, cultural, biochemical and biological properties of pathogens of the main infectious diseases;
- have skills: the basics of general microbiology, development of the pathogen, the role of humans and pathologies in humans and animals, classification, morphology, tinctorial, cultural, biochemical properties, resistance, pathogenicity, antigenic pathogenesis, pathogenesis, pathogenesis, pathogenesis, pathogenesis.

**III. As a result of mastering the subject, the student must:**

- have an idea of: taxonomy and morphology, physiology, ecology, beneficial and harmful properties of microorganisms, infections, immunity and their types, morphology, cultural, biochemical and biological properties of pathogens of the main infectious diseases;
- have skills: the basics of general microbiology, taxonomy of microorganisms, morphology and structure, chemical composition, nutrition, respiration, reproduction, role in the transformation of substances, the influence of environmental factors, the doctrine of infection and immunity, practically use them in the isolation of microorganisms, identification, diagnosis of infectious animal diseases; vaccine-serological prophylaxis and immunotherapy; characteristics of infectious diseases, history of pathogen discovery, role in human and animal pathology, classification, morphology, tinctorial, cultural, biochemical properties, resistance, pathogenicity, antigenic structure, pathogenesis, immunity and diagnosis, drugs used and disease prevention.
- have the qualifications: diagnosis of infectious diseases of animals and prevention, work in veterinary laboratories, industrial microbiological enterprises,

basic methods of microbiological research, timely and accurately bacteriologically and serologically diagnose some infectious diseases and make a final diagnosis, thereby for the development of animal husbandry in the republic, help veterinary service of public, private, farms and subsidiary farms, to effectively carry out therapeutic, preventive measures, eliminate diseases, to preserve the livestock of animals and increase their productivity, quickly, in a timely manner, conduct microbiological studies, develop measures for prevention and treatment.

**IV. Methods of teaching science:**

It is necessary to use modern methods in teaching the subject, to link problems in this area with mass forms of education, to strengthen the theoretical knowledge of students through practical exercises. For effective assimilation of educational material by students, technical teaching aids, texts of printed lectures on virology are widely used as visual aids, a system for assessing students' knowledge is being introduced. The lectures use advanced pedagogical technologies.

When designing the course "Veterinary Virology", the following basic conceptual approaches are used:

Personally oriented education
Systems approach
Activity-based approach
Dialogic approach
Organization of joint training
Problematic education

**V. Structure of the subject:**

**5.1. Calendar - thematic plan of lectures on the discipline "Veterinary Virology"**

| **Lectures:** | | | |
|---|---|---|---|
| **№** | **Themes** | **plan** | **hour** |
| **1-module. "Veterinary Virology" general part** | | | |
| 1.1 | Virology, its achievements and objectives. | 1.1.1. Discovered viruses and the history of their study<br>1.1.2. Veterinary virology, its achievements and objectives<br>1.1.3. The role of viruses in infectious pathology of animals. | 2 |
| 1.2 | The structure and chemical composition of viral virions | 1.2.1. The forms of existence of viruses in nature are their mutual transition.<br>1.2.2. Principles of organization of virions, capsid, nucleoid. Supercapsid shell and | 2 |

| | | | |
|---|---|---|---|
| | | others<br>1.2.3. Shapes and sizes of virions. Simple and complex virions | |
| 1.3 | Systematics of viruses | 1.3.1. Principles of the taxonomy of viruses.<br>1.3.2. Brief description of the main families.<br>1.3.3. Scientific practical value of the systematics of viruses. | 2 |
| 1.4 | Effects on viruses, physical and chemical factors | 1.4.1. Resistance of viruses to various objects.<br>1.4.2. Resistance of viruses to physical actions.<br>1.4.3. Resistance of viruses to chemical action. | 2 |
| 1.5 | Reproduction of virion viruses | 1.5.1. General understanding of the reproduction of viruses.<br>**1.5.2.** Reproduction phases.<br>1.5.3. The release of viral particles from the cell. | 2 |
| 1.6 | Virus genetics | 1.6.1. Structural organization of the cell genome.<br>1.6.2. Structural organization of the virus genome.<br>1.6.3. Heredity in viruses.<br>1.6.4. Virus mutation. | 2 |
| 1.7 | Ecology of viruses | 1.7.1. Ways and forms of circulation of viruses in nature.<br>1.7.2. The relationship between animal and human viruses.<br>1.7.3. The spectrum of pathogenicity in different viruses. | 2 |
| 1.8. | Pathogenesis of viral diseases of animals | 1.8.1. Pathogenesis at the cellular level.<br>1.8.2. Pathogenesis at the level of the organism.<br>1.8.3. Tell us about the ways of penetration, spread in the body and isolation of viruses from it | 2 |
| 1.9 | Features of antiviral immunity | 1.9.1. Natural species resistance.<br>1.9.2. Cellular basis of immunity.<br>1.9.3. On the role of antibodies in antiviral immunity. | 2 |

| | | | |
|---|---|---|---|
| | | 1.9.4. Interferon. | |
| 1.10 | Prevention of viral diseases in animals | 1.10.1. Viral tropism, selective localization of organs and tissues.<br>1.10.2. Virus carrier and virus isolation<br>1.10.3. Acute, chronic and latent course of viruses | 2 |
| 1.11 | Immunity to viruses is different from immunity to bacteria. | 1.11.1. Immunity to viruses is different from immunity to bacteria.<br>1.11.2. Nonspecific and general cellular biological reactions<br>1.11.3. Specific increased immunity | 2 |
| **2-module. Private Veterinary Virology** | | | |
| 2.1 | Serological tests in virology. | 2.1.1. RTGA, RNGA<br>2.1.2. RTGAD, RSK<br>2.1.3. RIF, RDP, IFA. | 2 |
| 2.2 | Immunoassay (ELISA, ELISA) | 2.2.1. ELISA and its use in the diagnosis of viral diseases<br>2.2.2. Histochemical ELISA and solid phase ELISA<br>2.2.3. Advantages and disadvantages of IFA. | 2 |
| 2.3 | Study viruses common to several animal species. | 2.3.1. The name of the virus and its place in the classification<br>2.3.2. Structure and size of viral virions<br>2.3.3. Resistance of viral virions | 2 |
| 2.4 | Overview of viruses in cattle. | 2.4.1. Name and taxonomy;<br>2.4.2. The structure and size of virions;<br>2.4.3. Resistance of virions;<br>2.4.4. Cultivation methods in the laboratory;<br>2.4.5. Antigenic properties;<br>2.4.6. Caused diseases of animals;<br>2.4.7. Clinical symptoms, pathological changes;<br>2.4.8. Epizootological features of the caused disease;<br>2.4.9. Methods for diagnosing caused diseases;<br>2.4.10. Specific prophylaxis | 2 |
| **Total:** | | | **30** |

## 5.2. Calendar - thematic plan of the planned practical training in the discipline "Veterinary Virology"

| Practical lessons: | | | |
|---|---|---|---|
| **№** | **Themes** | **Plan** | **watch** |
| 1. | Basic properties of viruses. Safety precautions and rules for working with vaccinated material. | 1.1. Get acquainted with the virological laboratory of the department and its main equipment.<br>1.2. To study the rules for working with vaccinated material.<br>1.3. The structure of the virology laboratory and the rules of work in it. | 2 |
| 2. | Rules for working with vaccinated materials Safety precautions. | 2.1. To acquaint students with the rules for taking and transporting pathological material for laboratory research.<br>2.2. Prepare vaccinated suspension from organs of dead or forcedly killed animals.<br>2.3. Prepare swabs obtained from sick animals for virological research. | 2 |
| 3. | Conservation of viruses | 3.1. Ways to save viruses<br>3.2. with 50% saline glycerin, at low temperatures and in liquid nitrogen, and lyophilization.<br>3.3. Basic documents used in the virology laboratory | 2 |
| 4. | Preparation of vaccinated material for research | 4.1. Organ and tissue preparation<br>4.2. Preparing nasal discharge<br>4.3. Blood sampling for serological testing | 2 |
| 5. | Indication of viruses in pathological material by culturing viruses in living, sensitive cells in virological practice | 5.1. Finding and drawing inclusions with a light microscope.<br>a) cytoplasmic inclusions;<br>b) bodies inserted into the nucleus;<br>c) virion of the Morozov smallpox virus;<br>5.2 Introduction to the principle and structure of the electron microscope.<br>5.3 Schematic study of electron micrographs of virions of various viruses. | 2 |
| 6. | Laboratory animals, purposes and methods of their use in virological practice | 6.1 **.** Types of laboratory animals<br>6.2. Grooming and caring for animals | 2 |
| 7. | Experimental infection, methods of | 7.1. Identification of laboratory animals<br>7.2. Methods of transmission of the virus to | |

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| | experimental infection of laboratory Ms - votnyh | laboratory animals<br>7.3. Signs of viral replication in laboratory animals | 2 |
| 8. | Autopsy of laboratory animals | 8.1. Examination of experimental laboratory animals by all means and methods of virus transmission.<br>Infection of the skin of white mice with ectromelia virus and rabbits with smallpox virus.<br>8.3. Determination of disease symptoms in infected animals. | 2 |
| 9. | Intended use of chicken embryos in Viru - sologii | 9.1. The use of chicken embryos in virology<br>9.2. Methods for transmitting the virus to chick embryos.<br>9.3. Infection with both open and closed methods of transmitting the virus to chick embryos | 2 |
| 10. | Zara - voltage chick embryos for the purpose of indication of pathological - com virus material | 10.1. Obtaining virus-containing material by opening a chicken embryo.<br>10.2. Hemagglutination properties of viruses and their use, as well as the mechanism of hemagglutination.<br>10.3. Calculation of signs of viral replication in chick embryos for various phenomena in the body. | 2 |
| 11. | Solutions and nutritional Wed - dy | 11.1. Nutrient medium<br>11.2. Hanks, 199, Gla Solutions, Needle<br>11.3. Acquaintance with the composition of earl solutions. | 2 |
| 12. | Cell cultures, their use in virology | 12.1. Types of cells grown<br>12.2. Cultured cell cultures<br>12.3 Diploid, monolayer and subcultures, intertwined tissue cultures. | 2 |
| 13. | Single-layer primary trypsinized culture glue - current and methods of their preparation | 13.1. Obtaining primary cultured cells from chicken embryo fibroblasts.<br>13.2. Introduction to the transmission of viruses to cultured cells.<br>13.3. Determine the multiplication of the virus in the cell by the cytopathic effect.<br>13.4. Hemadsorption reaction.<br>13.5. Introduction to the dump method. | 2 |
| 14. | Infection of cell | 14.1. Cellular infection | |

| | | | |
|---|---|---|---|
| | cultures with viruses | 14.2. Growing viruses<br>14.3 Infection of tissues with tissue, registration and implantation into special mattresses. | 2 |
| 15. | Practical detection of the cytopathic action of viruses, its form and use in virological practice | 15.1. Viewing intracellular entrances<br>15.2. Virus detection by immunoperoxidase reaction (enzyme-linked immunosorbent assay)<br>15.3. Assess the cytopathic effect of viruses on cells | 2 |
| **Total:** | | | **30** |

### 5.3. Calendar-thematic plan of laboratory classes in the discipline "Veterinary Virology"

| **Laboratory exercises:** | | | |
|---|---|---|---|
| **№** | **themes** | **plan** | **hour** |
| 1. | Virus titration | 1.1. Autopsy of dead animals<br>1.2. Taking pathological material and shipping<br>1.3. Bacteriological examination of pathological material | 2 |
| 2. | Titration of antibodies to viruses in RTGA | 2.1. Basic rules for the use of RTGA<br>2.2. RTGA modification<br>2.3. Calculation of results for avian influenza or PG-3 virus in bovine animals | 2 |
| 3 | Use of neutralization reactions in virology | 3.1. Neutralization reaction and its application in virology<br>3.2. Apply neutralizing reaction with diluted serum.<br>3.3. The neutralization reaction and its types are problems that can be solved with its help. | 2 |
| 4. | Use of indirect (passive) hemagglutination reactions in virology | 4.1. Difference between indirect hemagglutination reaction and hemagglutination reaction<br>4.2 Methodology for setting the RNGA<br>4.3. RNGA - basic legal provisions. | 2 |
| 5. | The use in virology of the reaction of diffusion precipitation in a gel | 5.1. Place the RDP on the Petri dish.<br>5.2. How to put RDP into capillaries<br>5.3. Types of RDP and methods of their application, calculation of results. Advantages and disadvantages of the reaction. | 2 |

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|---|---|---|---|
| 6. | Use of enzyme-linked immunosorbent assay in virology | 6.1. Put ELISA<br>6.2. ELISA reaction types<br>6.3. Serum fraction of IgG antibodies | 2 |
| 7 | Polymerase chain reaction | 7.1. Separation of RNA and DNA<br>7.2. Conditions and factors affecting PCR<br>7.3. PCR inhibitors<br>7.4. DNA molecular structure, RNA molecular structure, molecular diagnostics. | 2 |
| 8. | Solution of diagnostic tasks | 8.1. Differentiation of viruses.<br>8.2. Find a virus.<br>8.3. The importance of diagnosing viral diseases | 2 |
| 9. | Rabies laboratory diagnostics | 9.1. Learn how to diagnose rabies in the lab.<br>9.2. Training in the use of the RIF in rabies<br>9.3. Muromtsev and Sellers painting lubricants and stamps. | 2 |
| 10. | Laboratory diagnostics of smallpox | 10.1. Painting by the method of M.A. Morozov<br>10.2. Biological selection<br>10.3 Types of smallpox, pathogens, pathological material, laboratory diagnostics. | 2 |
| 11. | Laboratory diagnostics of foot and mouth disease | 11.1. Determining the type of protein virus<br>11.2. Retrospective diagnosis of proteinuria<br>11.3. Detection and identification of the protein antigen of the virus using RIF. | 2 |
| 12. | Differentiation of avian influenza viruses and sickness Nyukas - la via HAI | 12.1. Distinguish influenza virus from Newcastle virus using RTGA.<br>12.2. Similarities between Newcastle Disease and Influenza Viruses.<br>12.3. Isolation of the virus from sick and dead chickens | 2 |
| 13 | Differentiation of viruses causing pneumoenteritis in calves using biofactory | 13.1. Diagnostic kits for the diagnosis of YURT, PG-3, DV and adenovirus infections in large horned animals, | 2 |

| | | | |
|---|---|---|---|
| | diagnostic kits | prepared at biofactories<br>13.2. Serological identification<br>13.3 Assessment of immunity by differential, retrospective and serological methods. | |
| 12. | Laboratory diagnostics of avian influenza | 14.1. General characteristics of viruses.<br>14.2. Laboratory diagnostics<br>14.3. Isolating the virus | 2 |
| 15. | Laboratory diagnosis of Newcastle disease. | 15.1. Laboratory diagnosis of Newcastle disease.<br>15.2. Differentiating Newcastle Disease From Influenza Virus<br>15.3. Diagnostics using RTGA. | 2 |
| **Total:** | | | **30** |

## VI. Calendar-thematic plan of self-study in the discipline "Veterinary Virology"

| № | Self-study topics | Hour |
|---|---|---|
| 1. | Newcastle, infectious Bron - chickens hit birds infectious laryngotracheitis, diseases Ma - river. | 4 |
| 2. | European swine fever, af - Rican swine fever, Teschen disease, transmissible gastroenteritis of pigs. | 4 |
| 3. | Equine infectious anemia, Afri - Kan-hoofed swine | 6 |
| 4. | Infectious - Foot hepatitis dogs | 4 |
| 5. | Rabies virus, Aujeszky's disease, yaschu - ra, influenza, plague | 6 |
| 6. | Rinderpest, diarrhea in cattle,<br>infectious bovine rhinotracheitis of cattle paragrshsha NW | 6 |
| 7. | Laboratory diagnostics of rabies. Bioassay on Bat - max (virus fixe). The study of finished products, containing - boiling calf Babes-Negri, as well as finished products from the on - the power of the MFA | 6 |
| 8. | Laboratory diagnostics of chicken pox. Biaproba on cock (experimental infection in scarified Gre - Bien and feather follicles). Recording the results of infection | 6 |
| 9. | Morozov staining of the viroscopy of the prepared preparation, taking into account the damage. | 6 |
| 10. | Differentiation of avian influenza viruses and sickness Nyukas - la via HAI vaccine strains and production of diagnostic kits biofabrichnogo | 6 |
| 11. | Laboratory diagnosis of FMD and determining the type wi - tier FMD RSK using biofabrichnyh Antiga - new and sera. | 6 |
| 12. | The use of radiation antibodies in virology. | 6 |
| 13. | Introduction to the reaction of the enzyme-linked | 6 |

| | | |
|---|---|---|
| | immunosorbent assay IFA (ELISA). | |
| 14. | PCR Method of polymerase chain reaction in veterinary medicine. | 6 |
| 15. | Viral diseases of fish. | 6 |
| 16. | Viral diseases of bees. | 6 |
| **Total:** | | **90** |

## VII. Bibliography

### Basic literature

1. Bazarov FE, Abdulakimova AB Veterinary virusologiyasidan manual. Samarkand, "Navruz poligraf" Publishing House, 2016.
2. Muhamedov IM, Aliyev Sh.R. et al. “Microbiology, virology and immunology” Tashkent “Yangi asr avlodi” publishing house, 2019.
3. Muhamedov IM, Inoyatova FI and others. "Medical Virology" Tashkent "Science and Technology" Publishing House, 2012.

### Foreign literature

1. Frederick Murphy E. Gibbs Marian Horzinek Michael Studdert , “Veterinary Virology ” Academic Press Publishing House, 2017 year.
2. Generalova II “Medical virology”. Vitebsk, Garnitura TIMES Publishing House, 2017.
3. N.James MacLachlan, Edward J. Dubovi Veterinary virology (United States of America), “Academic Press is an imprint of Elsevier” publishing house, 2016 year.
4. Vahobov AH “Virology” Blackwell Publishing Ltd BLACKWELL, 2017.
5. RBKorochkin, AAVerbitsky "Frequent veterinary virology". Uchebnoe posobie. Minsk, IBTs Minfina Publishing House, 2018.

### Additional literature

1.Мирзиёев Ш.М. Вместе мы строим свободное и процветающее демократическое государство Узбекистана. Ташкент, НГУУ «Узбекистан», 2017. - 29 с.

2.Мирзиёев Ш.М. Верховенство закона и интересы народа являются основой развития страны и благосостояния народа. «Узбекистан» НМИУ, 2017. - 47 с.

3.Мирзиёев Ш.М. Мы будем строить наше великое будущее вместе с нашими храбрыми и благородными людьми. «Узбекистан» NMIU, 2017. - 485 с.

4. Мирзиёев Ш.М. Указ Президента Республики Узбекистан от 7 февраля 2017 года N UP-4947 «О стратегии действий по дальнейшему развитию Республики Узбекистан». Ташкент, 2017.

5. Мирзиёев Ш.М. Постановление Правительства Республики Узбекистан от 20 апреля 2017 года N PQ-2909 «О мерах по дальнейшему развитию системы высшего образования». Ташкент, 2017.

### Internet sites

1. www. Ziyo.net.uz.
2. www.veterinariya meditsinasi.uz
3. email: sea mail.net.ru
4. email: veterinarian .actavis.ru
5. email: fvat.academy . uzsci.net

## VIII. Grade

The mastery of subjects by students is assessed on a 5-point system

**grade 5 (excellent):**

Conclusion and decision making;
Ability to creatively misrepresent;
Think independently;
Be able to apply the knowledge gained in practice;
Understanding the essence;
Know, tell;
Have an idea;

**grade 4 (good):**

Think independently;
Be able to apply the knowledge gained in practice;
Understanding the essence;
Know, tell;
Have an idea;

**grade 3 (satisfactory);**

Understanding the essence;
Know, tell;
Have an idea;

**grade 2 (unsatisfactory):**

Not mastering the program;
Ignorance of the essence of the subject;
Don't have an accurate idea;
Do not think on your own.

# III. BASIC STUDY MATERIALS OF SCIENCE

# 3.1. TEACHING MATERIALS FOR LECTURES

**Topic: Introduction. Content, subject and method of veterinary virology.**

**Plan:**

1. The importance of the science of veterinary virology.
2. A brief history of the development of virology.
3. Advances in the science of virology .
4. The role of viruses in the biosphere and their distribution in nature.

**Basic literature**

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016

2. Trotsenko NI, Belousova RV, Preobrazhenskaya EA Practicum on veterinary virology. M., Kolos 2000 g.
3. Trotsenko NI, Belousova RV, Preobrazhenskaya EA Practicum on veterinary virology. M., Agropromizdat 1998 g.

**Foreign literature**

1. Fenner's Veterinary Virology (United States of America 2016)
2. Veterinary clinical pathology (M.Jackson).
3. Syurin VN, Belousova RV, Fomina NV Diagnosis of viral diseases of animals. Spravochnik. M. Agropromizdat 1991
4. Andreev GM, Davydov VU, Zlobin VS Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg. 2004

***BASIC EXPRESSIONS***

Virions, ecology of viruses, oncogenes, medicine, trypsinization, fibroblast, cytopathogenic effects, adsorption, Brownian motion, deproteinization, replication, assambelirovanie, nucleocapsid, latent, chronic, DI-fragments, defective viruses, pseudoviruses.

**Viruses** are made up of nucleic acid, i.e., RNA or DNA, which is the nucleic acid that multiplies only in living cells and forces the virus from the cell to synthesize the desired parts of the virion. A new virus created in this way will have the ability to reproduce itself in the future.

**Virology** is the study of viruses and viral diseases.

**Viruses** are small microparasites that reproduce inside cells that cause various infectious diseases.

**Viral diseases** are a group of diseases caused by viruses, their flu, measles, smallpox, botkin's disease, rabies, ornithosis are well studied.

From an epizootiological and virological point of view, it is the causative agent of influenza in humans

viruses began to migrate in animals and birds. At the time of the spread of influenza, the A [2] virus was isolated from pigs, horses, cattle, poultry, and dogs.

The migration of influenza virus between species and its antigen “Drift” and jump (shift) is a commonly identified fact and has no observations.

That is why the medical problem is becoming a medical and veterinary problem.

One of the important tasks of modern virology is the emergence of various malignant tumors, and every year more than 5 million people around the world die of cancer.

In addition to viruses, viroids have been found that have a special shape and are isolated from plants, which contain RNA and do not have an outer shell. To date, medicine, veterinary medicine for many viral diseases have not been able to develop biological drugs, such as AIDS, influenza from birds to humans, and others. Chemotherapy is in full swing.

As an example, the damage caused by a single protein disease, including anthrax and all other bacterial infections, is not the same as the damage caused by the study of protein diseases.

Reforms in agriculture require further improvement of veterinary services to increase the number and productivity of animals. Virology plays an important role in the veterinary sciences.

A modern veterinarian should not only know the clinical and pathological features of the disease, but also have a clear understanding of viruses and the nature of viruses, laboratory diagnosis, immunity in infected animals and post-vaccination immunity. should.

The discovery of viruses is associated with the Russian botanist **Dmitry Iosifovich Ivanovsky (1864-1920)** .

Two types of mosaic pathogens in tobacco have been identified, the first being ryabukha, a fungus, and the second being an unknown pathogen. Ivanovsky thoroughly crushed the diseased tobacco leaf and filtered the water through a very fine-grained porcelain filter, and the filtered liquid still retained its contagious properties, but planting in artificial nutrient media yielded no results.

Ivanovsky proved that the crystals accumulated in tobacco leaf cells are the crystals of the mosaic virus in this cell.

The results of his research were fully documented in his two **scientific works, The** Two Diseases of Tobacco (1892) and **The Mosaic Disease of Tobacco (1902).**

Six years after Ivanovsky ID, the German scientist Leffler proved that the causative agent of the protein disease was a virus.

Then (Nicole and Adil-Bey) the plague of large horned animals, the plague of dogs (Carre, 1905), the plague of pigs (Schweinitz and Dorse, Raus sarcoma 1911), the plague of sheep (Borrel). , 1903), smallpox in goats (Borrel, Negri, and Kozagrandi 1902), and others. Much information has emerged about measles, polio, influenza, encephalitis. After the above news, there was a peace of mind about viruses, and this peace lasted until the emergence of ways to grow, isolate, and differentiate viruses.

In 1940, the cultivation of the virus in growing chicken embryos was another breakthrough. In this way began to grow viruses of measles, influenza, infectious laryngotracheitis, infectious bronchitis, chicken pox, Newcastle disease. Information about viruses was a great success and a separate independent biological science - Virology was formed. In our country for 80 years virology as a separate profile science has been playing an important role in veterinary institutes, ie in the training of veterinarians.

New methods have been used to study the world of viruses, their origin, their relationship to sensitive cells, their reproduction and excretion in a particular system, the specificity of viral immunity, the ecology of some viruses and their oncogenicity. their role and evolution in processes began to be studied in the human and animal organism.

Why virology has achieved great success in medicine, biology and virology as a profiling science for 25-30 years .

**First,** the role of bacteria in the simplest animal fungi is the occurrence of swine fever, pasteurellosis, measles, anthrax and other diseases in humans and animal pathology, there are reliable biological and chemical drugs in medicine and veterinary medicine for the treatment and prevention of these diseases. The role of viruses in this line is increasing.

The production of biopreparations, medicines in veterinary and medical diseases for many viral diseases is the first step.

Protein disease in animals for agriculture alone causes enormous economic damage. And this damage, even when all the diseases caused by bacterial infections are added together, cannot be equated with the damage caused by a single protein deficiency.

Therefore, in order to prevent influenza and proteinuria, international virological organizations and specialized virological institutes have been established.

**The second** - unanimously viruses - is the lowest stage of life as a category that has nothing to do with anything.

Due to the simple structure of viruses, it is widely used as a biological model, in molecular biology, genetics, genetic engineering, biochemistry, immunology and other fields.

**In 1956-1960, virology began to be studied in two directions.**

**The first** is that it is considered an infectious agent that causes disease in humans and animals, plants.

**Second** - virology as a science has led to the development of several biological sciences (genetics, molecular biology, oncology, immunology).

The emergence of molecular biology 12 years ago made it possible to study the cipher of DNA structure and its replication, its role in RNA protein synthesis, in short, to determine the genetic code. Studies in recent years have led to the identification of the role of individual structural genes and specific proteins.

Thanks to the success of genetic engineering, it is possible to predict the application of new methods of molecular biology in medicine, agronomy, and other biological sciences.

On the other hand, the biophysical method, molecular biology, and genetics deepen the worldview on the origin and nature of viruses. Subsequent debates have not been so successful, many of the parties questioned have recently relied on new methods and facts of physics, chemistry, biochemistry, electron microscopy.

Therefore, in the last 6-8 years, we have before us new processes, such as the reproduction of DNA and RNA-storing viruses, the replicative form of nucleic acid, and the replicative satellites that play a key role.

The RNA of myxoviruses has been found to be fragmentable. Specific mechanisms governing protein synthesis in some viruses are transcription and translation, synthesis of "morning" and "evening" proteins, the order of genetic information .

The use of conditional lethal mutants in viral genetics led to the discovery of the first audible genetic map of viruses, the polio virus, and such studies revealed the first genetic map of human and animal viruses (smallpox, influenza, protein).

The new work listed above in the molecular biology of viruses is the sum of all the scientific news collected in recent years.

Professor S. Nicolai, a Romanian virologist, made an interesting point in his time.

He said that just as atomic physics is important for classical physics, virology is just as important for biology.

This exact analogy is based on the study of the function and structure of molecules necessary for life, especially in molecular biology.

Genetic function in the range of nucleic acid and protein structure

The strong development of the science of genetics over the next twenty years cannot be imagined without virology. Explains in detail the molecular model of the mechanism of heredity and variability.

The emergence and development of molecular genetics is associated with the study of pneumococci, bacteriophages, animal and plant viruses, the achievement of which is the rapid development of infected cells.

Due to the simple structure of the genome of some RNA-storing viruses, the use of these viruses has made it possible to study the nature of mutations and chemical changes in the genome, the composition of synthesized proteins and the phenotype of the virus.

**Third** - in recent years on industrial-type production farms, the number of large numbers of animals has been declining as a result of the prevalence of acute respiratory and gastrointestinal diseases among young calves. A closer look at their etiology reveals that many viruses, agents cause pneumoenteritis, dyspepsia. In the emergence of viral diseases, there is a combination of viruses and stress factors.

On such a mixed basis, only a laboratory with professional knowledge can apply epizootic analysis and timely preventive measures, using diagnostic kits.

As a result of improvements in laboratory methods, the economic and social significance of viral diseases is becoming clear in infectious pathology of humans and animals.

**Fourth** - the role of viruses in some pathological processes (congenital defects, growth defects, etc.) is suspected, but the contribution of viruses has been proven.

Viruses are the cause of the only pathological process that occurs in the fetus in medical practice.

The Krasnukha virus causes congenital malformations, even if it does not kill the fetus, causing it to malform its organs. Since 1964, the Krasnukha epidemic has plagued most pregnant women in the United States, resulting in 40,000 stillbirths or anomalous births in the United States. Therefore, prevention of this disease is one of the most important tasks of the World Health Organization.

The pathogenesis of viral processes in animals during pregnancy is a much less studied area.

The teratogenic effects of viruses are also found in infectious pathology of animals. The plague virus of pigs causes the stillbirth and retention of

the fetus . Diarrhea virus of large horned animals, hypoplasia of the brain of newborn calves; infectious bronchitis virus-pathological form of ovulation; **SMEDI** virus leads to stillbirth, waxing, infertility; **The YURT** virus causes deficiency, blindness, and more.

These problems have not yet attracted the attention of the field of veterinary virology, and there is no scientific research in this area. Many viruses, especially those that cause latent disease, chronic and progressive infections, have changed their outlook on the positive.

Over the last 20 years, the doctrine of arboviruses transmitted through arthropods has evolved.

By the beginning of 1971, the number of diseases caused by arboviruses studied had exceeded 180.

Currently, research is being conducted on migratory (migratory) birds, which are distributed and environmentally relevant. The Interdepartmental Coordinating Council is actively working to study this problem. In recent years, a lot of interesting information has been collected in this area.

**Demonstration weapons:**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, nutrient media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodological manuals.

## CONTROL QUESTIONS

1. Who is the Russian scientist who discovered that viruses cause disease in tobacco leaves?
2. What do you mean by the connection of virology with other sciences?
3. What proves that viruses cause diseases of genetic equality?
4. What is the difference between DNA-storing viruses and RNA-storing viruses?
5. Stages of development of virology
6. Scientists who have contributed to the development of science.
7. The role of viruses in the biosphere.

## TOPIC: Physical structure and chemical composition of viral virions

**Plan:**

1. The presence of viruses in nature.
2. The principle of formation of virions.
3. Capsid, nucleoid, supercapsid and mycoid shell.
4. The shape and size of the virions.
5. Nucleic acids of viruses and their function

## Basic literature

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016
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## *BASIC EXPRESSIONS*

Replication, lepressor genes, icosahedron, exonuclease, oncogen, plasmid, capsid, virion, vegetative, nucleocapsid, evolutionary supercapsid, mycoid shell, capsomer.

**The emergence of viruses.** According to a group of scientists, viruses are a group of living parasitic systems that do not have an ancient cell form and are organically related to the host cell, but develop independently and are genetically separate from the host cell. The presence of different nucleic acids in them is the evolution of the conversion of single-stranded RNA from stranded cells to double-stranded DNA.

Proponents of the second group believe that viruses lost their protein-synthesizing system during evolution and became real intracellular parasites.

The third group of scientists believe that viruses are made up of cellular elements and become an autonomous system. According to this hypothesis, the genetic material of viruses is diverse, as well as many structures within the cell that can be related to viral components. For example: DNA, RNA, plasmids, etc.

According to the current understanding, viruses differ from prokaryotes and eukaryotes in structure, chemical composition, and genetic apparatus. But like all living systems, they are self-generating, variable, carrying genetic material, the uniqueness of the interaction with the host cell, adaptation to the living environment, the master o It has the ability to change and move around in nature.

Viruses are in the form of large molecules before they enter the host cell, and when they enter the cell, they turn into a living system, multiply, and pass on their properties from generation to generation. Viruses are of two types in nature: 1) extracellular virion and 2) intracellular vegetative (propagating) form.

**Morphology and structure of viruses.** A virus (Latin Virus means poison) is a very small particle that does not have a cell structure. The name was given by L. Pasteur to many infectious agents. Later, after a detailed study of the nature of viruses, it was discovered that they could pass through a bacterial filter, hence they are called filtered viruses. Viruses come in different forms: spherical (influenza

virus, typhoid, measles, leukemia viruses in chickens and mice), rod-shaped (viruses that infect tobacco and potatoes), cuboid (smallpox and papilloma viruses), adenoviruses (enterovirus, reovirus, etc.) Viruses in the form of spermatozoa (bacterial viruses, facies) and others.

In 1975, stellar viruses (astroviruses, Greek astron star) were discovered. They cause gastroenteritis in humans and animals. A fully formed virus particle is called a ***virion*** . It consists of a nucleic acid and a protein shell (capsid). It is noteworthy that viruses contain only one of the nucleic acids: DNA or RNA. The capsid protects the virus particle from any influences and ensures that the virus is adsorbed (accumulated) in the cells of human or animal organisms. The capsid, in turn, is composed of a number of subunits of protein molecules, i.e., capsomers, and the number of capsomers in any viral capsid is constant under an electron microscope. For example, paralysis virus has 60 capsomers, adenoviruses have 252 capsomers, and the structure surrounding the nucleic acid is called a ***nucleocapsid*** . Some virions have a single nucleocapsid - these are simple viruses. In some virions, the nucleocapsid lipids and proteins are covered with many outer shells, which are located in the shell in the form of thorns. Viruses are located in a certain order of capsomers, and depending on the system of capsomers, viruses are divided into spiral, cubic and combined types. The size of the viruses ranges from 20 to 350nm. They are detected by filtering, ultracentrifugation, diffusion (absorption), viewing under an electron microscope and taking an image. Paralysis, leprosy, yellow fever viruses are up to 25nm in size and belong to the group of small viruses.

The morphology of viruses is studied using an electron microscope magnified 50,000-300,000 times. Large viruses can be seen using a simple microscope, magnified up to 1,000 times by staining in a special way .

Viruses do not grow in artificial food environments. Because they do not have the ability to produce enzymes that can break down various substances like other microorganisms .

Spiral symmetry with the type of virus nukleokapsidi tube in the form of the nucleic acid , and surrounded by the closing kapsomerlar (tobacco leaf virus disease pathogen). RNA-storing viruses have a nucleocapsid in the form of a virion spherical .

In cubic symmetry, the viral capsid is in the form of an icosahedron (20 inches) containing nucleic acid (picornoviruses) or nucleoproteins (adeno-herpes viruses) .

Picorno–, rheo-, adeno-, and paramyxoviruses have one nucleocapsid, and togo- and herpesviruses have a second outer shell — the supercapsid.

Viruses of mixed type structure (leukemia, sarcoma, smallpox vaccine viruses and some phages) have a cubic symmetry, their nucleoproteins are wrapped in a spiral shape.

## Chemical composition of viruses

One of the viral nucleic acids in a cotton cotton DNA or RNA bo'ladi.Bu division of the relative protection of all DNA viruses, virus-specific (complementary) RNA retroviruses the genome of RNA viruses (and vice versa) - the ability to create a complementary DNA with a .

**Virus DNA si.** The DNA of different viruses has a different molecular weight (1x106-1x108). There are several genes in the genome of viruses . DNA can be single-stranded or double-stranded in a straight or circular pattern. The nucleotide sequences in DNA are straight and have 1800 conversions. These reductions are important in distinguishing viral DNA from cellular DNA and creating a ring appearance. Because the DNA in the ring structure ensures their resistance to exonucleases. In addition, this form makes it easier to control DNA transcription and replication and bind to the cell genome .

Viruses are viruses that store genetic information in RNA . Viruses have a single or double-stranded RNA that is straight or ring-shaped .

Single-stranded RNAs are divided into two groups according to their functions. The genome of viruses in the first group is information RNA, which can transmit information directly to the cell ribosomes, so they are called ***positive-stranded genomes*** (picornoviruses, togaviruses, retroviruses). The second group of RNA is a- si RNA function can not be fulfilled. They only act as a matrix for information retrieval . To do this, viruses must be special transcriptases. Such enzymes are not cells. The genome of viruses that store single -stranded RNA is called ***negative-stranded*** (orthomyxoviruses , paramyxoviruses , rhabdoviruses).

Other components of nucleic acids in virions range from 1% (in influenza virus) to 40% (E.coli) phages .

A virus protein of 20 amino acids L - regime. Series of amino acids located in the C and N-linkage connected with the type of protein, the amount of each strain specific .

Mapping and managing viral genes (operator , the activation of genes, genes lepressor genes). RNA and polyol 3 polio virus, the virus on May 5 gene .

Unlike organisms composed of viruses with RNA and tiny DNA genomes , they do not have a pair of genes , but their remains have been found in a repeating oligonucleotide sequence . The genetic structure of viruses is schizonts (Greek schizo - fragmentation). They control polypeptides (schizomers). In some bacterial viruses (phages), a single gene encodes two proteins. In bunyavirus, reovirus, myxoviruses genes consisting of several parts have been identified.

The C and N groups of amino acids in the viral polypeptide chain are blocked , so the protease enzyme that is released during reproduction cannot affect the virus. This is a means of protecting the virus, which has evolved into a parasite that lives inside a real cell .

Some of the viral enzyme identified with the help of viruses in animal cells is increased. For example, influenza A virus contains neurominidase and transcriptase, epidemic mumps, hemolysin phages in parainfluenza viruses, lysozyme and phosphatase in RNA - containing oncogenic viruses , transcriptase protein kinase, and DNA - containing viruses .

**Demonstration weapons:**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, nutrient media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodological manuals.

**CONTROL QUESTIONS**

1. What is the composition of viruses?
2. What is the structure of the virus?
3. Where is the supercapsid shell synthesized?
4. What is a virus or virion?
5. What are the proteins of viruses, yukleic acids?
6. What role do the enzymes of viruses play?
7. What is the difference between RNA or DNA-storing viruses?

**Topic: Classification of viruses**

**Plan:**

**1.** Modern classification of viruses.
**2.** Family, sub-family, categories, cryptogram
**3.** DNA and RNA are classifications of protective viruses

**Basic literature**

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016
2. Trotsenko NI, Belousova RV, Preobrazhenskaya EA Practicum on veterinary virology. M., Kolos 2000 g.
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## *BASIC EXPRESSIONS*

Reproduction, morphology, symmetry, capsomer, phylogenetics, lipogrotein.

**Classification, morphology and structure of viruses**

Viruses have a special genome that multiplies in the cells of all organisms and cannot live outside the cells. They are obligate parasites of humans, animals, insects, plants, fungi and bacteria that live inside the obligate cell and do not have the ability to synthesize protein, enzymes and produce energy .

In the classification of the International Committee on the Taxonomy of Viruses (1982), viruses are mainly divided into two groups according to their chemical composition: 1) DNA-storing viruses; 2) RNA-storing viruses. There are 17 DNA-genome families of DNA- storing viruses and 42 RNA - genome families of RNA-storing viruses . Of these, 6 with DNA genome and 13 with RNA genome are important in family, medicine and veterinary medicine.

The classification of viruses takes into account the type of nucleic acid in them and its percentage in virions, the number of capsomers, the relative molecular weight, the structural properties of viruses , reproduction and other information.

**Classification of viruses.** The modern classification of viruses is common to viruses of vertebrates, invertebrates, plants, and microorganisms .

The following criteria are included in this classification:

1) The type of nucleic acid (RNA or DNA), its structure (number of strands);
2) Presence of lipoprotein shell;
3) Method of reproduction of the viral genome;
4) The size and morphology of the virion, the type of symmetry, the amount of capsomers .
5) Appearance of genetic influences;
6) Types of hosts affected by the virus;
7) Pathogenicity, cellular effects and formation of intracellular inclusions ;
8) Geographical distribution;
9) Ways of washing;
10) Antigenic properties.

Based on the listed characters, viruses are divided into families, genus, species and types . If the division into families is based on criteria 1 and 2, they are divided into categories and types according to the remaining characteristics.

Viruses found only in vertebrates include herpes, adenoviruses, orthomyxoviruses, arenoviruses, coronaviruses. A number of viruses have the ability to overcome phylogenetic barriers and reproduce in both vertebrates and invertebrates (canals, mosquitoes, scapulae). These include certain categories of bunyaviruses, togaviruses,

rhabdoviruses, and reoviruses . For these viruses, arthropods act as both a natural host and a carrier. Such viruses are called arboviruses.

Initial attempts to classify animal viruses were based primarily on the symptoms of the diseases they caused, followed by the tropism (location) of the viruses. Thus, neurotropic, epitheliotropic, pneumotropic, enterotropic and other viruses were isolated.

Epizootologists use the method of transmission of the disease as the basis of the classification, and in this way combine the strokes into groups of viruses: respiratory, intestinal (entero viruses), arboviruses.

In 1966, Gibbs et al proposed the introduction of a coded record of certain features of viruses in the form of a cryptogram.

The cryptogram facilitates the study of a virus or a separate group of viruses and consists of the following 4 pairs of characters.

**1)** The type of nucleic acid is the number of coils. RNA - R DNA - D chain-1 double helix- 2

**2)** The molecular mass of a nucleic acid is% i relative to its virion. Measured in millions of daltons. If the nucleic acid is divided into fragments, all are added together to show E (sum). If boric and nucleic acids are located in different parts, then the composition is calculated separately for each of the molecular weights.

**3)** The appearance of the virion is the appearance of a nucleoid capsid. The shape of the virion and nucleocapsid is represented by the following symbols. S - spherical E - elongated, the ends parallel to the sides are not twisted, U - elongated, the sides are parallel, the ends are twisted, X - complex structural.

The master carrier. The following characters are used for this.

A - actinomycetes, V - bacteria, F - fungi, S - invertebrates,

V- vertebrates, Ac- canals, Di- mosquitoes and flies, Si- fleas,

Ve - carrier unknown, * - feature unknown.

## 2. A brief description of the main DNA-storing viruses

**I. The family of papovaviruses (D / 2: 3-5 / 7: S / S: V / 0 Di Ac.Si)** includes the generations of papillomavirus and poliomavirus. Papoxaviruses have an icosahedral structure in the capsid shell.

The capsid has a diameter of 45–55 nm and consists of 72 capsomers

1) Warts in humans (cattle, dogs, rabbits)
2) In humans, focal microencephalopathy, which causes polio in mice, virions multiply in the nucleus that does not have an outer shell.

**II. Family of adenoviruses (D / 2: 20-30 / 12-17 S / S: V / 0)** capsid diameter around 70 nm, in the form of an icosahedron consisting of 250 capsomeres, oncogenic without outer shell, 3 types of respiratory infections calls: contains neutralizing, hemagglutination and complement-binding antigens.

**III.Family of herpesviruses. (D / 2: (99 ± 5) / 10: S / S: V / 0)** This family includes large DNA-protective viruses that have an icosahedron-shaped capsid with a lipoprotein shell 150-170 nm in diameter and 100 nm in diameter. Causes

equine rhinopneumonia, bovine rhinotracheitis, avian infectious laryngotracheitis and mareka disease, Aueski disease (in pigs) and others.

**IV.The family of Poxviruses (D / 2: 160-200 / 5-7: X / *: V / 0 Di Ac.Si) is** the largest virus with a complex structure measuring 390x250 nm, with a shell. Increases in cytopism. The insert forms corpuscles (in the cytoplasm). Many species cause smallpox in animals and humans.

**V. The family of parvoviruses (D / 1: 15-2 / 19-25: S / S: V / 0)** causes parvovirus diseases in cattle, pigs, and poultry (pneumoenteritis and abortions) composed of 1-stranded DNA.

### 3. Brief description of the main RNA-containing virus groups

**I. Family of picornaviruses (R / 1: 2,3-2,8 / 30: S / S: V / 0)** All are composed of 32 capsomers with an icosahedral capsid diameter of 25–40 nm, no lipoprotein shell. These include poliomyelitis, Teshen disease in pigs, bovine rhinopneumonia, proteinuria, and many other pneumo enteritis.

**II. The family of togoviruses (R / 1: 4 / 4-6: S / S: V; 1/0 Di Ac)** contains more than 200 species of viruses. They have a small nucleocapsid with a cubic symmetry and a lipoprotein shell, as well as the separation of viral RNA in the form of infection. Measles, swine fever, viral diarrhea in cattle.

**III. Myxcoviridae family** includes the generation of ortomiksovirus and paramiksoviruslar ortomiksoviruslar **(R / 1: 5/1: C / E: V / 0)** call, swine, horses, poultry flu. RNA fragments are wrapped in a lipoprotein shell in which peplomers bulge (antigens).

**Paramyxoviruses (R / 1: 6-8 / 1: S / E: V / 0) cause** Newcastle disease, parainfluenza, measles carnivorous plague, cattle plague, and other diseases.

**IV. Coronavirus family, generation (R: 1: * / *: S / E: V / 0)** causes infectious bronchitis of poultry, transmissible gastroenteritis of pigs.

**V. The family of rabdoviruses (R / 1: 4/2: 4 / E: V,** 1/0 **Di Ac.)** Causes vesicular stomatitis and rabies.

### Demonstration weapons:

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, nutrient media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodological manuals.

### CONTROL QUESTIONS:

1. What do you mean by classification of viruses?
2. Disadvantages of classification based on symptoms.
3. What is the definition of the classification based on the tropism of the virus?
4. Tell us about the tariff of epizootiological classification.
5. What are the main criteria for the classification of viruses?
6. What do you mean by classification of viruses?

7. What is meant by a family of viruses that store DNA?

## Topic: The effect of physical and chemical factors on viruses

**PLAN:**

1. Influence of enzymes on viruses on animal body temperature, heating and boiling at room temperature.
2. Low, medium, deep freezing, ultraviolet light, photodynamic effect
3. The effect of acids, alkaline alcohols, disinfectants, oxidants, reducing agents, fat solvents, antibiotics on viruses
4. Methods of preserving and preserving viruses

**Basic literature**

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016
2. Trotsenko NI, Belousova RV, Preobrazhenskaya EA Practicum on veterinary virology. M., Kolos 2000 g.
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**Basic expressions**

Sublimation, lyophilization, photodynamic effect, conservation, freezing.

**FERMENTERS.** In most cases, virion is highly resistant to ribonuclease, deoxyribonuclease, and proteases.

The nucleic acids of the virion are surrounded by a protein shell so they are not affected by the nucleases.

Activated papain reduces the activity of potato X virus and other plant viruses, but can not reduce the activity of polio, virus, bacteriophage.

Antibody-neutralized phage can in some cases reduce its activity with papain. There are many factors and agents that cause protein denaturation:

1) Artificial detergents for example: Lauryl sodium sulfate
   Urea and guanidine are involved in breaking hydrogen bonds.
2) High or low hydrogen ion.

Each virus is differently sensitive to detergents, of which it easily reduces its activity with myxoviruses, arboviruses, herpes group detergents that store lipids in its shell. It is also an ether or chloroform that dissolves lipids.

Temperature - most viruses lose their activity within 5-30 minutes at 56-60 °. The hepatitis virus does not lose its properties in the serum at 80 °in 30

minutes . Viruses that develop in the gut are resistant to heat, where adenoviruses, herpesviruses, and smallpox viruses lose their activity.

Most viruses - well kept at temperatures below 70 °. The lower the freezing point, the less the virus is killed. The slower the cooling, the more viruses lose their properties.

Speed - 196 °cool lose to its contagious nature of the virus, some viruses - 20 °to the lowest level in a few months to a year to keep the dust of life.

The infectious titer of viruses decreases suddenly after freezing, and if stored for a long time, the infectious titer gradually decreases.

Chicken egg yolk or protein, blood serum, peptone sucrose or glucose are added to the virus so that the virus does not lose its activity when frozen.

If the disease is detected on the farm, then in accordance with the veterinary legislation, it is quarantined in this troubled area (farm), and the removal and import of animals from there is prohibited without the supervision of a veterinarian.

The movement of livestock through troubled places, as well as the division of livestock into any regrouping on troubled horses will be stopped.

Animals that are incurable, as well as those that are not treated (e.g., rabies), are killed in specially equipped areas, and the dead are burned.

Conditionally healthy animals are vaccinated against the disease.

In order to prevent the spread of infectious diseases, they are recycled in veterinary-sanitary points, which dispose of the carcasses of unclean dead and slaughtered animals. Here they are boiled in high-pressure boilers with a temperature rise above 100 °. For prophylactic purposes, as well as when the disease occurs, livestock buildings are disinfected. For effective disinfection, the barn should be cleaned of manure, debris and other contaminants. To prevent the infection from spreading along with the dust, water is first sprinkled inside the barn and then the contaminants are gradually removed to a specially designated area.

Then the walls, floor, barriers and tools are washed with hot water and disinfected.

Immerse in a disinfectant solution for 3-5 days to disinfect pans, shovels, shovels and other items used to clean the building.

All solutions used to disinfect the building are 1l per 1m ²area. expense. First sprayed on the floor, then the walls, and then sprayed on the floor again. Cover the disinfected building with steam for 2-3 hours, then ventilate, wash the walls and troughs with water.

The area around the barn area where sick animals have been touched or contaminated with manure and everything should be decontaminated at once. The manure is then burned or disinfected.

Unquenched lime, carbolic acid and other means are used for disinfection. Unslaked lime is used as milk of 10-20% lime.

Purification of viruses is carried out through filters (which use various synthetic fibers and polymeric materials), as well as ultracentrifugation by centrifugation. These methods also allow the isolation of individual components (fragments) of the virus.

Viruses vary in their resistance to environmental factors and various physical factors as well as chemicals.

The level of resistance depends on the mechanism of transmission of the virus. Alimentary-transmitted viruses (classic plague of pigs) or viruses transmitted through external coatings (contagious pustular dermatitis of sheep and goats) are particularly resistant. By airborne droplets (respiratory), the resistance to transmissible viruses is lower.

There are two known forms of viruses.

In its vegetative form, the virus is intracellular and deeply attached to it, and its storage is fully cell-related. This process has not been fully explored. The resistance of virions is well studied. The protein shell capsid plays a key role in protection from environmental factors. Because this shell is structured differently in different viruses, their resistance is also different. For example, viruses that contain lipids in the capsid shell are rapidly inactivated by fat-soluble substances. If you do not store lipids, you will not be sensitive to such substances. The resistance of viruses is of great practical importance. The killing of viruses under the influence of one factor and their preservation under the influence of another are widely used in the preparation of inactivated vaccines and the preservation of vaccines. In viral diseases, there is an intensive multiplication of viruses in the animal's body. During the course of the disease, some of the viruses die in the body. Some of it is excreted into the environment and stored there as a source of infection.

Viruses belonging to different families do not have the same resistance in the external environment. Virions that do not have a shell and have an isiometric morphology of the virion are particularly resistant. These include adeno -, reo -, picornavir. Which retains its infectious activity for several days. Viruses with a polymorphic form in the shell (such as ortho-, paramyxo viruses) are inactivated on the surface in a few hours. However, the opposite is also true. For example, smallpox viruses with a shell are resistant to the effects of dehydration and remain active even in short-term boiling in the serum .

**Temperature.** Most viruses lose their activity in 5-30 minutes at 50-60 $^{0}$C. Viruses that develop in the gut are resistant to heat. Adenoviruses, herpesviruses, smallpox vaccine virus lose their activity. Most viruses are well stored at temperatures below 70 $^{0}$C. The lower the freezing point, the less the virus is killed. The slower the process of lowering the temperature, the more the virus loses its multifactorial properties. The virus does not lose its infectious properties when quickly frozen at a temperature of - 196 $^{0}$C. In some viruses , it survives for months to a year at temperatures below -20 $^{\circ}$C. The titer of viral infection suddenly decreases when frozen. Decreases again when stored for a long time.

**Drying.** For long-term storage of viruses, they are first frozen and then dried under vacuum (lyophilization). Long-term storage of the virus depends on its type, drying mode and storage conditions.

Air temperature, gaseous composition, and humidity play an important role in drying and storing viruses. Under vacuum conditions, the virus can be stored for a

very long time. Oxygen has a detrimental effect on the virus, with 0.5% causing the death of several different viruses. Drying at +4: -20: -40 $^0$C allows viruses to be stored for a long time. At room temperature or 37 $^0$C, the virus dies quickly.

**Ultraviolet rays** - Viruses are UBN resistant to bacteria. The exposure time to different viruses is not the same. Long-wavelength 2250 - 2537A $^o$ has great activity. To reduce the strength of the untreated virus suspension, 200 to 1000 ER g / mm $^2$ is applied for a few seconds. 200 Erg / mm $^2$ is required to deactivate influenza virus in Allantois fluid . Under the influence of light light on the damaged cell, the viruses can reactivate and restore the infectious property. Restoration of infectious properties from the effects of light does not occur in viruses outside the cell. Viruses are very resistant to ionizing radiation. Adequate viral activity can be lost in more than one second at 200,000 ultrasounds. The resistance of viruses to alkalis and acids is different, each virus has its own characteristic resistance, and in this case the virion retains its viability. A 5% lysol solution has a very strong effect on viruses and kills all viruses in 1-5 minutes. The best preservative for viruses is 50% glycerin, which +2 $^o$ maintains the viability of the virus for several months. Antibiotics do not affect viruses. However, lymphagranuelioma, ornithosis, and trachoma, which are in the range of viruses with rickettsiae and are not considered to be true viruses, have been shown to be affected by penicillin, biomycin, and tetracycline antibiotics.

The different types of radiation of a virus (ultraviolet, X-ray) depend on the size of its genome. If 5 * 104 rad X-rays are required for inactivation of pox - asfa -, irido - herpesviruses with the largest genome (125 to 383 kv - kilovaz), 5 * 104 rad for papillomavirus (genome 7 kv) is sufficient. 'ladi.

In general, viruses are more resistant to UV light than bacteria. The irradiation time is not the same for different viruses. Long-wavelength (2250-2537A $^0$) rays have great activity. The effect of 200-1000ER g / mm $^2$ for a few seconds is sufficient to reduce the activity of the purified virus suspension .

200 ER g / mm $^2$ is required to eliminate influenza virus activity in Allontois fluid .

Under the influence of light, viruses can reactivate and restore their infectious properties. Only intracellular viruses have this feature.

200,000 concussions with ultrasound can cause the virus to lose its activity in a matter of seconds.

**3. Virus solvents.** A number of properties of resistance to ether, acetone, chloroform, formaldehyde and other chemicals depend on the presence of a supercapsid shell, the presence of nucleic acid inside the capsid, the size of the genome.

Different viruses have different resistance to alkalis and acids. A 5% lysol solution kills all viruses in 1-5 minutes.

One of the important features of viruses is their resistance to the pH of the environment.

In the process of evolution, viruses have a special ability to reproduce in a special alkaline-acid ratio in the host organism. For example, reo -, karona -, picornaviruses, which enter the host organism through food and cause intestinal

secretions, are resistant to pH 2.2-3.0. However, most viruses die in an alkaline or acidic environment.

A 50% glycerin solution is convenient for preserving viruses, allowing them to survive at +2 $^0$C for several months. (It should be explained in the example of rabies).

**Demonstration weapons:**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, video projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, food medium, drugs, chloramine, caustic soda lysol , tables, slides popular films, methodological manuals.

**Control questions.**

1. The effect of temperature on viruses.
2. Effect of drying on viruses.
3. Effects of freezing on viruses.
4. Effects of ultraviolet light on viruses.
5. Effects of sunlight on viruses.
6. The effect of disinfectants on viruses.
7. Solvents of viruses.

**Demonstration weapons:**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, video projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, food medium, drugs, chloramine, caustic soda lysol , tables, slides popular films, methodological manuals.

**Topic : REPRODUCTION OF VIRAL VIRIONS** .

**PLAN:**

1. Cell genome and the implementation of genetic information in a normal cell.
2. Adsorption of virions on the cell surface, the importance of ionic ends of receptors.
3. Deproteinization and introduction.
4. Replication of viral nucleic acids.
5. Accumulation of virions.
6. Formation of supercapsid.

**Basic literature**

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016

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***BASIC EXPRESSIONS***

Trypsinization, fibroblast, cytopathogenic effect, adsorption, Brownian motion, deproteinization, replication, assambelirovanie, nucleocapsid, latent, chronic, DI-particles, defective virus, pseudoviruses.

**Reproduction of viruses**

Viruses are rigid intracellular parasites that do not grow in artificial nutrient media without tissue elements outside the body (Carrel tissue cultures, Maidlan Tirode whey tissue fragments, Sinsser Tirode whey agar) etc.).

The interaction of viruses with the host cell is a multi-step complex process. As a result of this interaction, a productive, abortive, integrative process develops. In the productive form, viral reproduction is observed, the virus can be excreted without the process of abortive reproduction, the nucleic acid of the integrative cycle is attached to the cell genome.

The proliferation of viruses is radically different from the proliferation of bacteria. Their reproduction takes place in the disjunctive (Latin disjunctus - separately) type. Dozens of virions are located inside the cell .

In this case, the components of the virus (nucleic acid, virus protein, etc.) are synthesized separately in the cell, according to the information encoded in the virus nucleic acid, and then the virion is collected.

Virus reproduction can be conditionally divided into two phases. The first phase involves the adsorption of the virus into the cell and its entry into it, the modification of the nucleic acid to get rid of the proteins and cause infection. Consequently, this phase consists of 3 stages: 1) the adsorption of the virus into the cell; 2) entry into the cell; 3) "undressing" of the virus in the cell. These steps are aimed at the virus entering the cell prone to it and getting rid of the protective shells of its internal component. Once the first phase is complete, the second phase of reproduction begins. There are the following stages in this phase: 1) transcription; 2) transfer of a-RNA; 3) genome replication; 4) assembly of virus components (Fig. 1).

In the final stage of reproduction, the virus leaves the cell.

**The first stage** is adsorption. Virions bind to receptors of a glycoprotein nature that trap neuraminic acid in the cell membrane. Such receptors are present in many cells in the body, including erythrocytes. Sialic acid receptors (gangliocytes) are specific receptors for ortho- and paramicroviruses, while protein glycolipids and lipids in the cell membrane are specific receptors for others.

Proteins in capsids and supercapsids serve as receptors for viruses. They come in the form of (lashes of adenoviruses) or thorns (ortho - and paramyxo -, rabdo -, areno - and glycoproteins in the outer shell of bunya viruses).

The first stage of adsorption takes place due to the forces of attraction between the molecules, the second due to homology (similarity) or complementarity in the structure of the receptors of virus-prone cells.

**The second stage** is the entry of the virus into the cell. This process occurs as a result of receptor endocytosis (viropexis) and the addition of membranes. In viropexis, the virus attaches to the invaginated portion of the receptor holding the plasma membrane. Then around the virus. a vacuole is formed and from it the virus nucleus enters the cytoplasm. This pathway is specific to adenovirus, influenza virus, and others.

Intracellular development of papavirus infection .

In the second stage, the virus shell and cell membrane are added, resulting in the virion nucleus entering the cytoplasm; if the nucleus joins the membrane, it enters the cell nucleus.

**The third stage** is the "undressing" of virions. In this case, the nucleic acid of the virus must get rid of the supercapsid and the capsid.

**The fourth stage is the** transcription and replication of the viral genome. In two-stranded DNA-storing viruses, transcription takes place according to a mechanism in the cell genome: DNA—> a-RNA—> protein. It differs only in the origin of DNA-linked RNA polymerase. For example, viruses that transcribe in the cytoplasm of the host cell (smallpox virus) have their own virus-specific RNA polymerase. Viruses (adenoviruses, herpes viruses) that transcribe their genomes in the cell nucleus use cellular RNA polymerase in this process.

Transcription of the genome of RNA-storing viruses takes place in several ways.

1. Negative-stranded genome-carrying viruses (ortho-, paramyxo-, and rhabdoviruses) contain virus-specific RNA polymerase or transcriptase. They synthesize α-RNA in the genome RNA matrix . Such an enzyme is synthesized in virus-infected cells, but it is not present in normal cells.

2. In viruses with a positive genome (positive filament) (picorno-, togoviruses, etc.) the a-RNA function performs the genome itself and transmits the information in the host cell. RNA - protective retroviruses contain transcriptase or revertase, an enzyme that transmits information from RNA to DNA. This process is called re-transcription. Transcription is controlled by special mechanisms of the cell and the

virus. In this case, the information is read first from the "early" and then from the "late" genes. The first genes contain information about virus-specific enzymes involved in transcription and replication, while the second contains information about the synthesis of capsid proteins.

The virus-specific information is transmitted to the host cell ribosomes and the virus accumulates in special polysomes.

**The fifth stage** is the assembly of the virion. In this process , the nucleocapsid is first collected. Since the nucleic acids and proteins of the virus are synthesized in different parts of the cell, they must be delivered to the place where the virus accumulates . The protein and nucleic acids of the virus recognize each other and spontaneously bind to each other. Viruses mainly accumulate in the membranes of the endoplasmic reticulum and Golgi apparatus.

**The sixth stage** is the release of virus particles from the cell. This process is done in two different ways. Simple viruses that do not have a supercapsid, such as picorno-, adenoviras, etc., break down the cell and come out. They have an outer shell of lipoprotein nature . Viruses, on the other hand, emerge from the cell through survival. In this process, the virus uses the components of the cell membrane at the site of escape to form its outer shell, so such viruses remain in the animal's body for a long time. In a single virus particle , $10^6$ virions are formed after $10^2$, 3 cycles per cycle .

Single-layer cultures prepared with trypsin are widely used to propagate virions . Trypsin acts on the connective tissue between the cells, separating the cells from each other. Cell cultures are prepared from normal tissue of an animal in a state of clinical lethality and aborted embryonic cells, internal organs of animals, various malignant tumor tissues (Hela, Hep-1, Hep-2, KB, etc.). For example, Hela cell cultures (uterine cancer cells) have been grown since the 1950s and are still used in virology laboratories around the world.

The set of substances necessary for the cell to survive outside the animal's body , amino acids, carbohydrates, vitamins, etc., as well as nutrients containing certain salts and pH (199, igla and other environments) are used. Cell cultures are grown under strong control, using standard nutrient media and pure biological substances

Reproduction of viruses in an infected cell culture can be determined by their cytopathogenic effect (SPT) on the cell . As a result of the pathogenic effect of the virus on the cell, the morphology changes dramatically, that is, picnosis occurs in the nuclei (large, multinucleated cells) and inclusions are formed (3-

picture).

In cultures with the addition of red neutral dye, the SPT of viruses can be detected by the formation of plaques. The plaques formed by the degenerated cells where the viruses multiplied appear shiny, spotted on a red background . In addition, hemadsorption (GATR) in virus-infected cell cultures is enhanced by the attachment and hemagglutination of erythrocytes by these cells .

To isolate the virus from the latent forms of infection: 1) co-cultivation method, in which trypsin is added to a tissue biopsy taken from a sick animal or

corpse and shaken well. The resulting cell mixture is grown in a single-layer culture of a virus-prone cell; 2) a method of growing the tissue of injured organs , for which a primary cell culture is prepared from them. As a result, the multiplied virus is excreted in the culture fluid.

To detect pathological changes, incisions are made in the injured organs and histological examinations are performed. Reproduction of viruses in chicken embryos is a common method. To do this , the virus-carrying material is sent to the amnion, the allantois cavity, the egg yolk sac

Specific changes in chicken embryos are manifested in the form of focal lesions, diffuse thickening of the shell, swelling with numerous wounds, areas of necrosis , hemorrhage, pustules and blisters. Reproduction of viruses in chicken embryos is determined using the hemagglutination reaction.

Viruses can also be propagated in the body of laboratory animals that are susceptible to them , in which case they are infected with viruses that do not reproduce in cell cultures and in chicken embryos. The method of reproduction is selected depending on the type of virus. Isolated viruses are identified (classified) by generally accepted methods.

**Adsorption of virion on the cell surface:**

The first stage of the infectious process is the adhesion of the virus particle to the cell surface, a condition that occurs as a result of repeated Brownian action outside the virus cell.

Two processes based on ingestion.

**The first is** a non-specific electrostatic interaction, in which a protein, a phosphate group, is located outside the cell and has a negative charge.

**The second is** specific, the virus is associated with the cell i.e. the complements are associated with the cell and the receptors of the virus. It consists of viral poproteid (absorption of arbo viruses) and mucoprotein (myxo viruses and adenoviruses) receptors.

The sensitivity of cells to viruses is due to the presence of these receptors. Antiviral-specific antibodies resist the absorption of viruses into the cell.

Adsorption, the process of absorption consists of two stages: reversible and irreversible.

Q THE absorption of the virus into the cell during the said period may prevent the desorption from being absorbed.

THE NON-Q period occurs when the virus is in prolonged contact with the cell, resulting in an irreversible absorption process.

For example, it takes 2-4 hours and 37 degrees to grow a protein virus from a pig kidney in a cell. However, at low levels, viruses are not absorbed into the cell, and the process of absorption can be reversed by treating the virus that has grown outside the cell with a Versen solution.

**Intracellular entry of the virus:**

The entry of viruses into the cell occurs in two ways, the first - viropexis (pinocytosis), the second way - after adsorption, due to the dissolution of the virus and the cell membrane as a result of the cell absorbing fluid from the environment.

Most viruses enter the cell through viropexy, while some viruses enter the cell as a result of the melting of the virus and the cell membrane, and the nucleic acid in the virion is not involved in the onset of infection, but in the nucleoprotein.

**Deproteinization process:**

It takes place under the influence of pre-existing cellular enzymes in the cell. The deproteinization process of ospavacin virus is also complicated. The process of deproteinization of DNA is under the influence of special "dissolving" enzymes, the effect of which takes place from the beginning of the infectious process.

**Synthesis of viral protein:**

The time from the adsorption of the virus to the cell until it enters the cell and creates a new generation is called the latent period, after which a new adult virus is released into the external environment.

Failure to encounter the virus inside the infected cell during the latent period is called the ecliptic phase.

24 hours is enough for the development of DNA-storing viruses. Q THE multiplication of most viruses over a period of time has also not been clearly studied. After damage, 20 early synthesized proteins, 16 late synthesized proteins, and 14 formative proteins can be found inside the cell at different times.

At this point, early synthesized proteins are divided into 2 groups: 1-synthesized, 2-DNA after the replication of the virus genome has begun.

The synthesis of some formative proteins is controlled by transcription in the presence of RNA and other proteins.

**Synthesis of the virus component:**

The type and shape of nucleic acids are different. DNA, RNA, is made up of two-stranded, single-stranded, straight-line, and round-ring-shaped molecules that also replicate differently. Viruses belonging to different families have their own genetic information and replication properties.

**Formation of the viral membrane:**

The virus forms a form consisting mainly of cytoplasmic bilayer lipids. The viral membrane consists of glycoproteins HN and F and the inner protein layer M protein.

**Admission of an adult virus particle from inside the cell:**

This process is the most recent, in which mature virions are released into the environment. For example, the flu virus can leave the cell for 30 hours. It has been observed that some viruses pass from cell to cell without leaving the cell. In this case, extracellular antibodies located between the cells cannot affect the virus.

**Transduction is** the mechanism by which genetic information is transferred from one cell to another.

**Transformation is a** change, alteration, change in shape or structure.

**Transcription - For** protein synthesis, ribosomes must be sent a synthesis program, that is, information on the structure of the protein present and stored in DNA. Exact copies of this information are sent to ribosomes for protein synthesis. RNA, which is synthesized and accurately copies from its structure,

helps send information. Precisely repeats the sequence sequence of RNA nucleotides. Thus, information in the structure of this gene is supposedly copied. This process is called transcription. Latin. “Transcription” means download.

You can copy as many copies of RNA as you want from each gene. The RNA that transmits information about the composition of proteins is called information (i-RNA).

**Demonstration weapons:**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, nutrient media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodological manuals.

**CONTROL QUESTIONS:**

1. What is the main stage of virus reproduction?
2. In what systems can viruses grow?
3. In which part of the cell do DNA-storing viruses multiply?
4. In which part of the cell do RNA-hosting viruses multiply?
5. What is the eclipse phase?
6. What is meant by disjunctive reproduction?
7. How does the virus enter the cell?

## Topic: GENETICS OF VIRUSES

**PLAN:**

1. The structure of the genome of viruses.
2. Mutations of viruses.

**Basic literature**

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016
2. Trotsenko NI, Belousova RV, Preobrazhenskaya EA Practicum on veterinary virology. M., Kolos 2000 g.
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4. Andreev GM, Davydov VU, Zlobin VS Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg. 2004

**Key words:** set of chromosomes, diploid, haploid chromosomes, gene structure, recombination, mutation, phenotype, genotype, virus variability, heredity, transformation, transduction.

**Structure and function of the viral gene.** Each biological species has a clearly defined set of chromosomes in its somatic cell. Each chromosome is a pair. A set of double chromosomes (diploid), and in mature germ cells single (haploid). In mitosis, chromosomes divide into two and the cell is evenly distributed.

In viruses, the nucleic acid strand (DNA or RNA) acts as a chromosome, in some it is whole, in others (influenza, rheo-, arenaviruses) it is fragmented. A certain part of nucleic acids is responsible for the synthesis of a certain protein (determinant), they are called genes. Certain common viruses have three to five genes (for example, DNA-storing polio virus; picornaviruses have 6-8 genes). But in complex viruses (e.g., large bacteriophage T4), more than 30 genes control the synthesis of shell protein, and 15 - the synthesis of nucleotide nuclei; about hundreds of genes are involved in the reproduction of this phage.

The gene is not indivisible. It has smaller particles (mutons, recons), which combine certain functions and can be easily studied. The structure of the gene is well studied in T4 bacteriophage. It is known that a gene has three properties at the same time: it controls one or another feature of the organism (function), is exchanged (recombination) and changes (mutation). **The** concept of **cystron corresponds to the** concept of a gene - a function that corresponds to the information about a single protein.

The synthesis of a viral enzyme is encoded in genes, i.e., in specific parts of DNA or RNA. All enzymes (proteins) can be synthesized only if there is an appropriate gene encoding the synthesis of a given enzyme in the nucleic acid.

A viral genome is the sum of all the genes of a virus. In some viruses, the genome consists of one molecule of nucleic acid (DNA or RNA), in others - several molecules (influenza virus, rheo- and arenaviruses).

**A phenotype** is a given viral function and the sum of all external and internal traits. The phenotypic properties of viruses can be determined by morphological and serological methods. **The genotype** is determined only by the composition of the genetic material - DNA or RNA, ie they are determined by the order of the nucleotides in the molecule or the code of protein synthesis. The phenotype of the virus does not remain a permanent feature of it, it can change both during its development and under the influence of the external environment. Genotype is a permanent feature of a virus that can change as a result of a mutation in the genome. Mutational changes in the virus genome, in turn, lead to changes in its phenotype.

The viral genome has a polystyrene structure. According to the idea of modern genetics, "one enzyme (protein) - one gene" has been proven in the example of animal viruses. Polystyrene of viral genomes has been clearly studied in mixoviruses. If they are weakened by exposure to a temperature of 37 $^{0}$C for several days , first their infectious properties disappear, then neurominidase, and later hemagglutinins. Hence, certain cistrons of myxoviruses are disrupted.

Inheritance of viruses

Modifications. Modifications in viruses are hereditary (phenotypic) changes are associated with the host cell, because this is where the virus reproduces.

Changes in the chemical composition of the outer shell (supercapsid) of most viruses found in humans and animals occur due to modifications. Mutations. Natural mutations occur during the replication of the nucleic acid lot of viruses, affecting their various properties.

Induced mutations occur under the influence of mutagenic chemical and physical factors, as in bacteria. One of them (nitric acid, hydroxylamine, nitrosoguanidine) affects the extracellular virus, the other (acrylic, nitrogen-based analogues) affect the replication of the intracellular virus. Mutant viruses differ in the antigenic properties, temperature sensitivity, virulence of phenotypic capsid oxides . Viruses, like bacteria, have both correct and reversible mutations. In correct mutations, the phenotype of viruses changes, in reversible mutations - in reversion, they recover, that is, the genome returns to its original state. Recombination and other phenomena. When host cells are damaged at the same time by two different viruses that are susceptible to them, the properties of the virus change. Such changes can be classified as genetic recombination, genetic reactivation, complementation, phenotypic exchange. Genetic recombination involves the exchange of genes based on DNA that replicates between two or more viruses. The result is r with recombinants with two or more viral genes. Genetic recombination is rare in RNA-carrying viruses. Genetic reactivation is a specific type of recombination in which two different genes of a relative virus are damaged (inactivated) due to an incorrect distribution of genes. When these two viruses are mixed, viruses are formed, that is, reactivation of the virus genomes occurs. This process is observed in reo- and poxviruses.

**Complementation** and phenotypic exchange are not part of hereditary processes. In supplementation, proteins produced by one virus carry out the reproduction of the other virus. In this process, a virus iktynclii captures a gene that is considered defective or missing in the virus. A virus that aids in the reproduction of another virus is called a tellite, and a virus that stains in the presence of this virus is called tellite. In addition, unlike recombination, there is no exchange of nucleic acids between viruses. Complementation is common among viruses. For example, adenoviruses that are pathogenic to humans can be propagated in kidney cell cultures of macaque rhesus monkeys. Subsequent studies have shown that adenoviruses can multiply due to the oncogenic virus SV-4 0 in the kidney cell.

**Phenotypic exchange.** The part of the new virus formed when two different viruses are infected in a cell has both vims phenotypes, but if their genotype does not change, this is called a phenotypic transfer process. For example, when cells are infected with paralysis and Coxsackie viruses, the RNA of one virus forms virions encapsulated by the capsid of the other virus. This phenomenon is called transcapsidation.

**Mutation of viruses.**

Viruses change their properties both under natural conditions of reproduction and in practice. Underlying the genetic variability of viral traits are two processes:

1. Mutation, i.e., a phenotypic change in the characteristics of a nucleotide sequence change in a particular part of the virus genome.
2. Recombination is the exchange of genetic material of viruses that are close to each other but differ in genetic characteristics.

**Mutation** is a variability associated with a change in genes.

All mutations of viruses are divided into two groups: spontaneous and induced, in terms of duration they are divided into two groups: dotted and aberration (changes in many parts of the genome). A point mutation is characterized by the exchange of a single nucleotide (for RNA-storing viruses) or a pair of complementary nucleotides (for DNA-storing viruses).

Oberration in phages is characterized by a decrease in the number of different nucleotides. Spontaneous mutation, induced mutation is also divided into direct and inverse mutations.

Morphological or structural mutations affect the size of the virion by altering the genes that determine the primary composition of viral proteins, the morning or evening specific viral enzymes that enable virus reproduction.

**Spontaneous (natural) mutation.** In living nature, mutations are rare and occur naturally, that is, under the influence of a cause that is difficult to detect in each individual case. Spontaneous mutation of viruses occurs in the population without artificial mixing of the experimenter. In this case, the adsorbent cannot be the same population. Because the homogeneity is relative, spontaneous mutants appear with a certain probability during its development in a virus population.

The mutation of a trait can vary depending on the strain. For example, the recurrence rate of a mutation in the W-Fox poliomyelitis strain at the ret $40^{0}$ mark is $2.4–10^{-5}$, while in the Sh-AT strain it is slightly lower at $2.4–10^{-6}$. It does not remain a genetically pure line that appears in a population, it can sometimes develop rapidly and cover an entire population. The mutation frequency of viruses also depends on the cell system in which the virus population is developing. The cell system can also be a selection factor (option selection) at the same time.

What are the causes and mechanism of spontaneous mutation ? According to Watson and Crick (1953), spontaneous mutations can occur as a result of tautameric exchange of the bases that make up DNA. For example, the tautomeric displacement of the hydrogen atom of adenine causes it to bind to guanine rather than thymine in replication. Such erroneous replications lead to the exchange of AT and GS pairs.

Spontaneous mutations that occur in a single gene are not uniformly distributed along its length. Some parts of the gene mutate frequently, and some parts mutate very little. Therefore, the probability of errors in the pairing of bases varies in different parts of the gene. It may be due to a certain conformation of nucleic acid, and some nucleotides may exchange more tautomers than others. Spontaneous mutations can also be caused by a malfunction of DNA or RNA polymerase enzymes during replication.

Mutational variability of viruses consists in determining the physicochemical and biological properties of mutates . This determines the covariance of the genetic traits of the mutants or the nature of the mutant phenotype.

**Covariance is** the relationship between the change of a particular sign (marker) and the virulence, reactogenicity, immunogenicity and other properties of the virus . The mutant phenotype consists of the following traits, or reproductive properties in this system , thermoregulation, hemagglutination, hemolysis and other properties.

Mutations in viruses can occur in vitro (cell culture) and in vivo (animals, chicken embryos) as a result of their adaptation to certain biological systems .

**Mutation of viruses from animal to animal.**

Many examples can be cited of obtaining persistently immunogenic high virus strains in laboratory animals, naturally adapted or non-predisposed animals by long adaptation methods. For example, to be able to prepare vaccines from strains of rabies (virus fixe), large horned plague virus (strain L), horse plague, protein virus.

**Mutation of viruses in chicken embryos.**

Genetic variability of viruses has also been observed when they are grown in chicken embryos. Examples include modified variants of live virus vaccines, such as avian bronchitis, infectious laryngotracheitis, canine distemper, catarrhal fever, large horned animal plague, and Newcastle disease.

**Virus mutation in cell culture.** In cell and tissue cultures, many viruses grow well and are attenuated. For example, the yellow fever virus loses its neurotropic and viscerotropic properties and retains its immunogenicity when grown for a long time in chicken embryonic tissue. The 17D strain obtained by this method is still used as a live vaccine. A number of attenuated strains of polio virus (three types) implanted in a monkey kidney cell were obtained. A vaccine made from these strains produces strong, long-lasting immunity that is harmless to humans.

**Causes of mutation in the process of adaptation.** Changes in the characteristics of the virus in the process of replanting are gradual. In the first inoculations there are basically virions of any genetic trait; As the number of plantings increases, the population will develop virions with two or more signs of change; as replantation is more frequent, the amount of such particles is constantly increasing, and subsequently many genetic traits are observed in most virus particles. This suggests that two processes underlie the mechanism of genetic variability of the virus population: mutation and selection, which means that the external environment, which is both a mutation inducer and a selective factor, plays an important role in both processes (Yu.Z. Gendon , 1964).

Induced mutations occur when viruses (its vegetative or quiescent form) are exposed to various chemical and physical mutagens, as well as in processes of adaptation to abnormal biological systems (adaptation, variability). There are two advantages to using artificial mutagens. Firstly, they mutate ten to a hundred times more than natural factors, secondly, the effect of some artificial mutagens has a certain direction, and in advance to which element of nucleic acid, how much of this or that mutagen? makes a mystery, and it is possible to know what changes will occur in them. Chemical mutagens, high temperature, mutagenic effects of ultraviolet light have been studied.

**Factors influencing the direction and effectiveness of mutagenesis.** There are 8 such factors: 1) mutagenic composition; 2) special features of the virus; 3) the period of interaction of the virus with the cell; 4) the number of replications of the virus after mutagenic exposure; 5) selection of the interaction of the mutagen with the viral gene; 6) processing conditions (pH, composition, temperature); 7) type of cell system; 8) growing conditions.

Under the same experimental conditions, different viruses of the same mutagen do not even induce mutations of different strains of the same virus in the same way. The mutability of different traits differs sharply even between single strains in the same mutagenic effect.

Mutations can also occur from mutagenic effects of mutagens on peaceful and vegetative forms of viruses. In the second case, the mutagenic effect is not only related to the entry of the mutagen into the cell, but is also closely related to the replication of the viral genome.

The effectiveness of mutagenic effects depends on the concentration of the mutagen, pH, and a number of other factors. For most mutagens, a correlation between mutagenesis intensity and mutagenesis intensity has been identified. Hence, there is a mathematical relationship between the increase in dose, the increase in mutagenic efficacy, and the viability of the virus.

Induced mutagenesis also depends on the composition of the nutrient medium in which the virus-cell system is present. Not all mutations that occur under the influence of mutagens are equally stable. Mutants obtained under the influence of high temperature, acidic environment, ultraviolet light and ultrasonic waves reversed up to 20%, while under the influence of proflavin all mutants were found to be completely stable. Such a difference in stability is due to the fact that the molecular mechanism of action of the mutagens used is not the same. High temperature, acidic environment, ultraviolet rays mainly lead to the exchange of virus nuclein separate bases. This, in turn, leads to an exchange of individual bases. The reason for the mutation in the mutagenic effect of proflavin as well as partial nitric acid is that the bases fall off or join. When vaccine virus strains are obtained by mutagenic exposure to viruses, it is advisable to use mutagens that alter the genetic code more deeply. Because such mutagens have the property of stabilizing hereditary traits.

**Demonstration weapons:**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope,

autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, nutrient media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodological manuals.

**Control questions:**

1. What is a genome?
2. What is the structure and function of the viral gene?
3. What is a phenotypic, genotic variability?
4. Explain the mutation of viruses.
5. Factors influencing the direction and effectiveness of mutagenesis.
6. Causes of mutation in the process of adaptation.
7. Mutation of viruses from animal to animal.

**Topic: ECOLOGY OF VIRUSES**

**PLAN:**

1. About the nature and origin of viruses.
2. Ecology of viruses.

**Basic literature**

1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

**Foreign literature**

1. Fenner's. Veterinary Virology (United States of America 2016 year).
2. M.Jackson. Veterinary clinical pathology. America 2010 year.
3. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
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**Additional literature**

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU "Uzbekistan", 2017.
2. Mirziyoyev Sh.M. Ensuring the rule of law and human interests is a guarantee of the country's development and the well-being of the people. NMIU "Uzbekistan", 2017.
3. Mirziyoyev Sh.M. We will build our great future together with our brave and noble people. NMIU "Uzbekistan", 2017.
4. Mirziyoev Sh.M. Decree No. PF-4947 of February 7, 2017 "On the strategy of further development of the Republic of Uzbekistan." Tashkent, 2017.
5. Vorobyov A.A. Medical microbiology, virology and immunology. Uchebnaya posobiya. M. 2008 god.
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**BASIC EXPRESSIONS**

Sublimation, lyophilization, photodynamic effect, conservation, freezing.

Currently, based on modern data, viruses are obligate intracellular parasites that are agents that can replicate their genome autonomously and transmit from cell to cell.

**There are 4 different concepts about the origin of viruses.**

1. Viruses are a generation of bacteria that have undergone regressive evolution. Viruses are made up of filtered bacteria, and rickettsiae and chlamydia are understood to be intermediate microorganisms between them.
2. Viruses are surviving generations of pre-cellular life forms due to parasitic order. It was believed that first DNA-storing and then RNA-storing viruses emerged.
3. Viruses are organisms in which nucleic acids are formed abiogenically without being bound to a living system.
4. Viruses are an isolated part of the cell. DNA-storing viruses are thought to have formed from episodes.

**There are currently 2 areas of virological research** .

a) the role of viruses in living systems and its evolution.

b) application of viruses in genetic engineering.

The study of the natural evolution of viruses should not be limited to the range of hosts that can be infected (pathogenic stator). Each group of viruses has a similar structure, but systematically identified species that cause pathological processes in distant hosts. Example: Rhabdoviruses with an axillary form cause rabies on the one hand, and yellow fever on the other. According to the structure of the genetic material, reoviruses that cause acute respiratory diseases in humans and animals cannot be distinguished from viruses that cause traumatic tumors (tumors) in plants.

This indicates the universality of their morphological structure, along with the high specialization of the parasitism of viruses. The acceleration of the development of virology can be explained by the application of modern techniques in biological research and the application of the method of cultivation in cell culture to the basic practice of virology.

Cell culture began to be widely used in virology after it was discovered that the polio virus could multiply in many tissues of humans and monkeys.

About 500 viruses have been identified and described in the last twenty years. Many of them have the ability to cause disease in humans. For this reason, much attention is now being paid to the study of viruses, including their ecology.

The problem of human opening of new ecological zones and filling them with dangerous and harmful organisms, including disease-causing viruses, has not been fully explored. (The mechanism of transmission of AIDS and bovine leukemia virus diseases can be traced in this way). However, this is the most pressing and potentially dangerous environmental problem.

New lethal diseases can occur in the course of a very widespread population of humans and animals. In nature, this is a natural process and depends on environmental factors (population, animal population density). Population outbreaks occur in humans with outbreaks (outbreaks) of disease. (Example: In

humans, in addition to controlled diseases (plague, yellow fever), new diseases that have not previously manifested or have not occurred may occur.

The ecology of viruses is very broad and includes invertebrates, vertebrates, plants, microbes (bacteria, microscopic fungi, algae). Viral diseases make up 70-80% of all infectious diseases. It has great results in the fight against viral diseases in medicine and veterinary medicine. Smallpox, acute epidermal pokoxomilitis, etc. have been eliminated, and many effective vaccines have been developed.

Nature enters and communicates to all living beings like man. In it, everything is interconnected and ecological equality is balanced. Viruses have been around since the beginning of life and have been around ever since. They are one of the components of the biosphere. They possessed the only biological "niche" (territorial circles) in nature, the total number of which is difficult for all to calculate.

In ecology, there is the concept of ecological "niche" in the interaction of organisms, including viruses and other taxonomic groups, with each other and with the external environment. This is the place occupied by the taxonomic group on earth. Ecological "niche" is a very broad concept, which includes the arsenal of the taxonomic group under study, its interaction with other groups of organisms, their role in the biociosis of nature and their place in the biosphere.

Most viruses parasitize only one type of organism (some phages, plant viruses, animal dung, hepatitis in humans, etc.)

Other viruses infect closely related species (most bacterial plasmids, potato virus diseases, protein virus, human animal influenza, and x).

A very large group of viruses has a two-phase transmission type. In doing so, they either call their master or another living organism is a mechanical carrier.

The source of the disease for the epizootic chain of the disease or the infectious process can be known as transmission factors and susceptible animals. The circulation of viruses in nature can take place in a horizontal and vertical way.

- **The horizontal path** is the spread of the virus into the host population.
- **The vertical path** is the **path** from mother to child.

They are characteristic of oncogenic viruses, which are explained by the integration of their genome with the genome of germ cells. In view of the above, viruses are ubiquitous (i.e., as a species that invades all living organisms).

The epizootic process involves a continuous chain of damage (infectious process) going on and the release of the pathogen into the external environment. In this chain, the source of infection, the transmission factors, and the susceptible organisms are affected.

The source of the disease can be humans and animals. All diseases caused only by parasitic pathogens in the human body are called **anthroponoses** . If the animals are infected **zoonozlar** said.

Anthroponotic viral diseases: influenza, measles, smallpox, herpes, polio.

Zoonotic viral diseases: catarrhal encephalitis, fibrotic fever, mass fever, myofocytic choriomeningitis, proteinuria;

However, these two concepts are relative and can be mixed. Examples are yellow fever, encephalitis, influenza, and others.

The source of the disease can be a carrier of the patient, a stage of recovery (reconbolescent) and a healthy carrier.

Transmission factors include other infections: air, water, food, tu prok, bedding, and arthropods.

**Transmission routes can be:** air droplets, enteral, damaged outer covering layer, blood-sucking joint through the legs, and others.

**In viral infections, the mechanism of vertical transmission is divided into two.**

a) fetal damage can occur when pregnant animals (females) are infected with viral diseases (measles, cytolysis in humans, infectious bronchitis in birds, and x).

b) genetic transmission is characteristic of oncogenic viruses, which is explained by the integration of their genome with the genome of germ cells.

Based on the above, viruses are considered ubiquitous objects (ubiquet - everywhere) as organisms that occupy all living organisms.

Ecological and social research has allowed to change the natural foci of a number of viruses: Arboviruses, Togoviruses, Bunyaviruses, Rabdoviruses, Iriboviruses, Loxviruses.

Ecology is the science that studies the interactions of humans, animals, plants, and microorganisms with each other and with the environment. (When we say ecology, we mean the waste of factories and mills.

Viruses are very small microorganisms that cause infectious diseases. Viruses do not have their own metabolic system and use the cells of the organism they are parasitizing (more precisely) to synthesize various substances. They do not have a cell structure and do not multiply by this cell division.

In the modern classification, viruses are also recognized as a non-cellular form. Therefore, there is a need to study the ecology of their interaction with the environment. They occupy a certain place in nature as living organisms and interact with other organisms as well as with the external environment.

Some aspects of viruses can be likened to parasitic worms in the body of the last host (main host).

Often mammals and birds are infected by plants and nutrients. Man, on the other hand, consumes their products, causing them to be harmed as the ultimate master. Thus, in the early 20th century, "bird flu" and "swine flu epidemics" emerged. There are still cases of people suffering from these diseases. However, pandemics and deaths have not been observed as at that time.

Of course, viruses can also be transmitted in other ways. However, it is beneficial for viruses to enter the body through the consumption of mammals and other animals. This explains the fact that in developed countries of Asia and Africa there are outbreaks of various infections.

(The cuisine of products consumed in these countries is very wide and unique).

The virus gradually adapts to the final host organism. Like the parasitic worms themselves, no response may be observed during the presence of the virus

in the hosts of other hosts and during the incubation period and inability to find suitable cells.

The human body, on the other hand, is considered to be the most favorable for the presence of high-level organisms and active life-threatening viruses. First, most viruses multiply through airborne droplets. This means that people talking to each other will be enough to spread the disease. Second, a person consumes the best products rich in protein and vitamins, which means that there are always enough chemicals needed for the virus to multiply.

If the development of viruses was not slowed down, they would continue to develop and infect all existing farms. However, like all living organisms, viruses are often inhibited by the composition of the environment or the alkaline-acidic environment. The secret is learned.

Also, viruses can often pick up older organisms or younger organisms so that middle-aged ones can survive. The habitat of each species should be ideally suited for each species, as the existing habitat is conditionally a sum of different thematic physical biological and environmental factors.

With viruses, however, everything is different. Viruses are causing more diseases in Asia and Africa. It is not in vain that Cars, Mers, COVID-19, caused by avian influenza, swine flu, Ebola, Zeka, chronaviruses, start on these continents. creates. In addition to improving hygiene conditions, medications can help fight the presence of ARVI (acute viral infections). A vaccine against Ebola was developed only in 2019. Anti-coronavirus is now being developed.

Viruses are spread not in natural areas but in places where large amounts of potential traits have accumulated. These are in places where animals and birds are kept densely or where they do not congregate, and among humans in large cities, states, etc.

Viruses limit their reproduction by causing infectious diseases in animals and plants (even killing them) and thereby regulating their ecology.

The biological significance of viruses can be seen as a factor in genetic variability in the evolution of living organisms. In this case, the effect of viruses on the evolutionary process may be due to several mechanisms. In particular, most viruses act as mutagenic factors that integrate into the body's DNA cells. In addition, viruses can be transmitted horizontally between two non-related (belonging to taxonomic groups) organisms.

## QUESTIONS FOR CONTROL

1. What is the ecology of viruses?
2. The concept of ecological *niche* .
3. The main directions of virological research.
4. The horizontal nature of the virus circulation
5. The vertical path of circulation of viruses in nature.
6. How chemicals react to viruses.
7. **List** the physical factors that affect viruses.

**Demonstration weapons.**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple mectroscopes, nutrient media, drugs, chloramine, carving, lysol, tables, slides, popular films, methodological manuals.

## Topic: OCCURRENCE OF VIRAL DISEASES IN ANIMALS (PATHOGENESIS)

**PLAN:**

1. Barriers to the entry of viruses into the body of animals and pathways.
   a) the primary cycle of viruses
   b) tropism of viruses and its interconnection
   c) the mechanism of injury to the cell
2. The emergence of the disease clinic and its causes.
   a) latent period
   b) the consequences of the disease
   c) causes of death
   g) convalescence, virus isolation and virus transmission.
3. Persistence of the virus.
4. Secondary circulation of the virus.

**Basic literature**

1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

**3. Foreign literature**

1. Fenner's. Veterinary Virology (United States of America 2016 year).
2. M.Jackson. Veterinary clinical pathology. America 2010 year.
3. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
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**Additional literature**

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU "Uzbekistan", 2017.
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5. Vorobyov A.A. Medical microbiology, virology and immunology. Uchebnaya posobiya. M. 2008 god.
6. Andreev G.M., Davydov V.U., Zlobin V.S. Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg, 2004

## BASIC EXPRESSIONS

Obligate, cytopathic effect, cytolytic transformer, inductive, lysis, cell genome, neuraminidase, tinctorial, hyaluronidase, septineuritis, pantrop, tropism, dermatrop, neurotrop, pneumotrop.

## PATHOGENESIS OF VIRAL DISEASE IN ANIMALS

Viruses enter the body in different ways. For example: Newcastle, smallpox, swine fever, infectious bronchitis in chickens, parainfluenza-3, respiratory syncytial infection, infectious rhinotracheitis viruses of large horned animals enter the body through the nasopharynx.

Poliomyelitis, swine enteroviruses, coxsackie, proteinuria, vesicular exanthema of pigs, Newcastle, influenza of chickens, adenoviruses of chickens, diarrhea virus of large horned animals enter the body through the digestive tract.

Parasitic virus transmitted through the skin (milk, in the hands of milkers) is known venereal lymphagranuloma, chickenpox virus of chickens, chickenpox virus of sheep and goats, infectious contagious ecthyma viruses.

A large group of arboviruses are transmitted to farm animals by fleas, mites, and flies.

**Reproduction of viruses in the body** - after the virus **enters the body** , it multiplies from the place of entry and then multiplies in certain organs and tissues and spreads throughout the body.

The spread of viruses in the body is in different ways, mainly through the blood and lymph fluid.

In 1887, Babesh proved that the spread of the rabies virus in the body is through nerve fibers. The passage of the virus into the central nervous system occurs as a result of movement toward the center. They do not have to multiply in the cells until the virus reaches the brain through the genome, they even reach the central nervous system as quickly as the poison is spread in the tissues or the inert substance is absorbed.

The amount of virus entering the bite site depends on the activity of the enzyme hyaluronidase in saliva and the presence of antagonists of the enzyme hyaluronidase in blood serum. Special antirabic gamma-globullin neutralizes rabies virus. The movement of the virus toward the center is called Nikolai-septineuritis because in bacteriology, the occurrence of bacteria in the blood is understood as sepsis.

When some neurotropic viruses herpes, poliomyelitis, neurosaccin, rabies viruses are transmitted to the body through the respiratory tract, subcutaneously, through the mucous membranes through the mouth and through the nerve, the direction of movement of the virus towards the central nervous system is observed.

**Isolation of the virus from the body** - occurs in different ways. In diseases caused by pantropic viruses, the virus is excreted in feces, urine, nasal and eye exudates, milk, saliva, European and African plague of pigs, Aueski disease, plague of large horned animals, infectious anemia.

In infectious rhinotracheitis in influenza in pigs, horses, large horned animals, the virus is secreted through the nasopharynx. This can be detected as a result of infection in sensitive systems to detect the presence of the virus in the secreted fluid. In enterovirus disease (teshen disease, transmissible gastroenteritis, viral diarrhea, encephalomyelitis of chickens in rotavirus infection) viral fecal excretion was detected.

In diseases associated with skin lesions, the virus is isolated from the affected area in the protein, chicken pox, sheep and goat pox, paravaccine, contagious ecthyma, and others. In rabies, the virus is excreted through saliva. In recent years, it has been observed that viruses are transmitted from one animal to another through semen. Examples include proteinuria, leukemia, infectious rhinotracheitis, diarrhea, ephemeral fever, and paravaccine diseases. In the past, this has been neglected. In many cases, contamination of the seed with the virus resulted in a significant decrease in seed germination. Accumulation of viruses in an infected organism. In 1921, the French virologist Bürrel first studied the tropism of viruses. There are 4 different clinical forms of plague in dogs: nervous, pneumonia in the lungs, visceral (enteritis) and cutaneous forms. In most cases, these forms do not occur in isolation, but all forms can occur in one organism at once.

**V Irusta effect of blood** - E ritrotsit tropizm herpes viruses, plague of pigs infected red blood cells and granulocytes production capability. Aplasia has a strong effect on the maturation of erythrocytes, disrupting the structure of blood-forming systems until the appearance of clinical signs of the disease. Damage to leukocytes in several chronic viral infections can lead to decreased interferon synthesis in the future.

**Effects of viruses on the genetic apparatus of the cell.** In several myxovirus infections (called measles, paratyphoid, Sendai, etc.). Disorders in chromosomes. This condition is observed during the acute phase of the disease.

**Virus virulence,** C irulentlik this level of pathogens. It depends on the strain and storage conditions of the virus, and the method of transmission to the organism. For example: a homogeneous virus can have different virulence levels. Newcastle disease virus has velogenn (highly virulent), lysogenic (moderately virulent), lentogenic, and apatogenic strains. There are live vaccines ( *La-sota*, $B_1$, Bor / VTNKI / 74 , *FR* and *F* -strains) that are non-pathogenic to single-celled cells and are widely used in virology practice .

**Control questions**

1. What do you mean by a source of infection?
2. In what ways does the pathogen pass from a sick animal to a healthy animal?
3. When does the latent period begin and where does it end?
4. What do you mean by the persistence of the virus?
5. What is your understanding of convalescent animals?
6. V Irusta how the effect of blood?
7. What is the function of interferon?

**Demonstration weapons.**

Bactericidal lamps, table-mounted box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass , panels, petri dishes, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple microscopes, media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodical manuals

**Topic: Immunofluorescence and diffusion precipitation reaction.**

**Plan:**

1. NAU and its essence.
2. Methods of putting IFR.
3. Application of IFR.
4. DPR and its essence.
5. Putting DPR.

**Basic literature**

1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

**4. Foreign literature**

1. Fenner's. Veterinary Virology (United States of America 2016 year).
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**Basic terms:** fluorescence, phosphoession, fluorochromes, luminescent microscope, conjugate **,** precipitation, gel, antigen, antibody.

The luminescence process underlies the method of irradiated antibodies. Its essence is that the atoms of different substances come into a state of excitation by

absorbing different types of energy (light, electricity, etc.) and then return to their previous state and dissipate the absorbed energy as light of light.

Occurs in the form of luminescence, fluorescence or phosphorescence.

Fluorescence is the scattering of light that occurs when irradiated with wavelength light ($10^{-9}$ to $10^{-}$), after which the irradiation also stops.

Phosphorescence - even after the excitation process has stopped, the radiation continues for a long time. Many substances in a living organism have their own individual fluorescence (autofluorescence), but its potency is very low.

Fluorochromes (light-emitting colors) are substances that give light to non-light-emitting substances. Such fluorescences are called secondary. Fluorochromes are widely used in luminescent microscopes to process biological objects.

Fluorescent light scattering follows the Stokes rule, according to which fluorescent light has a longer wavelength than excited light. If there is a lot of excitation light, the fluorescence light will be green. This allows you to finally filter low power fluorescence from bright excited light.

Near-ultraviolet or blue-purple spectral fragments are used to excite fluorescence under a luminescence microscope.

A fluorescent microscope is made using a special fluorescent. Currently, the laboratories use ML-1, ML-2, ML-3 and "Lumam" series fluorescent microscopes. (Fig. 61).

In luminescent microscopy, several slit filters (FS-1, SS-4 + SS-8) are used to separate the blue-purple fractional spectrum; filters that protect the optics and drugs from heat discoloration (SZS-14, SZS-7, BS-8, in a barrel filled with water or a solution of bitter stone) and in the eyepiece of the microscope to block the excited light and remove the luminescence light. 'tkazuvhsi (JS-18, J.S.-3) will be equipped with filters. The fluorescent microscope is mounted on a table placed in a dark room. It is important to ensure that the microscope does not vibrate, as this will interfere with microscopy.

The room should be well ventilated, as gas emitted from the light source can be harmful to health. If the current is 4-5A, the light emitting lamp in the microscope reaches its luminous power after 5-10 minutes.

To turn on the lamp a second time, you need to cool it down first. Most examiners examine drugs under a fluorescent microscope because they have a number of advantages when viewing the drug from below, low light consumption, good spectral composition of excitatory light, low light in the examiner's eye, and the illumination of the ect increases.

High quality immersion oils that do not emit light on their own are used for fluorescence microscopy. Sometimes its substitute-dimethylphthalate is used, but the long-term use of it impairs the quality of the objects.

In the practice of virology, a luminescent microscope is mainly used in two ways: fluorochromes (staining with light-emitting colors) and the method of irradiated antibodies.

Treatment of fluorochromes with fluorochromes in order to increase the luminosity and contrast. Currently, special fluorochrome kits are produced in the industry of our country. The most widely used acridine group (orange acridine,

yellow acridine, etc.) and thiozil group (primulin). Low-concentration aqueous solutions of fluorochromes are widely used (1: 1000 to 1: 1000000). The fluorochromization method can be used in the study of some viruses (smallpox, Born's disease, adenovirus diseases).

Among them, orange acridine is of great importance, which evokes polychromatic fluorescence of nucleic acids.

**Radiation antibody method (NAU), or immunofluorescence reaction (IFR):**

The essence of this method is that antibodies stained or marked with fluorochrome retain the property of binding to their homologous antigens. The resulting antigen + antibody complex is visible and found under luminescent microscopy due to its characteristic light scattering.

Thus, with the help of NAU it is possible to control the initial stage of the serological reaction, so its high sensitivity is added to the specificity of the reaction.

To obtain antibodies, anti-viral hyperimmune serums purified from foreign antibodies with high activity are used.

From these serums a homogeneous fraction containing its antibody is separated and they are marked with fluorochromes. Fluorochrome is often used as fluorescein isothiocyanate-FITC (good light emitter) and rhodamine sulfochloride-RSX (red light emitter). Antibodies marked with fluorochromes are called conjugates.

Cognac is poured into ampoules- or stored at a lower temperature. It can also be stored at temperatures by adding 1: 10000 thiomersal to the conjugates. Light-emitting serums or their globulin fractions retain their activity for a long time when lyophilized and dried. When using any series of conjugate, it is initially determined experimentally that its worker is diluted, as it depends not only on the quality of the irradiated serum but also on whether the drugs are irradiated under a luminescent microscope.

For this purpose, preparations stained with different dilutions of the conjugate (working dilution level 1-2 high and low dilution indicated on the label) are observed under a microscope and a high-brightness dilution is selected and the dye titer is doubled.

**PREPARATION OF DRUGS**

When immunofluorescent testing is performed, smears, seals, histological incisions, and cultured cells are used.

Used glass should be thin, clean, degreased and scratched.

They are therefore washed in neutral liquids, rinsed in distilled water, and stored in an alcohol mixture or a mixture of ether with alcohol. Before use, the glassware is heated in an alcohol lamp flame and then cooled.

The necessary notes on the pre-glued adhesive plaster are written with a simple pencil.

When written with different pens, the drug dissolves during fixation and prevents treatment with fluorescent serums.

Greases are prepared from washes and other liquids.

Greases are made from the material in which tissue or organ of the body the virus accumulates the most. From the brain to diagnose rabies; in rhinopneumonia of horses and hepatitis of dogs - from the liver; in influenza, infectious rhinotracheitis of large horned animals, adenovirus diseases, ointments from the nose and throat, and seals are prepared from the mucous membranes of the nasal cavity, bronchi and larynx; in smallpox ointments are prepared from vesicles, papules.

To detect influenza virus and to detect other respiratory pathogens, the nasal passages are cleaned of mucus, smeared using a cotton swab, and placed in a buffer containing saline solution or nutrient medium. The swab is then rinsed, squeezed, and removed, the solution centrifuged, and ointments prepared from its precipitate. Coated with a multilayered squamous epithelium, for example, to examine the mucous membranes of the throat, eyes, and vagina, it is first cleaned of mucous substances and scraped (scraped). Usually drugs prepared from these epithelium are not worth checking because they have autofluorescence. Therefore, the drugs are prepared from cells in the scraped areas.

When making stamps from organs, the glass of the product is touched to the surface of the organ. The marks should be thin and flat. The grease marks are air-dried, then fixed and stored in refrigerators (4 $^{0}$C-) until used . Drugs are prepared in this way from the organs of healthy animals for control.

If the viruses need to be collected in pre-grown cells, then the cultured cells are grown on the surface of closed vials placed in a test tube.

These plates are removed at different times after damage and are gently washed with saline or phosphate buffer solution to remove them from the nutrient medium.

It is then dried and fixed at room temperature or using clean filter paper.

The best fixative for viral antigens is pure acetone, minus 10-chilled or methyl alcohol is used.

The drugs are fixed for 10-20 minutes. Fixation time and temperature depend on the type of virus. The fixation time of highly dangerous viruses is prolonged.

Direct and indirect methods of irradiated antibodies are known.

**A. Direct method (single step)**

Virus (antigen) Radiation Radiation

globulin complex

(antibody) (antigen + antibody)

**B. Indirect method (two-step)**

1. Detection of antigen using irradiated antiglobulin

Phase I Phase II

Virus Non-radiating Radiation- Radiant Radiation (antigen) antibody, that antimicrobial antiglobulin complex.gen N2 (immune-complex N2 antigen-

serum) (antigen- antibody) antibody .

2. Detection of antigen using irradiated complement.

Phase I Phase II

Virus Complement Radiation-Radiation-Radiation (antigen) mixture called antimicrobial complex and radiation-plex (anti-plementary gene-antibody-globulin antibody)

1. Irradiated antibodies are used for each antigen when using a direct or single-step method (Weller and Coons, 1954) to indicate different viral antigens. The drug is injected directly into the moistened chamber by instillation of conjugate for 20-60 minutes, and some investigators have spent a longer time in this process.

To remove conjugates that are not bound to the antigen, the drugs are washed with saline solution (pH 7.2-7.5). They are then air-dried, dripped with irradiated oil and observed under a microscope.

Depending on the specificity and brightness of the radiation, its result is calculated and determined on the following scales depending on the specificity of the structure.

As a control, virus-free drugs are tested (normally grown cells, stamps made from the organs of healthy animals). They are treated at the same time as the experimental drugs (Fig. 63). A contrast method is used to reduce non-specific radiation in the drugs being tested.

To do this, the greases being tested are treated with rhodamine-laden liquids of horse or bull serum albumin. As a result, specific antigens from the drugs under the microscope emit a green light, and the bottom of the drugs is orange or brown.

Dried specific light-emitting immune serums and albumins released in biofactories are dissolved in distilled water in the volume indicated on the label before staining the greases.

Good drugs usually dissolve quickly and without precipitation. If they become cloudy and melt when melted, they are centrifuged at 6,000 rpm to remove mud and sediment. Dissolved drugs can be used for up to several weeks after storage. Before processing of the tested drugs, a working dilution of the irradiating albumin with a specific conjugate is prepared. The ratio of FITS-determined irradiated immune globulin mixtures to rhodamine-labeled albumin compounds is determined experimentally because the activity of their series can vary from release to use.

The direct method detects and differentiates antigens. To do this, each virus must have its own radiant serum.

2. Indirectly or in two stages, the antigen is initially treated with a non-radiating antibody (step 1). The result is an antigen + antibody complex, and an anti-irradiated serum is used to detect them. The type of serum is vaccinated with animal globulins derived from antiviral serum.

Serums are often used against rabbit, horse, and guinea pig globulins.

Indirectly, instilled serum or gamma-globulins not fixed against the suspected virus (as described above) are instilled, and then the drug is kept for 30 minutes.

Unbound antibodies are washed away. The drug is infused with an antibody-protective conjugate against gamma-globulin of the animal from which the antibody was obtained, if antibodies from chickens are used, then only antibodies against gamma-globulin of chickens and fluorochrome are used.

The timing of staining with these conjugates is similar to that of the direct method.

The drugs are washed from the unbound marker with antibodies, which are observed under a luminescent microscope with the addition of light-emitting oil (Fig. 64).

The indirect method has several advantages, it is used not only in the detection of antigens, but also in the titration of antibodies. This method is several times more sensitive than the direct method because each molecule of the antigen typically binds several molecules of the antibody.

These antibodies bind to the antigen being studied, which in turn acts as an antigen to the irradiated antiglobulins and binds it more. Furthermore, in this method, antigens of many different viruses can be found with a single identified serum.

Good conjugates dissolve immediately and do not form sediment. Melted conjugates can be stored at 2 ° C for up to 1-2 months.

We observe non-specific radiation when using conjugates at concentrations thicker than the working fluid.

Several variants of the indirect method have been developed. Of these, the use of complement deserves more attention. (Goldwasser and Shepard, 1958). In this method, the drug is injected with inactivated and fluorochrome-stained serum and complement, then the drug is instilled anti-complement irradiated serum in order to see the antigen + antibody + complement complex.

This option is more sensitive than the first and is also universal because a single irradiated complement serum is needed to detect different viral antigens.

Both variants of the indirect method are used to detect and differentiate antigens and to titrate specific antibodies.

It is also possible to find a specific antibody and determine its titer after previously diluting the test serum with different dilutions of greases prepared from specific virus-containing materials.

This method accelerates and simplifies the serological diagnosis of viral diseases. (See the section on the diagnosis of proteinuria, the method of detection and titration of antibodies).

NAU is widely used in various fields of biology. It is widely used, especially in virology.

Due to the high specificity, sensitivity, simplicity, and rapid response of the NAU method, it is used to detect and differentiate viral antigens.

This method is especially important in the detection of viruses that do not cause cytopathic effects, do not have the ability to hemagglutination and hemadsorption;

The process of interaction between NAU antigens and cells in the detection and titration of antiviral antibodies and specific antibodies allows to study the morphology, dynamics of accumulation of viral antigen in cells, the relationship of viral antigens, and the pathogenesis of viral diseases. .

This method is especially important in the study of mixed and chronic viral diseases.

NAU belongs to the express method of diagnosis because in a short time (several hours) it finds even small amounts of viral antigens.

However, in the process of laboratory diagnosis, NAU often gives unsatisfactory results. The main reason for this is that it can explain the degree of specificity of the reaction result, which depends on many factors.

The nature of the non-specific reaction has not been fully studied.

However, some of the causes have been identified, which include;

1) The presence of fluorochromes that are not bound to proteins in the conjugate;

2) the presence of foreign antibodies in the conjugate;

3) Adsorption of non-specific proteins in the drug.

Currently, NAU is widely used in the diagnosis of many viral diseases of animals.

**Gel diffusion precipitation reaction.**

Gel diffusion precipitation reaction DPR (synonyms: gel-precipitation reaction, gel secondary diffusion reaction) is based on the gel diffusion property of antibodies and dissolved antigens, the antigen-antibody complex does not have such a property.

The antigen-antibody complex is formed by the diffuse meeting of homologous antigens and antibodies against each other. It sinks into the gel layer to form precipitation lines.

The entry of one substance into the molecules of another substance at a certain temperature is called a diffusion phenomenon. Diffusion can occur in gases, liquids, solids, and gel media.

A gel is a system of uniformly dispersed liquid phases in a solid.

Such compounds include starch, agar, gelatin, and others. Agar is often used in laboratory practice.

Serum antibodies are a collection of immunoglobulin molecules that, despite their size, can easily diffuse in the gel.

Viral antigens are viral proteins. They are present in the virion and represent the corpuscle of the antigen, the adult of which does not diffuse if the gel.

Soluble antigens of the virus are easily diffused in the gel.

The method of placing the DPR in the gel is as if several grooves are made in the gel layer and antigens and serums are placed in them so that the serums and antigens are close to each other. From the pits, the antigen and serum diffuse to the gel thickness. It begins to diffuse in all directions from each cavity.

Antigen and serum diffuse opposite to each other on the surface between the filled cavities (secondary diffusion in the gel). If they are homologous to each other, an antigen-antibody complex is formed; it is no longer diffused because it is large, but the sinking (precipitating) leak forms a precipitation line.

It is well known against the clear background of the gel surface (Fig. 52).

Hence, if the diffuse antigen and serum are not homologous to each other, a precipitation line will not form. This approach addresses a number of issues in practice, the most important of which are:

1) Using the DPR scheme, it detects antibodies in serum (Z) relative to a homologous SA antigen (e.g. virus).

If serum Z retains antibodies against SA-specific antigen in its composition, a precipitation line is formed between Z and SA infiltrated pores. Such a precipitation line does not occur between the controlled normal serum NZ and SA infusion cavities.

2) The detection of an unknown (SA) in a material that is homologous to a specific serum SZ antibody is performed using a scheme similar to DPR (Fig. 54).

If the test material contains a homologous antigen to the antibodies in the serum (SZ), a precipitation line is formed between the A and SZ infiltrated pits but does not appear between the other pits;

3) Differentiation of an unknown virus can be performed using the scheme of DPR described in Figure 55.Here SA is an unknown antigen; $SZ_1$. . . . $SZ_5$. Serums that contain antibodies to unknown antigens.

If a precipitation line appears, for example, between SA and $SZ_3$ filled pits, then the antigen being tested indicates that $SZ_3$ is homologous to serum antibodies.

4) The titer of the antibody in the serum can be determined.

Here, the formation of a line of precipitation of serum with a homologous antigen at its highest diluted level (1:16 in our example) determines the index of antibody titer in serum (SZ) (Fig. 56).

DPR can be placed on a petri dish, on a piece of glass and on tubes. DPR is widely used for placing on glassware. To do this, you need: degreased glass panes; 2-5 ml marked pipettes and pasteurized pipettes; a sharp-edged diameter tube or special mold; humidified chamber; a training pen or special device that can remove the gel if the pit; 1.0–1.5% agar prepared in saline or pH 7.2-7.4 phosphate buffer solution; antigens; whey

The purity of agar is of great importance, so well-cleaned Difko agar is used

High-titer specific antigens and serums are obtained that can form a clear precipitation line for work and provide antigen + antibody complex formation.

Put DPR. The order of the reaction is as follows:

Degreased glassware is stored in a cool, flat place (on the table). Take 1.5-2 ml of heated agar in a pipette and pour in a zigzag pattern, first around the glass and then in the middle, there should be no waves and bubbles during the injection. The thickness of the agar poured into the glass is 1.5 should be left, then left for 5-10 minutes to allow the agar to harden.

In the layer of solidified agar is prepared pits. The number of pits depends on the purpose for which the DPR is placed, the diameter of the pits is 5mm, the distance between the pits is 3-. Most often, two types of honeycomb placement are used.

Sharp-tipped tubes are used to make the pits. If a ready-made mold is not available, the cartridge case of any tube or small-caliber rifle (5.6 caliber) whose area fits is used. In this case, first draw a picture of the relative position of the pits on the paper, and if it is placed under a cast-iron petri dish or a piece of glass, cut the pits according to it.

The agar left in the pit is removed with a needle, the tip of a pasteurized pipette, or a training pen. To ensure that the liquids poured into the trough do not leak, a drop of melted liquid agar is pipetted to the bottom of the trough using a

paste pipette and then withdrawn again. The depiction of this condition is done in appearance as shown in Fig. 57. However, in some cases when melted on a well-degreased glass, if it adheres well, the liquid poured into the groove will not flow even if no additional liquid is dripped into it, and a precipitation line will form in the norm.

DPR components (antigens and serums) are poured into the prepared pits. When pouring the components, the pits should be filled to prevent them from mixing with each other. To do this, the liquids are dripped using well-stretched pasteurized pipettes.

DPR components are placed in drip panes in humidified chambers to prevent them from drying out. Any lidded container (desiccator, petri dish, etc.) can be used as a moistened chamber, on which is placed a cotton ball or filter paper soaked in water.

The humidified chamber is heated to room temperature or placed in a thermostat (in a thermostat) where diffusion is less rapid.

The calculation of the initial result of DPR is carried out after 8-10 hours, the main after 24 hours and the last after 48 hours.

Put the DPR on a Petri dish. Technically it is no different than putting on glassware, only here if the thickness of the layer is 3mm, the area of the recesses and the distance between them will also be slightly larger. Therefore, the time to calculate the result is extended to 5-7 days.

Method of placing DPR in capillaries. Since this method is not widely used in practice, we will not dwell on it. DPR preparations applied to glassware can be dried after 48-72 hours and stained with a black amide color. This allows the drug to be stored for a long time and photographed.

The achievements of DPR include: simple casting technique; quick response; the purity of the components is not necessary; does not require work in sterile conditions; components are finally required in small quantities; can work with any soluble antigens; the results can be photographed.

But these qualities are offset by his low sensitivity, which is his main shortcoming.

Nevertheless, DPR is widely used in laboratory diagnosis of viral diseases.

Detection of rabies in patmaterials, rhinotracheitis of large horned animals, African swine fever of pigs, plague of dogs and other diseases and differentiation of viruses of infectious anemia, adenoviruses, respiratory syncytial disease, diarrhea of large horned animals and blood serum of large horned animals RS is widely used in the detection of antibodies to the virus.

DPR is placed with positive controls in order to increase sensitivity, and the result is calculated depending on where the precipitation lines are bent.

Material supply. Degreased glass panes; 2 and 5 ml marked pipettes; pasteurized pipettes; caliber cartridge cases; 18-24 cm cuvette lined with moistened filter paper and covered; Petri dish lined with moistened filter paper; pen mounted pen; 1.2% agar prepared in saline solution; blood serum of rabbits immunized with nyukasl virus; allantois fluid of a chicken embryo infected with the

nyukasl virus; normal blood serum of rabbit; normal allantois fluid of the chicken fetus.

**Control questions**

1. What is NAU and how can it be used to diagnose viral diseases?
2. What types of NAUs are used in virology?
3. What issues can be addressed using NAU?
4. What are the strengths and weaknesses of NAU?
5. What is the essence of DPR?
6. What issues can the DPR address?
7. What are the features and disadvantages of DPR?

**Demonstration weapons.**

Bactericidal lamps, table-mounted box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, 1hermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass, panels, petri dishes, flasks, glassware, test tubes, vaccines, scissors, tweezers, tweezers, tweezers Ph meters, ordinary microscopes, nutrient media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodical manuals

**Topic: PCR- polymerase chain reaction**

**Plan:**

1.Discovery and application of PCR.
2. The essence of PCR and the technique of installation.
3. Understanding of PCR stages.

**Basic literature**

1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

**5. Foreign literature**

1. Fenner's. Veterinary Virology (United States of America 2016 year).
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**Additional literature**

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## -BASIC EXPRESSIONS

Nucleotide, amplification, otjig, denaturation, polymerase, ingredients.

PCR is an experimental method of molecular biology that allows a significant increase in the known number of small fragments of nucleic acids in a biological material (sample).

In addition to DNA amplification, PCR allows many other manipulations with nucleic acids (mutations, growth of DNA fragments) and is widely used in biology and medicine. For example: in the diagnosis of hereditary and infectious diseases, paternity detection, gene cloning, separation of new genes, etc.

PCR was invented in 1983 by the American biochemist Kerry Mullis.

K. Mullis was awarded the Nobel Prize in 1993 for his discovery of the PCR method.

Putting (transferring) PCR (PSR).

The method is based on the selective replication of a specific part of DNA using enzymes under artificial conditions (in vitro). In this case, certain parts are copied only if they are present in the sample to be tested.

In contrast to the amplification of DNA in the body, a relatively short part of it is amplified using PCR. The length of a piece of DNA copied using the conventional PCR method does not exceed 3,000 pairs of bases (3 square meters). When supplements are used under certain conditions using different polymerases, the length of the PCR fragment can consist of 20,000 to 40,000 pairs of nucleotides. This is much less than the length of the chromosome eukaryotic cell DNA. For example, the human genome is made up of about 3 billion pairs of bases.

Reaction components.

In the simplest case, the following components are required to install a PCR.

The DNA that holds the part of the DNA that needs to be amplified is DNA.

Two complementary primers at opposite ends of the required DNA fragment.

The thermostable fragment that catalyzes DNA polymerization is DNA polymerase.

The polymerase must remain active for a long time at high temperatures for use in PCR denaturation. Therefore, the thermophilic Thermus aquaticus (single polymerase). Pyroceccus furiosus (PFU - polymerase). Enzymes isolated from Pyroceccus wosseu (PWO-polymerase) and others are used.

- deoxyribonucleoside triphosphates (d ATP, d GTP, d TTP).
- $Mg^{2+}$ ions required for polymerase activity .
- buffer solution, which provides the necessary conditions for the working capacity of the solution - the reaction pH. Contains serum albumin and salts.

In order to prevent the reaction mixture from evaporating, the solution is boiled in oil at high temperature, e.g. Vaseline is poured. Vaseline does not need to be applied if an amplifier with a heated lid is used.

Application of pyrophosphatase may have a positive effect on the course of the PCR reaction. This enzyme catalyzes the hydrolysis of pyrophosphate (a by-product of nucleotide triphosphate binding to a growing DNA chain) to orthophosphate. Pyrophosphate can inhibit the PCR-reaction.

***Primers.***

Primers are the part of a single-stranded DNA line that is complementary to the m-DNA of 20-30 nucleotides, which serve as a source (raw material, "zatravka") in the process of new DNA synthesis. The specificity of PCR is based on the formation of a complementary complex of synthetic oligo nucleotides with a short 180–300 base length between the matrix and the primers. Each of the primers is complementary to one of the two chains of the matrix, delimiting the beginning and end of the part to be amplified.

Once the matrix is hybridized with the primer (otjig), the latter serves as the basis for the synthesis of the matrix complementary chain for DNA polymerase.

The most important characteristic for primers is the melting temperature (Tm) of the primer matrix complex. Tm is the temperature at which half of the DNA matrix forms a complex with oligo nucleotide primers. The formula for calculating tm.

$Tm = 77.1 + 11.7 \lg [K^+] + 41 (G + C) -528 / L-0.75 [DMSO]$

Where: L is the number of nucleotides in the primer.

$K^+$ is the molar concentration of potassium ions.

G + C is the amount of all guanine and cytosines.

In the case of incorrect selection of the length of the primers and the nucleotide composition or the "otjig" temperature, the matrix forms complementary complexes with other parts of the DNA, which in turn can lead to the formation of nonspecific products. The upper limit of the melting temperature is limited by the optimal exposure temperature of the polymerase (polymerase activity decreases at temperatures above + 80 $^0$C).

The following criteria should be followed when selecting primers.

G, C - content - 40–60%.

Proximity of primers Tm ( should not exceed 5 $^0$C).

- Absence of nonspecific secondary structures "pins", "dimers".

- Arrival (location) of guanine and cytosine at the ends of 3 $^1$. Hybridization is more stable, robust because they form 3 hydrogen bonds with a molecular matrix.

PCR - is carried out in the amplifier. A device that periodically cools or heats amplifier solutions to the nearest 0.1 $^\circ$C.

***The course of the reaction:***

Typically, 20-35 cycles are performed to set the PCR, and each of them consists of 3 stages.

*Denaturation.*

The double-stranded DNA matrix is heated at 94–96 $^0$C for 0.5–2 min . Sometimes complete denaturation of the matrix and primers is achieved by primary heating for 2-3 minutes before polymerase application. This is called a boiling start and serves to reduce the amount of nonspecific products.

Once the chain is broken, the temperature is lowered. At this stage, the complementary coupling of the primers with the chain matrix takes place. Its temperature is selected to be equal to the melting temperature of the primers.

The application time of this step is 30 seconds and during this time the polymerase manages to synthesize several hundred nucleotides. Therefore, it is recommended to select primers with a melting point above 60 $^0$C and to carry out simultaneous elongation and elongation stages at a temperature of 60-72 $^0$C.

*Elongation* .

The stage of DNA synthesis under the action of the enzyme DNA polymerase, the formation of primers, the replication of the matrix chain is called elongation.

The polymerase initiates the synthesis of the two chains from the 3 $^1$ end of the primer that is connected to the matrix .

The elongation time depends on the type of DNA polymerase and the length of the amplified fragment. It usually takes 1 minute for every 1000 pairs of foundations to be formed. At the end of all cycles, an additional final announcement is made. This stage takes 7-10 minutes to compile all 1 chain fragments.

## CONTROL QUESTIONS

1. What is the essence of PCR?
2. Name the areas of application of PCR.
3. List the PCR components.
4. What are primers?
5. What is denaturation?
6. Explain what amplification is.
7. What does "Otjig" mean?

## Demonstration weapons:

Bactericidal lamps, table-mounted box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple mectroscopes, food media, drugs, chloramine, carving, lysol, tables, slides, popular films, methodological manuals.

## TOPIC: DISEASE IN LARGE HORNED ANIMALS GENERALIZING INFORMATION ON INVADING VIRUSES. INFECTIOS BOVINE RHINOTRACHEITIS VIRUS, INFECTIOUS PESTULAR VULVOVAGINITIS VIRUS

**Family. Herpetoviridae**

**Generation Horpesvirus bovis 1**

**Cryptogram. (D / 2: (99 ± 5) / 10: s / s: v / o)**

## PLAN

**The following questions will be explored on each pathogenic virus:**

**The name of the virus and its place in the classification**

Structure and size of viral virions

Resistance of viral virions

Methods of growing the virus in the laboratory

Antigenic properties of the virus

A disease that causes the virus in animals

Clinical signs of the disease, pathological changes

Epizootiological features of the disease caused by the virus

A method of diagnosing a disease caused by a virus

Specific disease prevention measures

## Basic literature

1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

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## BASIC EXPRESSIONS

Virulence, conservation, transovorial, caseous, fibrinous, laryngotracheal, conjunctival, atypical, rhinitis, sinusitis

Infectious rhinotracheitis (YURT, vesicular rash, infectious vulvovaginitis, infectious necrotic rhinotracheitis, infectious rhinitis, red nose, contagious bronchopneumonia, upper respiratory tract infection) is an acute contagious disease of large horned animals. catarrhal necrotic lesions are characterized by the

development of fever, general malaise and conjunctivitis, as well as pustular vulvovaginitis, abortion as a result of the virus entering the genitals of the animal.

The disease is ubiquitous. It was first approved in our country in 1969.

The economic damage is due to a decrease in milk production during the illness (50-60%) and the disease is mostly in the vaginal form due to infertility, slow growth of sick calves and blindness of the calves.

## SYMPTOMS OF THE DISEASE AND PATHOLOGICAL - ANATOMICAL CHANGES.

In large horned animals, the disease occurs in 5 different forms and is characterized by inflammation of the upper respiratory tract, vaginitis, encephalitis, conjunctivitis, and arthritis. Young calves may also have pneumonia.

Chronic serous - up to 20% of calves die from purulent pneumonia. Upper respiratory tract injury, miscarriage, encephalitis, keratoconjunctivitis are observed due to transmission and transmission of the disease.

In the genital form of the disease, the external genitalia sometimes develop endometritis in cows and orchitis in bulls, which can lead to susceptibility of animals in the future.

Recurrent dermatitis if the bulls used for artificial insemination are infected with YURT (hair loss, the appearance of mucous deposits around the anus and in the groin, and this condition can also be found in the surrounding tail and seed sac) .

The virus-contaminated semen causes the cow to become infected with endometritis and become infertile.

Rapid rise in temperature in the form of a respirator to 41-42 °C Inflammation of the mucous membranes of the nose, painful cough due to inflammation of the throat, trachea, runny nose, serous fluid, foamy saliva from the mouth o ' zigzag

As the disease progresses, the fluid secreted from the nose thickens. In the respiratory tract, centers of mucous blockage and necrosis are formed.

Asphyxia occurs when the disease is severe.

The resulting hyperemia also appears in the nasal cavity and makes the nose red. When studying the etiology of YURT virus, massive keratoconjunctivitis was observed in young calves. In young calves, the disease begins in a short period of time, reminiscent of encephalitis. Sudden agitation is characterized by aggression, impaired coordination of movements.

But body temperature is normal.

When clinical signs of the disease appear and the dead animal is torn, cyanosis in the nasal mucosa accumulates pus in the nasal cavity, the mucous membranes of the forehead cavities become hyperemic.

The conjunctiva is reddish, swollen, fine-grained, and gray in color.

Spotted hemorrhage in the mucous membranes of the throat A similar change is observed in the mucous membrane of the trachea, a puffy fluid accumulates.

In the upper parts of the lungs enlarged atelectasis areas are visible bronchial cavities are filled with mucous-purulent exudate.

When the lymph nodes are swollen, red, enlarged, they become filled with blood. The stomach, colon, and small intestine become swollen and red.

Centers that occur in the form of hepatitis, with necrosis in the liver and lungs, may also occur.

In preparations prepared from growing cells and stained with hemotoxylin eosin, inclusions can be found inside the nucleus.

The virus was first introduced into growing cells by Maiden, York, and McKercher in 1956; Lee and Baker separated in 1957.

Resistance - the virus survives for 7-9 months at minus 60-70 °in 20 minutes at 56 °C, in 4-10 days at 37 °C, in 22 °C-56 days.

Lyophilization does not affect viral activity at all but freezing and re-thawing of the virus reduces the virulence and immunogenicity of the virus.

A 1: 500 solution of formalin kills the virus within 24 hours, 1: 4000 within 46 hours , 1: 5000, 96 hours .

Acetone, ether, chloroform, and ethyl alcohol cause the virus to lose its activity immediately. Under the influence of ether, the outer lipid membrane of the virus degrades and nucleic acid is broken down into extracts.

In an acidic environment, the virus loses its activity when the pH is 6-9 and the temperature can be maintained at 4 °C for up to 9 months.

The YURT virus has been shown to survive in dried ice for up to 4-12 months in bull semen and up to a year at minus temperature for liquid nitrogen.

**Antigenic structure** - 9 structural proteins of YURT virus
UR105; UR 90 (hemagglutinin) UR 74, UR64,
UR 54, UR 50, UR47, UR 40 and UR 31.

According to the results of the neutralization reaction , UR-74 and UR-90 are distinguished by their immunogenic properties.

In the laboratory diagnosis - NR, BGAR, IFR.

Immunity and specific prophylaxis - in the body of sick animals, immunity is maintained for 1.5-2 years, there is no confidence in the antibodies present in convalescent animals, because such animals should be considered a potential source of disease.

Live and reduced vaccines are used for prophylaxis.

GOA - ethanol vaccine is used from reduced vaccines.

The duration of post-vaccination immunity is 6-7 months and occurs as a result of re-vaccination after 14 days.

Live vaccine - mono and polyvalent vaccine is administered through the nose. But with live vaccines, bovine cows can drop off their offspring.

In our country, the live TK-A vaccine VIEV is used to vaccinate against YURT.

Bivak was vaccinated using PG-3 and YURT strains

**Demonstration weapons:**

Bactericidal lamps, table-top box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes,

solutions, plexiglass panels, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles, pH meter, simple mectroscopes, food media, drugs, chloramine, carving, lysol, tables, slides, popular films, methodological manuals.

## CONTROL QUESTIONS

1. To which family and generation does the virus that causes rhinotracheitis belong?
2. What does a cryptogram look like?
3. What is the clinical presentation of infectious rhinotracheitis in large horned animals?
4. How can this disease be distinguished from the plague in large horned animals?
5. Where does the rhinotracheitis virus infect calves?
6. How many months old calves are infected with rhinotracheitis?
7. How to fight infectious rhinotracheitis?

## Subject. GENERALIZED INFORMATION ON DISEASE-CAUSING VIRUSES IN SMALL HORNED ANIMALS .

### The virus that causes smallpox (smallpox, variola)

### Family poxviridae. Cow pox virus

**Family. *Pox viridae.* Generations . *Orthopoxvirus***

**Cryptogram. D / 2 : 160 - 200 / S - 7 : x / *: V / O, Si, Ac, Si.**

### PLAN:

**The following questions will be explored on each pathogenic virus:**

The name of the virus and its place in the classification
Structure and size of viral virions
Resistance of viral virions
Methods of growing the virus in the laboratory
Antigenic properties of the virus
A disease that causes the virus in animals
Clinical signs of the disease, pathological changes
Epizootiological features of the disease caused by the virus
A method of diagnosing a disease caused by a virus
Specific disease prevention measures

### Basic literature

1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

### Foreign literature

1. Fenner's. Veterinary Virology (United States of America 2016 year).
2. M.Jackson. Veterinary clinical pathology. America 2010 year.
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### Additional literature

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2. Mirziyoyev Sh.M. Ensuring the rule of law and human interests is a guarantee of the country's development and the well-being of the people. NMIU "Uzbekistan", 2017.
3. Mirziyoyev Sh.M. We will build our great future together with our brave and noble people. NMIU "Uzbekistan", 2017.
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6. Andreev G.M., Davydov V.U., Zlobin V.S. Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg, 2004

## BASIC EXPRESSIONS

Borrel, Bollinger, Pashen, tachycardia, variola, licorice, poksvirus, susceptibility to disease, viremia, exanthema, roziola, papules, vesicles, pustules, hemorrhagic inflammation, pneumonia, hepatitis, gangrene, mastitis, methicone.

Chickenpox is a viral contagious disease of many species of mammals and birds, characterized by the formation of papular and pustular growths on the skin and mucous membranes.

Poxviruses combine the causative agents of smallpox found in humans, mammals, and birds. They are complex, contain DNA, proteins, lipids, and multiply in the cytoplasm of damaged cells surrounded by an outer membrane. When stained by special methods, they can be seen under a light microscope.

Chickenpox virus is an acute contagious disease characterized by papular and pustular rashes on the skin in the mucous membranes.

Prevalence - the disease is most common in Africa, Asia, Europe.

The spread of the disease in neighboring countries poses a threat to other countries as well.

The incubation period is 5 days in large horned animals, 6-9 days in sheep, 2-7 days in pigs, and 7-20 days in poultry. The disease is accompanied by a rise in body temperature to 41-42 $^{0}$C, injury to the skin and mucous membranes.

Clinical signs - the first symptom of the disease begins with a 1-2 $^{\circ}$rise in temperature , fatigue and a decrease in appetite. Then catarrhal conjunctivitis, rhinitis and tumors appear in the subcutaneous tissue. The disease lasts 20-28 days and 50% of animals die as a result of sepsis.

Morphology and biological properties - the edges of the virus are flat cube-shaped, the size is 170-325 NM. Covered with a three-layer curtain.

Information about smallpox disease for the first time in A ngliyada which appeared in 1272. In 1903, the French scientist Borrell proved that the causative agent of this disease was a virus.

At a temperature of 2-4 °in the lymph fluid, the virus retains its properties for 2 years. Dies in 20 minutes at high temperature 55 °. In dry and fallen wounds, it has been proven that the virus persists in the lymph fluid at -5 -10 °for 4-5 years.

The virus is sensitive to chloroform and diethyl ether.

Antigen activity. It is detected by titration of the presence of virus-neutralizing antibodies in sick or vaccinated animals.

Virus transmission in the body, viremia, virus carrier, virus excretion. The disease-causing virus enters the body through the respiratory tract, and multiplies in the epithelial cells of the respiratory tract, causing disease-specific changes.

In this way it is spread throughout the body through the blood. In ewes, penetration through the placenta causes abortion and the birth of frail sick lambs.

Source and spread of the disease - the source of the disease are sick animals. When a sick animal inhales and exhales, it spreads several viruses, and healthy animals are infected.

Diagnosis - the diagnosis is made as a result of epizootiological features of the disease, clinical signs, biological examination of laboratory animals, preparation and examination of ointments.

Treatment - Rash on the skin is treated with burning ointments. The nasal cavity is washed with 2-3% boric acid. Potassium iodine is added to water and drunk.

Immunity and specific prophylaxis method. Sick animals do not become ill for 2 years due to increased immunity, and in 8-10 months in the blood of a sick animal can be found antibodies that neutralize the virus, and this titer is in the ratio 1:20 - 1:40.

Inactivated live vaccines are used for specific vaccination. Vaccine VGNKI suxaya kulturalnaya protiv ospi ptits iz kurinogo virusa.

GOA-formol vaccine has been used in our country since 1944, and the polyvalent concentrated vaccine is used to protect against smallpox, measles and poisoning.

Prophylactic vaccination is carried out in troubled and dangerous farms. Farms with smallpox will be quarantined and complex anti-epizootic measures will be taken. Sick animals are treated symptomatically. Dead animals are burned along with their skins. Thorough disinfection is carried out, feces are biothermally decontaminated. Quarantine is removed 2 months after the disease has disappeared.

**Diagnosis of smallpox in the laboratory**

Smallpox affects 23 species of mammals, 5 species of birds and 16 species of insects. Some smallpox viruses cause disease in certain types of animals, and some in several species.

In some animals, smallpox is caused by a single pathogen, while in others it is caused by two or three smallpox viruses. Although smallpox is not the same in all animals, it is very similar. The lesion occurs most often on the mucous membranes in the hairless (hairless) areas of the body.

Damage to the mucous membranes of the skin results in the appearance of roseola (redness), papules (swelling) and vesicles (blisters). The final stage is

pustules, in which fluid builds up inside the wound and then an erosive dried crust appears.

As the wound heals, the bark falls off and scars form. The advanced process of smallpox is characterized by fever, low energy, loss of appetite, tumors in the subcutaneous tissue, diphtheria deposits in the respiratory tract of chickens.

The smallpox virus produces virions with a size of 260 ch 390 nm. Among other virions, smallpox virion is the largest.

Smallpox is transmitted in many ways from animals to healthy animals. It is possible to infect animals quickly through experimentation. Some smallpox viruses form in the XAO cortex of the chicken fetus, necrotic nodules - smallpox.

The smallpox virus multiplies in growing cells and shows SPT.

Like all viruses, smallpox virus antigens can be found in a variety of materials via FAU and DPR. The diagnosis of smallpox is based on the symptoms and epizootiological data of the disease. However, it is recommended that laboratory tests be performed to confirm the diagnosis.

The most universal of the laboratory methods is viroscopy, which is based on the examination of the smallpox virus in a patmaterial using a light microscope. To do this, a piece of damaged skin or a piece of mucous membrane (papule or vesicle) is prepared ointments on the glass of the item at the stage.

Prepared greases are painted in different ways, the most widely used of which is the silver plating method according to MAMorozov. It is necessary to prepare 3 reagents for painting smears by MAMorozov method.

Reagent №1 (Ruge liquid): 1 ml of acetic acid, 2 ml of 40% formaldehyde solution and 100 ml of distilled water are poured into a container.

Reactive №2. (protrava); Dissolve 5 g of tannin in 100 ml of distilled water and add to it 1 ml of liquid carbolic acid (phenol).

A 56 °C water bath should be used to dissolve the carbolic acid in the crystalline state . We use the best varieties of tannins. To know that the tannin is pure, dissolve 1 g of tannin in 5 ml of water and add 10 ml of 90 ° alcohol. There should be no blurring for 1 hour. Sugar means that the resulting turbidity is a pure type of tannin, even if it is not formed when 5 ml of ether is added.

Reactive №3. (silver solution with ammonia); Dissolve 5 ml of crystalline silver nitrate in 100 ml of distilled water.

Put the total solution in another container (part of it). The remaining silver is added dropwise (25%) to ammonia to the nitrate solution. Initially, a thick black precipitate precipitates, then ammonia is mixed as a result of addition. The task is not to melt the sediment completely, but to make the solution slightly thicker.

If a shiny solution is formed without our preparation of such a solution, then a drop of silver nitrate is formed, and turbidity is formed in the basic solution. The resulting opalescent solution is diluted in distilled water to 1:10 and used for dyeing drugs. This solution is very stable and is stored in a dark and tightly sealed stopper.

Biological testing. It is the most commonly used method. In smallpox, biological testing is performed on cell tissue prepared from naturally sensitive animals.

Rabbits are susceptible to smallpox virus, cattle and horses to smallpox virus, and chicken embryos are not only susceptible to smallpox virus, but also to smallpox vaccine virus in cattle and pigeons.

All smallpox viruses are dermatropic, so they can infect subcutaneous experimental lesions or scratched skin and XAO peel of a chicken fetus.

Injury to the cock is simple, the crown is scratched without deepening with needles or a broken paste pipette, and then the scratched crown is rubbed with a swab from the virus suspension or with a shortened toothbrush. The cockroach virus can easily infect the feather follicles. To do this, the feather on the number of cocks is removed and the suspension of the virus is rubbed with a tampon or brush instead of the open feather. If the test material contains the smallpox virus, then 6-7 days after infection, inflammation of the characteristic hairs on the crown and follicles in the thigh is observed.

In smears prepared from fresh flowers, we encounter the virion of the smallpox virus using viroscopy. When infecting a rabbit, the area is cleaned of wool and the rooster is damaged as the crown is damaged. The method of administration of FAU, DPR reactions in smallpox is performed as in other subjects.

## CONTROL QUESTIONS

1. What family and generation of viruses cause smallpox?
2. What is the cryptogram of the virus that causes smallpox?
3. What are the clinical signs of smallpox in sheep, goats, pigs and large horned animals, camels, horses?
4. How is smallpox diagnosed and what is its specific prevention?
5. How to paint the prepared grease?
6. Can the sheep vaccine be applied to goats?
7. What are the similarities between smallpox and other diseases?

## Demonstration weapons.

Bactericidal lamps, table-mounted box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass , panels, petri dishes, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles pH meter, simple microscopes, media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodical guides.

## Topic: GENERALIZED INFORMATION ON DISEASE-CAUSING VIRUSES IN PIGS.

### Viral transmissible gastroenteritis of pigs

TRANSMISSIBLE GASTROENTERITIS VIRUS OF SWINE (TGEV)

**Family. *Coronaviridae***
**Generations. *Coronavirus***

**Cryptogram.** R / 1; */ .; S / E; V / O

**PLAN:**

**The following questions will be explored on each pathogenic virus:**

The name of the virus and its place in the classification
Structure and size of viral virions
Resistance of viral virions
Methods of growing the virus in the laboratory
Antigenic properties of the virus
A disease that causes the virus in animals
Clinical signs of the disease, pathological changes
Epizootiological features of the disease caused by the virus
A method of diagnosing a disease caused by a virus
Specific disease prevention measures

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**BASIC EXPRESSIONS**

Gastro enteritis, coronovirus, cytopathic changes, alimentary, desquamative-necrotic belt, fluorescent antibodies, formaldehyde.

Viral transmissible gastroenteritis is a highly contagious, infectious disease characterized by vomiting, diarrhea, dehydration, catarrhal hemorrhagic gastroenteritis, and is characterized by the death of piglets from 1 to 10 days of age.

Historical information. The transmission of the virus among pigs was recorded by the U.S. Doyle and Hutchings (1946). A few years later, viral gastroenteritis was registered in Japan, the United Kingdom (1958), and in recent years in St. Petersburg, in 1971, when the disease was registered on all continents of the world.

Economic damage. Sick pigs lose weight up to 3–4 kg. Economic damage is caused to the farm, many suckling pigs die in 5 days - 100%, in 6-10 days - 67%. Large temperatures are required for vaccination, treatment, restriction, disinfection.

Etiology - The disease is caused by a virus belonging to the coronaviridae family of RNA-storing coronavirus offspring. The virions are polymorphic and range in size from 75 to 120 nm. The virus is epitheliotropic and reproduces mainly in the small intestine, lungs, mucous membranes.

Laboratory animals are not susceptible to the virus. Experiments have shown that pigs and dogs can be infected orally and intranasally.

Coronavirus interferes with diarrhea and Aujeszky's disease viruses. In the blood of pigs that have recovered from the disease, agglutinins, precipitins and antibodies that neutralize the virus are formed.

Durability. V is sensitive to irus ether, chloroform, deoxycholate sodium, resistant to trypsin RN-3,0-11,0, ut acid. The virus is well preserved when frozen at cold temperatures -20 °C for 1.5 years, -28 °C for 3 years. The virus is very sensitive to heat and light, especially ultraviolet light.

Therefore, it dies quickly under natural conditions in the external environment. It loses its activity in 30 minutes when heated to 58 °C, in 6 hours in liquid manure, in 3 days in the shade.

Epizootology - Young pigs are more susceptible to viral gastroenteritis than adult pigs.

Gastroenteritis virus is reproduced in the body of dogs, cats, foxes and has been proven to persist in the body of birds for a long time.

The source of the disease are sick and diseased pigs. Infected pigs spread the virus to the external environment through feces, urine and nasal secretions, even from the latent period, even 2-3 months after recovery.

The concentration of the virus in the feces is so high that the disease spreads rapidly in a restless farm.

In the transmission of the pathogen are the meat, intestines, feed, water, air, manure, vehicles, special clothing of the sick animal.

The virus is transmitted to animals mainly through oral and airborne droplets. Therefore, transmissible gastroenteritis is one of the most common foodborne infections.

Dogs and birds (squirrels) play an important role in transmitting the disease. In many cases, this disease can become one of the inpatient diseases due to

the censorship and unsystematic implementation of health measures in a troubled farm.

In fattening farms, the disease is more common among pigs brought from different farms.

Failure to feed with quality fodder hay does not meet the requirements of storage conditions, various stress factors lead to the spread of the disease and even to 10-15% of deaths among adult pigs.

Viral gastroenteritis can occur in all seasons, but the disease is more common in cold weather.

Pathogenesis - When the virus enters the body orally, it enters the small intestine despite any obstruction of the stomach.

The first sensitive tissue is the mucous membrane of the small intestine, a small amount of 12-fingered intestinal tissue.

Cells that have reproduced the virus lose their activity. Twelve hours after infection, the virus begins to leave the intestinal cavity, is absorbed into the bloodstream and spreads throughout the body.

Reaching the internal organs, especially in the lungs, secondary reproduction of the virus disrupts epithelial cells.

Atrophy of intestinal villi occurs 36 hours after infection with the virus . The degree of atrophy of villi depends on the virulence of the virus. Intestinal atrophy of newborn piglets occurs in 90-95% of cases.

As a result, after 12-24 hours, severe diarrhea, water-electrolyte imbalance, dehydration, acidosis can lead to metabolic disorders. After 1–5 days, the sick pig dies due to the intervention of secondary infection.

The incubation period is short and lasts 1-3 days, the younger the animal, the shorter it is, no more than 12-18 hours in lactating pigs. In adult pigs, it lasts 7 days.

Clinical signs. The course and clinical signs of the disease depend on the age of the pig and the virulence of the virus.

One of the most important clinical signs is vomiting in pigs, decreased performance, rapid onset of diarrhea.

Piglets leave without drinking milk, and gather in a daze.

In the beginning, there is frequent diarrhea, the stool is semi-liquid, grayish-yellow in color, then involuntarily grayish-bluish in color, with an unpleasant odor.

The animal quickly loses weight, bruising of the body, the stickiness of the skin lining, the appearance of streaks indicates a violation of cardiac function. Short-term temperature rise of 2-2.5 ° is accompanied by a violation of movement coordination.

According to PIPritulin (1976), mortality in 5-day-old pigs is 100%, 67% at 6-10 days, 30% at 11-15 days, and 3.5% at 0.5-3.5 months. .

Adult pigs have anorexia and diarrhea, and thirst and vomiting are observed. The disease lasts 1-2 weeks and in most cases ends with recovery.

Patanatomy. Dead pigs are dehydrated and major changes are observed in the gastrointestinal tract. The stomach was filled with empty milk or empty. Small

hemorrhages are observed in some places where the mucous membranes in the lower part of the stomach are swollen and reddened to varying degrees.

In some cases, there are areas of mucosal fibrinous necrosis. The small intestine is filled with gas, a frothy aqueous mass, undigested milk.

The walls of the intestine become thin, the light passes through it, and the blood vessels become filled with blood.

The blood vessels and mesenteric lymph nodes in the uterus are filled with blood.

Bleeding in the spleen is reminiscent of a heart attack. We can also observe bleeding in the mucous membrane of the bladder.

The most noticeable pathological changes are atrophy of the small and large intestine. Histological examination of the brain may reveal purulent encephalitis.

Diagnosis - Because this disease is similar to other alimentary diseases, a reliable diagnosis is based on a thorough complex examination. The rapid spread of diarrhea, regardless of age, is one of the main epizootiological signs.

To confirm the diagnosis, a biological test is performed on 2-7-day-old piglets. The virus is identified in a neutralization reaction. Detection of the virus in the ointment, biological testing to confirm the diagnosis is carried out in pigs 2-7 days. The virus is identified in a neutralization reaction. We use an immunofluorescence test to determine the presence of the virus in the grease .

We use the NR and BGAR test to make a serological diagnosis of transmissible gastroenteritis.

The rapid increase in antibody titer NR (1:10), BGAR (1:16) indicates that the result is positive.

Differential diagnosis - it is necessary to distinguish from plague, dysentery, colibacillosis, salmonellosis, enterovirus infection and various non-communicable food diseases.

Immunity, prevention and control measures . Sick pigs develop immunity for up to 2 years. The titer of the virus-neutralizing antibody in the blood of such animals ranges from 1:60 to 1: 320. Vaccinated mother pigs transmit lactogenic class A and G immunoglobulins to the offspring.

Protecting young pigs from disease involves the infiltration of antibodies through continuous milk, which is AT. Has the ability to neutralize the virus.

Prophylaxis. Work tools, equipment and lathes are disinfected once every 5 days until the restriction in the insulator is removed.

For disinfection, alkali, formaldehyde, 2% active chlorinated lime are used in a 3-hour exposure, 20% slaked lime.

Manure is biothermally decontaminated, dead pigs are burned and disposed of.

Restrictive measures on unhealthy farms will be lifted 3 months after the last case. Reproductive farms are considered healthy farms after 12 months, and the results of two serological tests at intervals of four weeks are allowed in 6-10-week-old pigs when they are negative.

## CONTROL QUESTIONS

1. To which family and generation does the virus that causes transmissible gastroenteritis belong?
2. What is the cryptogram of a virus?
3. What are the specific features of transmissible gastroenteritis in pigs?
4. How is the disease diagnosed?
5. How is gastroenteritis different from other diseases?
6. What vaccine is used to prevent the disease?
7. In what country was the Riems vaccine produced?

**DEMONSTRATION WEAPONS.**

Bactericidal lamps, table-mounted box, magnetic stirrer, fluorescent microscope, tissue grinder, slide projector, thermostat, centrifuge, water bath, ovoscope, autoclaves, drying cabinet, distiller, refrigerators, mattresses, sterilizers, cuvettes, solutions, plexiglass , panels, petri dishes, tubes, glassware, test tubes, vaccines, scissors, tweezers, syringes, needles pH meter, simple microscopes, media, drugs, chloramine, caustic soda, lysol, tables, slides, popular films, methodical guides.

**Topic: Generalized information about disease-causing viruses in horses**

**Plan:**

**1.** Horses are influenza virus
**2.** Horses renopneumonia virus

**Basic literature**

1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

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## BASIC EXPRESSIONS

Immunoprophylaxis, chemoprophylaxis, seroprophylaxis, live, inactivated vaccines, polyvalent serums, hyperimmune serum, lyophilization, culture, strain, New Jersey attenuation, preservative, adjuvant adsorbent. Suspension, split-vaccine, methicone, amantadine, marboran, nuclease, interferon.

Equine influenza (infectious catarrhal of the upper respiratory tract) is an acute high contagious disease characterized by short-term fever, weakness, conjunctivitis, tearing, upper respiratory tract, dry ring The rash is characterized by deep and painful cough symptoms. The disease is complicated by laryngotracheitis, bronchitis, in severe cases pneumonia.

Outbreaks appear to be exacerbated during Europe, Asia, North and South America.

**Clinical signs and pathology.**

The incubation period is 1-3 days, on the second day the body temperature rises sharply (+ 39-40C and above) and is maintained for 4-6 days. Breathing and pulse speed up, appetite decreases or disappears. Dry cough and wheezing are observed. Later, the cough becomes painful, breathing becomes difficult, the bronchi in the lungs become hoarse and noisy, the conjunctiva is hyperemic and swollen. On day 3, serous, fluid flows from the nose, and the serous mucus and mucus turn into a purulent fluid.

On palpation, the larynx is painful and the lymph nodes are hardened. Conjunctivitis, rhinitis and cough are the most characteristic symptoms of equine influenza.

In animals that have died at the time of rupture, the conjunctival nasal mucosa is hyperemic, swollen, and swollen. Pneumonia-like parts of the lungs are reddish-gray, and when the disease progresses, these parts join together to form large affected areas.

No differences in the structural structure of influenza A virus were found in horses and humans. The virus stores RNA. It is composed of 60-70% protein, 18-37% lipids, 5-7% polysaccharides. Virions can be spherical, oval, fibrous.

The resistance of the virus to physicochemical effects has not been studied.

Influenza viruses contain 5 types of proteins (antigens): nucleoids, hemagglutinin, neutralinidase, tramicriptase, and endocrine protein. In sick animals, compile-bound antibodies accumulate at high titers.

After two antigens were administered to rats, virus neutralizers and antihemoglatinins appear in the serum.

The proximity of the antigen of influenza viruses in horses and humans is based not only on serological data, but also on experimental studies.

Pathogenic spectrum. The equine influenza virus is also pathogenic to humans. The human flu virus can multiply in horses.

Equine influenza viruses are toxigenic to mice. When they are administered intravenously, there is a loss of hair, loss of appetite, lethargy, conjunctivitis. 50% of mice die.

The virus can also be grown in a developing chicken embryo. The maximum type of virus is infected after 72 hours. The affected embryo usually does not die. The virus, which is surgically obtained from a chicken embryo, is easily adapted in the cells of monkey kidneys.

Equine flu is transmitted by airborne droplets, just like human flu. The source of the disease - sick animals.

**Diagnosis** . Morning (serological identification for virus isolation) and retdosnectomy (detection of antihemoglobin, compliment-binding, and virus-neutralizing antibodies). Diagnosis is carried out in the same way as the detection of human and avian influenza. It is the most reliable method. The antigen is found in the cytoplasm of epithelial cells.

In sick animals, immunity does not exceed one year, and is formed only against that type, whichever of the two types is infected.

There are several different vaccines. They will be vaccinated 2 times in a few weeks and 3 times a year.

Equine renopneumonia (abortion) virus.

Equine renopneumonia is an acute antagonistic disease of horses, genital exanthema of horses, genital exanthema of horses, rhinotracheitis of horses is characterized by acute respiratory disease of horses, abortion in the second half of calving and it passes without noticeable symptoms. Rhinopneumonia manifests itself in the form of an epzootic plane, and many animals can become ill when horse storage conditions are poor. Confusion of a close relative to the development of the disease may be due to the weakness of the paternal constitution. Up to 10-90% of bull horses can be sick.

Clinical signs and pathology

Equine rhinopneumonia virus Acute respiratory disease of 6-9 month old foals causes abortion and parilytic syndrome in bovine horses.

In the form of a respirator is often observed in autumn and early winter. This is accompanied by a rise in body temperature, deprivation, loss of appetite, inflammation of the mucous membranes of the nose and nose, and sometimes symptoms of rhinopharyngitis. Rhinitis is accompanied by runny nose and enlarged submandibular lymph nodes. Lungs are rarely damaged, sick animals recover in 10–15 days. In some animals, the development of peripneumonia results in thickening and difficulty breathing. In such cases, it is usually fatal as a result of complications with bacterial infections. Abortion can occur in horses with rhinopneumonia and without any symptoms.

The incubation period is reported by some factors to be 3-4 weeks, while others report 2-10 days. Abortion 8; 9-; Up to 90% of bull horses that can occur in 10 months (sometimes 6 months) can have a miscarriage.

Characteristic changes can be seen in aborted fetuses and weddings that die quickly after birth. The fetus dies from acute and chronic hepatitis. There will be

numerous necrosis, foci in the liver, serous-hemorrhagic fluid accumulation in the lungs, swelling in the chest and accumulation of fibrin.
Spotted hemorrhages are seen in the muscles, spleen and liver capsule, pleura, peritoneum, pericardium, epicardium. The mucous membranes of the fetus, the conjunctiva is yellowed.
In horses, the disease is caused by 3 types of herpesviruses.
The virion has a central nucleus and a boundary membrane in a 60 nm free space. A virion with a diameter of 100 nm can be shell or shellless.
Endurance has not been adequately studied. At -18 $^0$C, the virus-protective tissue material retains its pathogenicity for up to 457 days. The infectious nature of the fetus discarded at 4 $^0$C is maintained for 6-7 days, and at 55-56 $^0$for 10-20 minutes. The virus is sensitive to ether, chloroform, sodium deoxidation. The virus is completely inactivated when the protective material is treated with ether.

Rhinopneumonia virus has complementary binding and virus-neutralizing antibodies in infected animals with pronounced antigenic activity.
The virus agglutinates erythrocytes of soup and guinea pigs at 4 and 37 $^0$C. Hemagglutinin - an integral part of the viral shell, its activity is not dependent on lipids.
Under natural conditions, only horses get sick, regardless of age, sex and breed.
The virus enters through the airways and meets in the upper respiratory tract, and when symptoms of rhinitis and rhinopneumonia are called, it then travels from the conjunctiva and upper respiratory tract after the viremia stage, causing fetal harm and abortion. The virus exhibits tropism to epithelial and endothelial cells. Infected animals can excrete the virus through nasal secretions and genitals for up to 2 months.
Mammal mice and fetuses (damage to the abdomen), 8 -12-day-old chicken embryos (yellow sac, allantois cavity, amniotic cavity), as well as various animals (horse, calf, piglet, dog, sheep, bulls) cell cultures of the kidney or their embryos can be used.

The source of the disease is sick animals, the virus is transmitted through the respiratory tract, and especially with an abandoned fetus. Under natural conditions, the virus is transmitted by airborne droplets.

**Diagnosis.** Rhinopneumonia is diagnosed by the results of laboratory tests, epizootic, clinical data and pathological changes.
Animals that recover from the disease develop short-term immunity, while immunity in the form of abortion lasts longer than in the respiratory form.
Live and inactivated vaccines are used for prophylaxis.

## CONTROL QUESTIONS

1. Which family and generation of viruses cause renopneumonia in horses?
2. What is the cryptogram of the virus that causes influenza in horses?
3. Clinical signs of renopneumonia and influenza in horses?
4. What are the clinical signs and epizootiological features of renopneumonia in horses?
5. What information is used to diagnose rhinopneumonia in horses?
6. What are the measures to eliminate the disease?

7. In which laboratory animals can the influenza virus be grown in horses?

## Topic: Disease-causing viruses in birds.

### Plan:

1. Infectious laryngotracheitis virus
2. Marek's disease
3. Newcastle disease virus
4. Infectious bronchitis virus
5. Infectious laryngotracheitis virus of birds.

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1. Bazarov HK, Abdulakimova AB Veterinary virology. Study guide. Samarkand, 2016.

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### BASIC EXPRESSIONS

Coronovirus, cytopathic changes, alimentary, desquamative-necrotic belt, fluorescent antibodies, formaldehyde.

Infectious laryngotracheitis virus is a contagious respiratory disease that affects chickens, turkeys and phantoms. The disease occurs in all countries where industrial poultry is developed.

Clinical signs and pathology The incubation period of YULT can range from 2 to 30 days. Its duration depends on the virulence of the virus, the dose, the method of introduction into the body and the physiological condition of the bird. The shortest incubation period is 40 hours and is observed when infected intranasally.

YULT is very sharp, acute and chronic. Mild and atypical forms of the disease, depending on the localization, differ laryngotracheal and conjunctival forms.

The first is usually accompanied by coughing, choking, wheezing. The conjunctival form is observed in chickens and is characterized by catarrhal or fibrinous conjunctivitis.

When ruptured in the laryngotracheal form, the main changes are congestion in the larynx and uneven, reddish swelling, thickening of the mucous membrane.

In the epithelial cells of the larynx, 12 hours after the lesion, the inner core of the nucleus (type A) can be seen (identified by Zeifrid in 1931).

The virus fragment has a shell size of 87–97 nm and a single thickness of 10 nm, with significant differences in nucleoid structure.

Laryngotaxeitis virus lipotitic substances are sensitive to the effects of heat and disinfectants. Store for a long time in the lyophilized state or at -20-60 $^0$C. At 55 $^0$C the virus decomposes in 10-15 minutes and at 38 $^0$in 48 hours. At 37 $^0$the virus persists in the laryngeal mucosa for up to 44 hours, and at 25 $^0$C in the chorioallantois membrane for up to 5 hours. In pathological material obtained from the larynx of sick birds, the virus persists for 370 days at a temperature of -8-10 $^0$C, retains its activity in frozen poultry for more than 19 months. In 1% sodium hydroxide and 3% cresol solutions, the virus is completely inactivated within 30 seconds.

The hemagglutination property of the virus is determined using GAR, GATR. Under natural conditions, the virus infects chickens and pheasants of all ages.

The virus is mainly excreted from the respiratory tract, less so from the liver and spleen. Animals that recover from the disease can remain carriers of the virus for up to 2 years.

The source of the disease are sick and diseased animals.

Diagnosis is made with epizootiological data, clinical signs, pathological changes and laboratory tests.

Various vaccines are used to prevent the disease.

## Marek's disease

Marek's disease (neurolymphomatosis of birds, epizootic neuroencephalomyelitis of paralysis, infectious neurogranulomatosis) is a highly contagious viral disease that manifests itself in chickens and turkeys in two forms: classical (peripheral and central nervous system damage) and acute (lymphoid leukemia).

Among viral diseases, this disease is the number 1 disease.

Clinical signs and pathology The incubation period in the classical form of the disease is 14-20 days.

The disease is characterized by damage to the peripheral and central nervous system, manifested by lameness, ataxia, hanging of the wings, tail and paralysis. The pupil is at the level of extinction and as a result partial or complete blindness occurs.

In the acute course, 4–22-week-old chicks become infected with Marek's disease. On the farm, the disease begins suddenly, progresses rapidly, and is seen in many "transit paralysis". In 5–7 days, almost all of the 1–2-month-old chicks become ill, and the discharge is noticeable. After 2-6 weeks, the number of deaths increases sharply as a result of the development of lymphoid tumors in the internal organs.

In sick birds, depression, severe shortness of breath, ataxia, paralysis and depigmentation of the iris, pre-growth paralysis, dehydration and weight loss are observed.

The highest incidence (up to 30%) is observed in 1-2.5 months after the onset of the disease.

In the classical form, the nervous system of infected birds can be seen diffuse focal thickening, discoloration, and often (up to 20%) the development of tumors mainly in the ovaries and sperm from the internal organs.

Tumors in the internal organs, skin, muscles of birds that die from acute exacerbations are observed lesions in the peripheral and central nervous system.

The virus virion is in the form of an icosahedron, the size of 85-100 nm (sometimes 150-170 nm), the number of 162 capsomers has 162 shells.

Because Marek virus binds to the cell, it is active when the structural integrity of the cell is maintained.

In dried epithelial cells of the pat follicle, the virus can persist for up to 8 months. At -65 $^0$, the virus retains its virulence for a long time and at -20 $^0$ for up to 4 months.

Resistant to repeated freezing and thawing. Resistant to ultrasound for up to 10 minutes. The virus is completely thermoinactivated at 4 $^0$ at 2 weeks, at 20-25 $^0$C for 4 days at 37 $^0$ at 18 hours, and at 60 $^0$C at 10 minutes for cell release.

The virus has up to 6 antigens, three of which are A, B and C, and the antigens are particularly important. In the blood of infected birds are found virus-neutralizing and precipitating antibodies.

Under natural conditions, mackerel disease has been detected in chickens, turkeys, quails, pheasants, ducks, swans, and turkeys.

Chicks are especially susceptible to disease in the first 2 weeks of life.

The virus can be found in the blood of infected birds when clinical signs appear. The virus spreads by leukocytes and multiplies in the cells of lymphoid organs (fabric sac , spleen, thymus, appendix ) in the epithelial cells of the renal canal, especially in the epithelium of the feather follicle.

The virus can be grown in 1-day-old chickens, chicken embryos, fibroblasts and kidney cells of chicken and duck embryos.

The main source of the disease are sick animals. The virus enters through the respiratory tract. The virus can be isolated by infected animals with respiratory and digestive tract secretions from the epithelium of the feather follicle and feces.

Diagnosis is made on the basis of clinical and epizootiological data, pathological and histological changes and virological examinations.

There are several different vaccines available to prevent the disease.

**Newcastle disease virus.**

Newcastle disease (a pseudo-plague of birds) is a highly contagious disease of chicken turkeys that is less common in other game and wild birds.

The disease is prevalent in all birds, causes enormous economic damage, and belongs to the group of extremely dangerous diseases.

Clinical signs and pathology The latent period of the disease is 5-15 days. Its symptoms are quite varied. In the acute course all the birds die in 3–4 days. The subclinical course depends on the virulence of the epizootic strain, the age and immunological status of the bird, and the accompanying infections.

There are 4 forms of clinical manifestations of the disease.

In the form of nervousness, weakness, weakness, dysfunction of the respiratory organs, diarrhea, a mixture of blood in the liquid green feces, muscle tremors, pain in the neck muscles, signs of opisthatonus are observed. Paralysis of the legs and wings may be observed. The main pathological anatomical change is hemorrhagic hemorrhage of the digestive tract. This form of the disease is believed to be caused by highly pathogenic (velogenic) Asian strains.

The second form is characterized by damage to the respiratory organs (coughing) and nervous system, the disease kills 10% to 50% of infected birds. Chickens can die up to 90%.

In the third form it occurs in the form of acute respiratory disease in large birds and damage to the nervous system, which leads to lethal consequences in young animals (called lysogenic strains).

The fourth form is the mildest and is caused by lectogenic strains - mild lesions of the respiratory and hermetic tract (oophoric, silpingitis) in sick birds.

Laying eggs stops for 7–22 days. On pathological examination, the mucous membrane of the nasopharynx was inflamed, filled with a scaly mass. At the border of the glandular and muscular stomach appear hemorrhages, enlarged discoloration and spots on the spleen. The hepatic eggs from the ovary are enlarged, sometimes blood is transfused into the ruptured heart muscle, and exudates accumulate in the ovary.

The mucous layer of the larynx and trachea is catarrhally inflamed. Acute catarrhal, hyperemia and hemorrhage are observed in the intestines.

Viruses range from 120-300 nm. The shell has bumps or filaments up to 8 nm long and retains antigenic components.

The virus is resistant to low temperatures and remains active for up to 2 years when frozen. 1-2% formalin, 1-2% caustic soda, 1% chilled cresol, 3-4% phenol kill the virus quickly.

The virus decomposes rapidly under the influence of resistant ultrasound when the pH is around 2-10. The virus is resistant to antibiotics.

Newcastle disease virus stores antigen B (hemagglutinin and neutraminidase) and antigen C (RNP).

The virus induces the synthesis of neutralizing and antihemagglutination antibodies.

The Newcastle disease virus has been found in many species of birds.

The virus can be present in parenchymatous organs, bones and brain, muscles, tracheal mucosa, colon and small intestine, in various secretions.

The source of the disease is infected infected birds through contact with infected and healthy animals, and therefore through contaminated water and feed debris.

Diagnosis is based on epizootiological, clinical, and pathoanatomical data tests (NR and GATR are used to identify the virus).

The disease should be distinguished from infectious bronchitis, laryngotracheitis, classic avian plague (influenza A), mycoplasmosis. Several different vaccines are used for prophylaxis.

## CONTROL QUESTIONS

1. Infectious laryngotracheitis is caused by viruses belonging to which family and generation?
2. What is the cryptogram of the virus that causes Marek's disease?
3. What are the clinical signs of Newcastle disease?
4. Describe the source of influenza in birds and ways of its spread.
5. What are the methods of prevention and control of the disease?
6. Disease transmission factors and its spread
7. What is a diagnosis and a differential diagnosis?

## TOPIC: Viruses that cause disease in fish

### Plan:

1. Viral hemorrhagic septicemia
2. Clinical signs and pathological changes of the disease
3. A method of diagnosing the disease

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## BASIC EXPRESSIONS

Trout, hemorrhagic diathesis, clinical signs, action, prophylaxis

**Viral diseases** . The causative agents of this disease are very small organisms, the size of which is millimicrons (10-300). These organisms parasitize inside the cells of the fish body, both in the cytoplasm and in the nucleus. They come in a variety of shapes: rod-shaped, thread-like, spider-like, and so on. The mature part of viruses - varions - consists of two components, namely a protein and a single nucleic acid (either DNA and or RNA), which differs sharply from other microorganisms by these properties. Reproduction of viruses also differs from other microorganisms in that each component in the virus is synthesized separately in different parts of the host organism, and then they combine with each other and form a mature virus.

It is necessary to isolate the causative agent of the virus in order to make an accurate and correct diagnosis in viral diseases. There are several ways to do this. The most important of these is the cultivation of these viruses in tissue culture and their detection under an electron microscope. Isolation of tissue culture in virological examination is a very difficult task and can only be performed under specially equipped laboratory conditions. Different tissue cultures will be required for different virus types. For example, while some viruses develop in a specific tissue culture derived from fish, others do not feel the need for it, i.e. it does not make much difference whether it is derived from infected fish or from healthy fish.

All the material collected about the viruses of fish allows them to distinguish them from viruses in warm-blooded animals and to classify them. The main difference between fish viruses and warm-blooded animal viruses is that fish viruses have the ability to live and reproduce at different, extensive temperature ranges. In this case, the lower temperature limit is much lower than in warm-blooded animals and is equal to the temperature required for fish to survive.

Viral diseases of fish are spread through contact or through the habitat. In some diseases, they are spread by carriers, such as invertebrates (leeches, crabs).

**Viral hemorrhagic septicemia (in large fish).** This contagious disease is an infectious disease characterized by viral (viral) processes, darkening of the skin, swelling of the abdomen, dysfunction of the swimming apparatus, dysfunction of the nervous system, hemorrhage in the abdomen and connective tissue of the eye. , characterized by hemorrhage in the skeletal muscle, perivisseral adipose tissue, and the bladder (pucheglazie). The functions of individual organs as well as the whole organism are completely disrupted.

**Etiology.** The causative agents of the disease are RNA viral pathogens. Jensen (1965) first isolated the virus and managed to grow it in artificial culture tissue (nutrient medium) and named the virus egtved-virus in honor of the Danish city of egtved .

Near this town there is a farm that breeds trout species, which is considered unhealthy for viral hemorrhagic septicemia. Viral hemorrhagic septicemia virus is finger-shaped, 180-240 millimicrons long and 60-75 nm wide. Its apical part is round and the distal part is flat and armed with a caudal tumor. Inside the virus, the nucleus is 2nm in size, surrounded by a very complex shell-like shell (membrane) and covered with a smooth membrane. The virus grows well in digestive tissue cultures (RTQ-2), and the virus derived from fibroblasts in the ovaries of trout species is more sensitive to ether, chloroform, glycerin, and pH-3.5. The virus inactivates the entire layer at 44 degrees, within 15 minutes, at 30 degrees it loses its pathogenicity by 50%. In 50% glycerin, if the temperature is 14 degrees, the virus loses its infectious properties after about 6 days. The virus loses 50% of its activity when stored in a bottle of distilled water at 14 degrees, and about 90% when stored in water bodies. Ultraviolet rays have a lethal effect on the virus for 10 minutes. Of the disinfectants, 2% sodium hydroxide and 3% formalin kill the virus in 5-10 minutes. Active chlorine, which is widely used in ichthyopathology, has the ability to kill the virus in 2-20 minutes, depending on its concentration.

In the death of trout, which died of VGS, if the body is stored on ice, the virus can maintain its viability for 24 hours - at temperatures of 20 degrees and below, the virus retains its infectious ability for 2 years but the titer is reduced by a factor of 2.

Several types of VGS virus have been identified. For example, N (liver), R (kidney), V visceral and P (general affective), and N (neurotropic).

**Epizootiological data.** The disease has been reported in most European countries. In 1968, the virus was introduced from Denmark through caviar bred in the Czech Republic. In the former Soviet Union, it was found that the disease was transmitted through caviar.

VGS mainly affects trout. In the wild, trout, whales, hares and pali are infected. Mortality is 9-78% when the disease is epizootic. In hot weather, the disease is latent, but if the nutrition and storage conditions of fish do not meet the zoohygienic requirements, the disease develops in the summer with clinical signs. VGS affects trout with a size of 5-7 cm up to one year of age. Malki and segoletkas as well as adult fish are more resistant to the disease.

The source of the disease is sick fish, its waste and dead. Healthy fish can also get sick through the waters and muds of water bodies. The latent period of the disease depends on the ambient temperature, the virulence of the virus and the resistance of the fish organism. Under natural conditions, the incubation period is 7-15 days when the water temperature is 15-16 degrees, sometimes this period can be slightly extended to 25 days. Under experimental conditions, the latent period of the disease may be 2 weeks, 4 days when the pathogen is inoculated, and this period may be further reduced in contact with healthy fish and sick fish. When the virus is

grown in vitro, it can cause disease in 10-15 days. Trout infected with VGS develop strong immunity.

**Clinical signs of the disease.** The disease is acute and chronic, as well as in the form of disorders of the nervous system. Sometimes it is very acute (sverx ostroe) and subclinical (latent).

When the disease is acute, the pathological process develops rapidly and the mortality rate is high. Dark brown spots appear on the body of sick fish, unilateral or bilateral blindness (pucheglazie), anemia and hemorrhagic streaks in the jaw, periocular membrane of the eye. The base of the filter apparatus (osnovanie) is red.

In the chronic course of the disease, the clinical signs develop slowly and the mortality rate is much lower. The body is completely darkened, a state of severe exophthalmos, as well as anemia. In this case, the jaw is light red or white-gray, and sometimes completely white. Sometimes water accumulates in the abdominal cavity.

In the nervous form of the disease we can see specific changes in the movement of fish. Sick fish move in a spiral (under water basins or against the flow of water), sometimes floating sideways for some time. They have tremors and spasms. Death will be much lower.

The duration of the disease depends on the external environmental conditions, the sanitary condition of water bodies, technological processes. The appearance of the disease enzootia ends in 1–2 months.

**Pathoanatomical changes.** The main pathologic changes were observed in the periocular membrane of the eye, muscles, perivisceral fat layer, bladder (sac), abdominal wall, heart, where blood was transfused. Hemorrhage is often observed in the acute course of the disease, and disappears in the chronic course. In the acute course the liver is hyperemic, the color is dark red, and in the chronic course it is white-gray. On histological examination, necrotic lesions of hepatocytes, vacuolation of the cytoplasm, cariolysis and picnic state, spread in the liver parenchyma or in groups. Kidney disease is reddish in the acute course, thin, the surface is gray and bumpy in the chronic course of smooth. On histological examination we can see necrotic lesions, cytoplasmic vacuolation of the protoplasm, pycnosis, karyolysis, separation of the epithelium, general swelling. There are also changes in blood composition, decreased hemoglobin levels and erythrocyte counts.

**Pathogenesis** . The virus enters the fish's body through its jaws. It develops and multiplies in the endothelial cell of the spleen and the whole blood vessel, then spreads to all internal organs and tissues and causes a deep pathological process. Nerve form of the disease is manifested as a result of damage to the nervous system. When the epithelium of the blood vessels is damaged, their permeability increases, blood clots are observed, the wall is damaged, and a hemorrhagic condition occurs. In chronic flow, tumors are formed as a result of toxicosis, the process of osmoregulation is disrupted. When the nervous system is damaged, motor coordination is impaired. Hyperglycemia, decreased lipid levels,

variable electrolyte concentrations, decreased serum protein levels, especially albumins, but increased alpha and betta globulins.

**Diagnosis** . Diagnosis of the disease is based on a complex method: epizootiological data, depending on clinical signs and pathological changes. The most reliable diagnosis is to isolate the VGS virus and grow it in a tissue culture, identify it by serological tests, and place a bioprobe on susceptible fish.

**Treatment, prevention and control measures.** No treatment for VGS has been developed. Foreign scientists recommend the use of antibiotics (oxytetracycline) and antiseptics (methylene blue). Although they do not kill the virus, they do prevent the development of a secondary infection and make the course of the disease a little easier.

Disease prevention and control measures include a set of comprehensive general veterinary-sanitary, fishery-reclamation and biotechnological measures, which should be aimed at:

-epizootology chain breakage (parasite-host);

-increasing the natural resistance of fish;

-reduction of the total amount of the pathogen in the external environment;

-improvement of veterinary and fishing culture.

**Vet san expertise** . The VGS pathogen is not dangerous to humans and and animals. If the fish caught from unhealthy farms meets the demand for the appearance and quality of the product, it will be released without any restrictions. If it does not meet the requirements, it can be fed to farm animals after boiling on the advice of a veterinarian-ichthyopathologist.

## CONTROL QUESTIONS

1. What living systems are used to separate viruses from fish?
2. What is the basis of the biological sample and the final diagnosis?
3. What is the etiological cause of hemorrhagic septicemia in fish?
4. What antibiotics are used in treatment?
5. What are prevention and control measures?
6. What are the clinical symptoms and clinical forms of the disease?
7. What diseases of fish should be distinguished?

## TOPIC: Disease-causing viruses in bees.

## PLAN:

1. Causes of the disease
2. Etiology of the disease, clinical signs

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**BASIC EXPRESSIONS**

Larvae, tapeworm disease, family, virus isolation, virus identification, differentiation, deep decay, mesentery,

**Bag worm disease** (lot. Sacculisatio contagiosa larvae; visual. Sacbrood; Russian - meshotchatiy rasplod, meshotchataya ruble, bubble Gibert ruble; o'zb. - the death of the bag worm, the worm) - bees virus is a disease of the larval and is characterized by bag rot of fungi.

**Historical information.** The first information about this disease was written in 1857 by Langstrot under the name "dry rot" . The disease was later reported in many countries, and fundamental research on the disease was conducted by White in 1913-1917. He studied the etiology, clinical signs of the disease, and the name given to the disease at that time is still preserved. On the territory of Russia this disease was recorded in 1917 by K. A. Gorbachev.

**Economic damage.** This disease causes great economic damage to beekeeping. It is not possible to get the planned commodity honey from sick families, bees cannot provide themselves with food, the farm cannot sell mother bees and enough honey. In particular, the disease has caused significant economic damage to Australian beekeeping .

**The causative agent.** RNA-protective virus with a diameter of 30 nm. Viral strains do not differ serologically. The virus grows well in primary cultures made from bee tissue. 72 hours after cell culture is infected with the virus, the mitotic division of the cells is accelerated, followed by the onset of the initial symptoms of SPT. This virus does not develop in a culture of endlessly intertwined cells made from vertebrate tissue .

**Driver resistance.** The virus is resistant to drying, ether and chloroform. It is inactivated in honey in an aqueous suspension at 59 ° C, at a temperature of 70-73

° C for 10 minutes, in direct sunlight for 4-7 hours. It is stored actively in the dried object for 3 weeks. The virus is inactivated when boiled and in 0.3% potassium permanganate solution for 40 minutes. It is actively stored in honey at room temperature for about 1 month, in the refrigerator - 2 months, in the rotten mass for more than 10 days. The virus does not lose its activity for 10-15 days on the surface of wood with propolis, 5-10 days on the surface of metal, 80-90 days on wax. The virus is resistant to 3% sodium hydroxide and 0.3-10% rivanol.

**Epizootiological data.** The disease is recorded in all beekeeping areas. Local bees are more resistant to this disease than those brought from other regions. Under natural and experimental conditions, worker, mother and male bees are infected with this virus regardless of age and breed. However, 2- to 3-day-old larvae are the most prone to infection, and they usually die within 5–7 days of infection. In the family, the pathogen is spread by worker bees working inside the hive. Adult young bees infect healthy larvae with the virus through their saliva during the period of clearing the larvae of dead larvae . In saliva, the virus is actively stored during the winter. The varroa canal also transfers the virus from infected larvae and fungi to healthy larvae and accelerates larval death. If the larvae contracted the virus from worker bees during feeding, the virus infection in latent (innaparant) fungi formed in them and in adult bees.

This disease is most often observed in the family of bees in early summer, when the family lacks pollen and honey. Strong families are less likely to get sick than weak and average families. Symptoms of the disease disappear when you start taking honey. However, the disease may appear again in the fall or spring of next year. On the farm, the pathogen can be spread by worker and male bees entering other healthy families or by placing sick bee hives in a healthy family in order to balance the strength of the families. This is because adult larvae clean the larvae and fungi that have died from the disease in the bees.

**Pathogenesis.** 18-48 hours after the larvae are infected with the virus, the presence of the virus can be detected in their fat body cells, epithelial cells of the larynx, midgut, muscle and nerve fibers . As the virus multiplies in these cells, they die. The virus also lives and multiplies in fungi and young adult bees.

**Transmission and clinical signs.** The incubation period of the disease lasts 7 days for larvae and 5 days for fungi . In diseased family mummies, the larvae are not evenly spaced, spotted, many closed cages have sunken or 1-2 holes, or none at all. In them, larvae that are dead, lying in different positions, or lying along the cell wall are visible. Under the cuticle of recently dead mushrooms appear in their throats. When their bodies are carefully separated, they look like a bag filled with a granular white-muddy liquid. Then the tip of their head darkens, the segments smooth out, the fluid volume increases, and they turn brown. Then the elasticity of the sponge decreases, but the shape of the body is preserved; the cuticle is filled with a brown granular mass. Its body then turns into a shapeless mass, the liquid inside becoming sticky like glue; the sponge itself is dark brown or black in color; they dry out and look like a crescent moon that is lightly visible with its back bent against the cell wall. Gradually the number of dead larvae and fungi increases and their rate can reach up to 10%.

The behavior of young bees infected with the virus changes, they do not approach the larvae, do not feed them, participate in the early collection of honey, but poorly collect pollen . Part of the family dies, while others lose their symptoms during the process of bringing nectar to the nest . In 10% of cases, the disease may be latent. In the bee family, bagworm disease is often associated with European rot. Usually, when the disease is mixed, it is more severe and the specific symptoms of the underlying disease are not clear.

**Pathological changes.** Larvae and fungi form a large cavity at the base of the cuticle, filling it with fluid, killing and disintegrating the fat cells there. The body color of infected larvae changes, there are hairs and blisters, premature sclerotic changes, that is, an intermediate form to the imago with adult bees.

**Diagnosis.** Diagnosis of this disease is made on the basis of characteristic clinical signs and laboratory examination of pathological material. A portion of the mummies and at least 20 dead larvae and fungi, or altered larvae and fungi preserved in the same amount of 50% glycerin, are sent by a person with a referral letter.

IDR and direct and indirect IFR and coagglutination reactions (CoAR) are used in the laboratory for diagnostics on the basis of special "Guidelines" for the use of these methods .

**Separate diagnosis.** It is necessary to distinguish this disease from other diseases of larvae and fungi (American, European rot, etc.). In all cases, a special laboratory test will be the basis for a final diagnosis.

**Treatment.** Bacterial endonuclease (endoglucin) or ribonuclease is used for treatment . Good results were observed in experimental conditions when sugar juice was given with 0.5% potassium permanganate . Mix with the bag worm ridden European night, twice in 4 days 400 000 b / l juice or rivanol (250 mg / l), the juice of pirated been effective.

**Immunity.** Immunity has not been adequately studied. Vaccination of bees with the inactivated virus did not work. Treatment with hyperimmune serum prepared from rabbits and horses gave good results.

**Prevention and control measures.** Sick families are shortened and heated so that they are provided with adequate protein and carbohydrate foods. It is necessary to replace the queen bees or it is not allowed to lay eggs (it is stored in a separate cage for 5 - 7 days). All diseased mummies are lost.

If the incidence is very high, the waxes are melted and the wax is removed. Bees are given sugary juice. It is forbidden to give sick family honey or food to healthy bees. Once the diagnosis is confirmed in the laboratory, beekeeping is *restricted* under the Veterinary Regulations . Endoglyukin (bacterial endonuclease) and ribonuclease are given as treatment and prophylaxis. The sick family is treated by giving 0.5% potassium permanganate along with sugar juice .

Beehives and beehives are disinfected with 5% perhydrol, all used inventory is burned in a gas flame after mechanical cleaning or treated with one of 5% perhydrol, formic, acetic acid . Then washed with water and dried. Bathrobes, canvas utensils, towels are boiled in sodium carbonate solution, thoroughly washed

in water and dried. The wax is disinfected and stored thawed in a water bath at 70 °C for 70 min or sterilized in an autoclave for 30 min.

*Restriction from the* farm *is* taken after the final disinfection, when the disease is completely eliminated.

## CHRONIC VIRAL PALACY

*Chronic paralysis* (Lat. - Paralysis chronic apium; English - Chronic paralysis; Russian - viral paralysis) - a viral disease of bees, fungi , young and pre - ima form, which can not fly in the flight area of the box, o ' characterized by paralysis of the wings.

**Historical information.** And raised **a** Salaria crippling disease before scientists (who lived in BC are reflected in the works of Aristotle, Varro). The disease was first called "paralysis" in 1933 by Barnside. The disease was caused by the chronic paralysis virus under natural conditions and its 2: chronic and acute forms were caused by separate viruses in 1974. Until the 60s and 70s of the twentieth century , only the chronic paralysis virus of the three viruses that cause this disease periodically appeared in bee families in 1-2%, causing clear clinical signs of the disease . The remaining viruses, including the acute paralysis virus, caused the disease in bees in the form of a latent infection. However, the spread of varroa cane among bee families, which enhances viral activity and ensures its mechanical spread, has greatly complicated the epizootic situation of paralysis and resulted in the death of thousands of bee families in unhealthy areas.

**The causative agent is an** RNA-storing virus that develops in an elliptical shape, measuring 30–75 x 20–22 nm, 48 hours after infection in a primary cell and tissue culture prepared from bees, showing SPT.

The virus multiplies in the cytoplasm of cells of adult bee nerve tissue, small intestine, malpighian vessels, mandibular and hypopharyngeal glands. In virus-infected cells, they accumulate in various sizes and shapes, and in the small intestinal epithelial cells, they form cytoplasmic inclusions - Morrison inclusions. Chronic paralysis virus is usually detected at a temperature of 35 °C when infected with acute paralysis virus , but at 30 °C acute paralysis virus prevents the development of chronic paralysis virus .

**Driver resistance.** The virus is actively stored in the body of dead bees for more than half a year at a temperature of minus 70 ° C, more than 1 month at -15 ° C and 3-4 days at 4 ° C. At 60 ° C the virus is inactivated for 30-60 minutes, at 75 ° C for 10 minutes. However, there are reports that the virus is active for 30 minutes at 95 ° C , 7 days at 35 ° C, and 3 days at 35 ° C in 0.2% formalin solution . Under the influence of ultraviolet light, the virus is inactivated in 1 hour .

**Epizootiological data.** The death of bees in this disease can occur at any time of year. However, the *acute* course of the disease *is* more pronounced in the summer months. Chronic paralysis can be observed in some cases on the whole bee farm or only in some families. Among the bees *tashuvchanlik the virus* is widespread. Poor nutrition is a contributing factor to the chronic paralysis virus. Within the family, the virus is passed on through contact with sick bees and bees, cleaning from dead bees, and feeding through saliva. Infected bees contaminate the food they prepare with

saliva. The virus is also spread when flying bees, including males, thief bees, and bees in boxes, replace them with food.

The disease occurs on all continents except the Caribbean. In particular, the disease is widespread in several regions of China, Russia, including the Primorye Territory , Ukraine in 1965-1967, and later in the regions of Moldova and Kazakhstan .

**Pathogenesis.** Most of the food-borne virions are inactivated until the larvae turn into a fungus, while the remaining virus particles are kept inactive in the fungus and in young adult bees. Under the influence of factors that adversely affect various bees, the virus becomes active, they begin to multiply and pass into the hemolymph, resulting in viremia and subsequent damage to all cells.

Chronic paralysis virus is detected in the nerve cells of bees, in the cytoplasm of cells of the small intestine, malpighian vessels, mandibular and hypopharyngeal glands when the disease is *acute* and severe ( deadly). In the cytoplasm of the small intestinal epithelium of bees are formed circular Morrison bodies (inclusions) with a diameter of 0.5-5 μm. Bees die from high levels of virulence.

**Transmission and clinical signs.** When the virus is artificially transmitted to bees, the symptoms of the disease are observed in 4-10 days. The incubation period is 7 days for adult bee hemolymph with a minimal dose of the virus, and 5 days for fungal infections . When sick bees are kept with clinically healthy bees, their mortality from this disease is observed for 5 to 18 days.

The disease is characterized by the inability of bees to crawl in the flight area of the hive. Some bees move excitedly, erratically, flutter their wings, try to climb slowly on the grass, but without being able to stand firmly on the grass, they fall to the ground, turn sideways, and make a buzzing sound. Some sick bees are passive, often accumulating 2-5 or more in the ground or grass , moving very slowly, often extending one leg, the abdomen is large. These symptoms are mainly observed in late spring and autumn. In summer, when the temperature is high, sick bees are black, hairless, shiny, and the belly is small, like an ant. In some bees, three parts of the wing are severed, which is usually driven out of the hive by healthy bees. Usually bees that show signs of paralysis die, resulting in families becoming very weak. Undead bees become *carriers* of the *virus* and become *a source of disease,* and as a result, sick bees gradually die, and the family becomes weaker and weaker.

**Pathological changes.** Bees do not have feathers on the surface of the body, the tip of the wing is torn, and in some cases the abdomen is enlarged. On pathohistological examination, Morison corpuscles appear under the microscope in the cytoplasm of the small intestinal cell.

**Diagnosis and differential diagnosis.** The final diagnosis of this disease is based on clinical signs and, of course, the results of laboratory tests. Laboratory examination is performed by examining Morrison's bodies under a microscope in a histocosm of the small intestine of sick bees in the cytoplasm of the cell or in a smear prepared from there and stained with Romanovsky-Gimza dye. This entry can also be seen in IFR . The most accurate and easiest of these methods are IDR and NR.

Chronic paralysis requires differentiation of adult bees from other viral diseases, spirooplasmosis, phytotoxicosis, and pesticide poisoning. In all cases, complex laboratory tests allow to make a final diagnosis.

**Immunity.** Inactivation of the virus to bees to form active immunity did not work well.

**Treatment.** Mother bees of sick families are replaced. Bacterial endonuclease (endoglucin) or ribonuclease is used for treatment . Under experimental conditions, good results were observed when 0.5% copper sulphate, metronidazole solutions were given with sugar juice.

**Prophylaxis.** Disease prevention depends on protecting healthy bee farms from the entry of this virus, creating normal storage and feeding conditions for bees . Bees need to protect their hives from extreme heat and cold in winter. Bee nests gap with honey or maintain the torrid winter. Bee families are required to place in pollen-rich places. Thief bees are not allowed to come to the farm and reunite the two families without determining the cause of the weakening. In the production of queen bees it is necessary to take into account its resistance to disease and use such families to build a new family. It is necessary to achieve the highest level of sanitation in the household and in all families. Regular varroa canal control is required. In order to prevent bee diseases on the farm, it is necessary to regularly use endonuclease or ribonuclease (viran) on the basis of a special manual .

**Countermeasures.** Once the diagnosis is confirmed in the laboratory, beekeeping is *restricted* under the Veterinary Regulations . This will be reported to the nearest and district bee farms and veterinary specialists. It is prohibited for this bee farm to exchange mother bees or beeswax, honey and honey products, bee equipment, inventory with other farms . Veterinary and sanitary measures on the farm : old mummies are melted and turned into wax, mummies, frames, inventory, special clothes used in the family for 2-3 years are disinfected. It is not allowed to replace larval and nutritious beehives in boxes, to use honey extracted and dried beeswax without cleaning and disinfecting, to keep families without weak and mother bees. Once the disease has been eliminated, the *restriction is lifted in* accordance with the Veterinary Regulations.

**Control questions**

1. How is bee sting disease transmitted within the bee family?
2. What are the symptoms of the disease in a troubled family of bees?
3. What pathological material is sent for virological examination?
4. What are the different symptoms of tapeworm disease?
5. Are treatments developed?
6. Which bee should be replaced in families where the disease occurs?
7. How to explain the geographical distribution of the disease depends on the age of the bees?

# 3.2. TRAINING MATERIALS FOR PRACTICAL TRAINING

**TOPIC: Basic features of viruses, rules of work with virus-protective material and safety precautions**

Viruses cause disease in animals, plants and humans. Like other infectious agents, it contains genetic information and alternating nucleic acid molecules (DNA or RNA).

It differs from other infectious agents in that viruses themselves do not have a separate metabolism. Therefore, it does not feed on anything, does not breathe, and does not excrete anything from itself, and viruses have almost no protein-synthesizing, energy-generating system.

Viruses only multiply in living cells. Viruses therefore represent a form that carries genetic information only because it reproduces in living cells of animals and plants that carry genetic information biologically.

In industrial farms, acute respiratory and intestinal diseases caused by viruses are caused by paramyxoviruses (paramyxoviruses), infectious rhinotracheitis (herpes viruses), viral diarrhea (togaviruses), adenoviruses and other viruses.

They are also the cause of pathological processes occurring in the fetus. The virus, which causes plague in pigs, is also one of the leading causes of fetal waxing and stillbirth. The virus of infectious rhinotracheitis causes fetal malformations or blind birth.

The role of viruses in causing malignant tumors, leukemia, Marek and other diseases has also been proven.

Many viral diseases of animals (rabies, viral encephalomyelitis, mumps encephalopathy, scrapies, influenza, hemorrhagic fever, etc.) are also dangerous for humans.

Laboratory diagnosis is important in the successful fight against viral diseases.

Laboratory Department of Virology, Research Veterinary Stations Laboratory Diagnosis of Viral Infection Control of viral diseases in animals during the epizootic interval and taking into account the specific post-disease and post-vaccination immunity in the service area preventive measures such as the fight against viral and chlamydial diseases are aimed at organizing the implementation of measures.

The structure of the virology laboratory is determined by the role to be performed in the work process.

On the first floor there is a separate closet, sanitary control, sanitary units, a warehouse for storage of laboratory equipment and utensils, a device for disinfection by receiving water from the sewage, a room for keeping healthy and infected experimental animals, a vacuum cleaner, autoclave, washing rooms will be available.

On the second floor, a laboratory room will be located: rooms for tissue, cell growth, serological and virological examinations, apparatus, thermostat, and a room for the laboratory manager and staff. A small diagnostic laboratory should consist of 5-6 separate rooms.

The laboratory should have a separate well-lit room. A room that works with viruses should be well lit and consist of two rooms. The front box box is not less than 4 $m^2$ and the box box is not less than 9 $m^2$. The wall between them consists of a glass barrier and a door.

The boxing room of the laboratory will be equipped with a table, chairs and equipment necessary for work. The table tops are covered with glass, plastic or stainless steel and a BUV-30 (bactericidal uviolevaya) lamp is mounted on the desk.

At the entrance to the box, a carpet soaked in disinfectant solution is laid. Sterilized gowns, rugs, face masks, light shoes are stored in the front boxing box and worn before entering the boxing box.

Depending on the work performed, the box will be equipped with a thermostat, refrigerator, water bath, centrifuge and others.

The floor of the laboratory rooms is made of hard, moisture-proof, disinfectant-resistant material (malachite tile, plastic, linoleum). The walls and ceiling are made of a material that is easy to wash - oil paint or tile, and the window is covered with a net to prevent the entry of mosquitoes and flies or other insects.

The virology department of the laboratory is provided with cold and hot water, sterile air supply device. After drawing up the pathological material sent for examination, a table covered with several zinc-tin cans and containers with disinfectant solution (3% -chloramine, sodium hydroxide or 5% -phenol) are placed in the receiving room.

After the animals have been specially treated in the room, the material is taken for further inspection after being dissected. This processing is performed on a specially allocated table. This room should have a container for disinfectants, a glass cabinet for storing tools: scissors, tweezers, scalpel, cornice, etc., sterile containers for collecting material and a cabinet for storing special clothing.

Boxing rooms are equipped for special virological examination. It is forbidden to work with virus-containing material in the box used to grow cells. (Figure 1).

In the room where the autoclave is installed, utensils, food media, equipment, appliances and infectious materials are disinfected. Two autoclaves are required for

operation, the first in which clean materials and the second in which materials contaminated with infection are decontaminated. There should be a tank, a drying cabinet, a distiller and a storage cabinet for sterile containers for the collection of contaminated material.

Infected dishes, pipettes and instruments are washed after disinfection. The quarantine room in the laboratory animal storage room (vivarium) should be a separate room for healthy animals and experimental animals.

There should also be separate rooms for disinfection of cages for laboratory animals, preparation of inventory, special clothing, hay, storage of fodder, cremation of dead laboratory animals.

The building where healthy and experimental animals are kept should be separated from each other and the exit doors should be separate.

Laboratory animals are kept in cages. A passport is hung in the cage where each laboratory animal stands, and on the day it is brought to the vivarium, the mass is indicated. The passport of the experimental animals kept in the cage shall contain the date of infection, the type of antiviral material, the examination number and the date of infection. All types of virology lab must also have a box mounted on the table (Figure 2). The best is laminar boxing (Figure 3).

A glass barrier can be used to do uncomplicated work. This barrier is mounted on a table and separates the face of the employee from the material while performing the work.

During the examination in the laboratory should be planned rooms and the following basic conditions:

1. Ensuring safe work of employees.
2. Elimination of contamination of the tested material with microflora.
3. Take measures to prevent infection from leaving the laboratory.

An employee working with antiviral material in a virology laboratory must keep this requirement in mind and adhere to the operating mode.

### *Procedure for work in the laboratory of virology*

All employees of the laboratory will be instructed on occupational safety and will be provided with sanitary protection, special footwear and special clothing in accordance with the required standards.

The main rules of work of the virology laboratory are:

1. Unauthorized persons, as well as laboratory staff may not enter the production building without a gown and special shoes;

2. It is forbidden to go out of the laboratory in a robe and special shoes or to wear clothes on a robe, to smoke, to eat in a production building and to store food.

The employee works in a box in a sterile gown, face mask, slippers, rubber gloves and goggles if necessary. Shoes will definitely be replaced. Talking and walking are not allowed during working hours;

3. All material brought to the laboratory for examination is considered to have infection. Extreme care must be taken when handling material that is considered to be infected;

A few layers of gauze are moistened with a 5% chloramine solution and placed on the desktop.

Infusion of antiviral fluids is performed on a cuvette filled with disinfectant solution.

Rubber dots are used when working with pipettes. Previously used pipettes, utensils, and sealed glasses are disinfected by immersion in 5% chloramine solution, phenol, lysol, or sulfuric acid.

It is prohibited to take laboratory equipment, inventory, materials and other items out of the laboratory without prior disinfection on site;

4. Upon completion of the work, the workplace is tidied up and then completely disinfected. The virus-protective material that will be needed in the future will be sealed and placed in the refrigerator for storage;

5. It is important that containers containing infectious material are firmly marked. The glove should be washed with a 5% chloramine solution, then the glove should be removed, disinfected a second time, and washed.

If the infectious material falls on a robe, hand, table, shoes, etc., it is reported to the head of the laboratory (a teacher in educational institutions) and immediately disinfected under his supervision. If an infection is suspected, consult a doctor.

During the work in the virology laboratory, all employees must strictly follow the rules of asepsis and antiseptics.

**Asepsis** is a set of measures to prevent the entry of microorganisms and viruses from the external environment into the human body and the material under test.

This includes the use of sterile instruments and materials, handling of personnel, special attention to the rules and methods of sanitation and hygiene.

**Antiseptics** are complex measures aimed at killing viruses, microorganisms that enter the skin and mucous membranes or injured areas and cause an infectious process.

Various chemicals as antiseptics: 70% - ethyl alcohol, 0.5-3% chloramine solution, 0.1% - potassium permanganate solution, 0.5-1% formalin solution, 1-2% alcohol of methyl blue solution or diamond green is used.

**Disinfection** is the decontamination of the environment and objects as a result of the killing of microorganisms and viruses that are pathogenic to humans and animals by chemicals or physical methods. Chemicals (0.1-10%) chlorinated lime solution, formalin, (0.5-5%) chloramine, (3-5%) phenol, (3-5%) lysol, (2-3%) o ' washing alkali and others are used.

The choice of disinfectant and its concentration depends on the disinfectant material.

For disinfection of the box in the laboratory is often steamed formalin vapor (30-35 ml of 40% formaldehyde solution in 1 m $^{3\,of}$ air), beta propiolactone (1.1 ml per 100 m $^{3\,of}$ air) or carbolic acid (once a week). and chloramine or caustic soda solution is used daily.

**Sterilization** is the complete **elimination of** viruses and microorganisms in various materials, burning of the skin.

Physical (high temperature exposure) irradiation with ultraviolet light, liquid filtration through bacterial filters, and chemical sterilization are performed.

**Physical method of sterilization:**

a) heating in an alcohol lamp or torch flame. This method is used in a limited way to sterilize needles, rings of the takachi apparatus.

b) boiling sterilization. This method sterilizes syringes, small surgical instruments, utensils and shutters, and other items. The boiling time should not be less than 30 minutes, 2% sodium bicarbonate is added to the water to raise the boiling point of the water and soften it.

However, this method does not provide complete sterility, as some viruses, such as hepatitis virus, can maintain the viability of bacterial spores.

c) sterilization by dry heat in a drying cabinet. This method is based on the effect of air heated to 165-180 $^0$C sterilized glass jars with dry heat;

d) sterilization by steam pressure in an autoclave. This method of sterilization is widely used because it is very effective.

d) is used for sterilization of food-resistant materials under the influence of high temperatures of nutrient media containing vitamins and carbohydrates for 30 minutes at a pressure of 1-1.5 atm using a coke oven or autoclave steam.

e) sterilization by ultraviolet light. This method is based on the bactericidal effect of ultraviolet light 260-300 mcm long wavelength. We use BUV-15, BUV-30 lamps to sterilize the air in the box. Irradiation is carried out for 1–2 hours.

f) filtration of liquids through bacterial filters. In this way, the nutrient medium, blood serum, vitamins are cleaned of bacteria, but the nutrient medium, blood serum, vitamins can not be cleaned from viruses by filtration.

**Chemical method of sterilization** - this method uses a variety of chemicals (see antiseptic, disinfectant).

Storage of viruses in laboratories, labeling,
to consider

All virology laboratories have a single procedure for working with viruses, which provides for the storage, registration and use of viruses in the laboratory.

A label is affixed to the virus-containing materials in a test tube, vial, or other container, indicating the presence of the virus, the time the strain was taken, the passage number, size, and other information. The information on the label must match the strain recorded in the laboratory log.

Virus strains are stored in a refrigerated room in a locked, sealed, or sealed state.

Isolated virus strains are stored under the same conditions for a long maximum supply under comparable serological testing along with standard strains.

## Homework

1. Getting acquainted with the virology laboratory of the department and the main equipment there.
2. To study the rules of working with antiviral material.

## Material supply:

Virology laboratory room and laboratory equipment required for virological examination, table-top box, fluorescent microscope, centrifuge, refrigerator, magnetic stirrer, thermostats, alcohol, glassware (rubber dot, rubber stopper test tube, vials) , mattresses, petri dish, pipette) Takachi and Titertek apparatus, basic

reagents and nutrient media; a journal to record students' safety briefings while working in a virology laboratory;

**Control questions**

1. What is the role of viruses in infectious diseases of animals?
2. Talk about the rules of work and safety in the virology laboratory.
3. What method do you know to preserve viruses?
4. Tell us about the most effective way to eliminate viruses in laboratory practice.

**Methodical instructions**

The lesson can be organized as follows. After the teacher explains the topic based on the plan, students should prepare the workplace to work with the viral material. To do this, the workplace is disinfected with a solution of chloramine. On the table is placed a disinfectant solution (2% chloramine or 2% sodium hydroxide solution), a container for waste, alcohol, sterile cotton, tampon, jars of alcohol, a tripod for test tubes, a petri dish, a writing pen. Then sterilization equipment (syringe, needle, tweezers) is prepared, boiled in a sterilizer. During this time, students will learn how to work with pipettes and rubber balloons. Students are divided into two groups and study each task in turn. He then learns how to use sterile instruments.

## TOPIC: Obtaining viral material from sick animals and bodies and sending it to the laboratory by vehicle.

In making a definitive diagnosis of viral diseases in the laboratory, first of all, it is necessary to pay attention to the correct receipt of pathological material, timely delivery to the laboratory, the quality of preparation of antiviral material and the method of examination.

Material for examination of sick, dead, or intentionally killed animals should be obtained, as far as possible, within 2–3 hours after the appearance of obvious signs of disease or clinical death, sometimes after death.

After 1-2 days of the disease, the barrier role of the intestine decreases, which increases the permeability of blood vessels and the dissolution of the intestinal flora occurs. In addition, the number of viruses may decrease due to the continuation and in some cases deepening of the infectious process and as a result of the protective effect of the organism.

When obtaining patmaterial for virus isolation, attention is paid to the pathogenesis of the studied infection (gateway of the virus, the spread of the virus in the body, its place of reproduction and ways of excretion). In respiratory infections, nasal fluid, ointment from the nose and esophagus, scraped material from the trachea, and a piece of lung from dead animals are taken to isolate the virus; in enteroviruses-feces; in neurotropic viruses — a fragment of the head and spinal cord; in a dermotropic infection — a newly injured part of the skin, etc. (Table 1). Thus, a material is obtained in which the material must have a high concentration of the virus.

Various excretions and secretions, fragments of the organ, blood, lymph serve as material in the isolation of the virus. In pigs, blood is drawn from the jugular vein, the tip of the tail, and the ear. It is very convenient to draw blood from the veins in the eyes of pigs.

**Table 1. Obtaining pathological material for the diagnosis of certain viral diseases of animals**

| **Illness** | Nasal fluid | ion of vesicles, pustules | Saliva | Blood | Fecal | From injured | From the injured conjuncti | Brain | Lungs | Liver | Lymph nodes | Spinal fluid | From divorce | From the kidneys | The mucous membrane | From a piece of | The bronchus is part of |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rabies | | | | | | | | + | | | | | | | | | |
| Protein | | + | | | | + | | | | | | | | | | | |
| Vesicular stomatitis | | + | + | | | + | | | | | | | | | | | |
| Aueski's disease | + | | | | | | | + | + | + | | | + | + | | | |
| Rotavirus infection | | | | | + | | | | | | | | | | + | | |
| Parvovirus infection | | | | | + | | | | | | | | | | + | | |
| Infectious rhinotracheitis of large horned animals | + | | | | | | + | | + | | | | | | | | + |
| Y.Sh.h. viral diarrhea | + | | | + | + | | | | + | + | + | | + | | + | | |
| Y.Sh.h. parainfluenza | + | | | | + | | | | + | | + | | | | | | + |
| Y.Sh.h.adenovirus infection | + | | | + | + | | + | | + | | + | | + | + | + | | + |
| Equine rhinopneumonia | + | | | | | | | | + | + | | | | | | | + |
| Plague of pigs | | | | + . | | | | + | + | + | + | + | + | + | + | | + |

| Illness | African plague of pigs | Teshen's disease | Infectious gastroenteritis of pigs | Swine flu | Vesicular disease of pigs | Vesicular exanthema of pigs | Contagious ecthyma of sheep and goats |
|---|---|---|---|---|---|---|---|
| Nasal fluid | | | | + | | | |
| From the composition of vesicles, pustules | | | | | + | + | + |
| Saliva | | | | | | | |
| Blood | + | | | | | | |
| Fecal | | + | + | | | | |
| From injured skin | | | | + | + | + | + |
| From the injured conjunctiva | | | | | | | + |
| Brain | | + | | | | | |
| Lungs | + | | | + | | | |
| Liver | + | | | | | | |
| Lymph nodes | + | | | | | | |
| Spinal fluid | | + | | | | | |
| From divorce | + | | | | | | |
| From the kidneys | + | | | | | | |
| The mucous membrane of the intestine | | + | + | | | | |
| From a piece of tumor | | | | | | | |
| The bronchus is part of the trachea | | | | + | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sheep's feathers | | | | | | + | + | | | | | | | | | | |
| Duck flu | + | | | | | | | + | + | + | | | + | | | | |
| Infectious laryngotracheitis of chickens | + | | | | | | + | | + | | | | | | | | + |
| Infectious bronchitis of chickens | | | | | | | | | | + | | | | | | | + |
| Viral hepatitis of ducks | | | | + | | | | | | + | | | + | | | | |
| Poultry leukemia | | | | + | | | | | | + | + | | + | + | | + | |
| Marek's disease | | | | + | | | | | | + | + | | + | + | | + | |
| Newcastle disease | + | | | + | + | | + | + | + | | | | + | | | | |
| Birds of a feather flock together | | | | | | + | + | | | | | | | + | | | |

The wash is washed from the nasal mucosa, eyes, larynx, rectum from the cloaca of birds using a sterile cotton swab and immersed in penicillin vials with a special liquid. Instead of a special liquid is often used Hank's solution or lactalbumin hydrolyzate, used in cell growth, Igla solutions with the addition of 500 units of penicillin and streptomycin, 20 units of nystatin in 1 ml of medium.

Of the protein stabilizers, 0.5% gelatin solution or albumin solution with 0.5-1% bull serum is used. Stabilizers are added to prevent some viruses from losing their activity quickly (e.g. parainfluenza virus).

A customized tool developed by Thomas and Stock can be used to extract material from the nose and throat. It consists of a tube with a diameter of 9 mm and a length of 30 cm with a stainless stern inside, a thin inner tube with a nylon brush at the end.

After the instrument is sent through the nasal cavity (into the room) or into the larynx through the nasal passage, the brush is activated, and the instrument is pulled into the tube when it is removed from the organ. The mucus and cells in the brush are then thoroughly washed with 2 ml of liquid.

Saliva can be checked if there are signs of injury to the oral cavity or salivary glands. Saliva flowing from the oral cavity can be collected directly into the test tube.

If the saliva is poorly excreted, it is soaked in a cotton swab, then immersed in a test tube filled with saline and sealed with a rubber stopper. It is also possible to administer pilocarpine at a rate of 0.02-0.05 g per 1 kg of animal weight to accelerate salivation.

Urine is collected using a catheter and collected in a sterile container. Fecal is removed from the rectum using a spatula or swab and placed in sterile penicillin vials. The vesicular fluid is collected in a sterile solution using a syringe or pasteurized pipette.

The aphthae walls on the surface of the skin are removed using peeled tweezers. Spinal fluid is obtained by puncture and is rarely checked in veterinary practice.

A piece of organ is removed as soon as possible after the animal dies, because in many viral infections, the virus is not detected at all due to the presence of emergency self-sterilization after death, or the virus is detected by simple testing methods. it will not be possible to separate.

The second reason for the rapid acquisition of the material is that the carcass is contaminated with bacteria quickly, making it impossible to obtain material for sterile examination.In experimental conditions, infectious material is obtained from a sick animal by killing the disease during the agonal period.

The use of antibiotics is effective only when the sample being tested is less contaminated with bacteria. However, some changes in the tissues after the death of the animal can stop the growth of bacteria due to the use of antibiotics, it is impossible to neutralize the toxic substance, metabolic products in the damaged

tissue. However, it is not possible to experiment with such material in animals, chicken embryos, and cultured cells.

For the reasons stated above, the material obtained for inspection should be obtained under as sterile conditions as possible. Contamination of the sample with food debris should be avoided during sampling, mainly in the digestive tract, as the food contains non-pathogenic viruses, causing disruption of the structure of the growing cell and complicating diagnostic testing.

As a pathological material, a piece of organs (several cubic centimeters in size and 10-20 g in mass) was sampled, in which:

a) there is a significant difference from the norm in the eye (shape, size, color, consistency and different tumors);

b) based on the clinical sign of the disease can be preceded by death and retain the virus;

c) in most cases stores the virus in the liver, spleen, lungs, brain, lymph nodes, and kidneys.

**Sample storage and transportation.**

To slow down the process of deactivation of the virus, the sample taken is placed for storage under conditions that are able to quickly maintain virus activity. Such conditions are provided by low temperatures. To do this, test tubes with patmaterial and covered with a rubber stopper are placed in a thermos with a cooling mixture (Fig. 4).

A mixture of dry ice (solid carbonic acid) with ethyl alcohol ( up to several days at a temperature of minus 71 °C) is kept as a cooling mixture . A mixture of three parts by weight of ice and one part by weight of table salt can also be used.The result can be obtained at a temperature of minus 15-20 °C. The use of chemical preservatives for freezing does not give good results. The best of these is an equal solution of 0.85% table salt of pure glycerin (as an isotonic solution, the patmaterial is placed in this mixture). In most cases, this mixture is used in the preservation of tissues, a piece of parenchymal organs. Adding glycerin to the virus-protective fluid, this material can not be sent to animals, fetuses, cultured cells. Due to the use of glycerin, pathological material cannot be examined by immuno-fluorescence method. Therefore, a stamp is made of this material using a piece of glass together with the patmaterial, which is sent for examination under a fixed fluorescent microscope.

**Figure 4.** Basic rules for placing virus samples:

*First container: 1-Sample storage non-toxic*

*container with rubber gasket and screw cap or welded glass ampoule:*

*2nd internal placement: 2nd self-absorbing material. Cigarette paper or cotton wool in sufficient quantity to absorb the liquid;*

*3-Plastic bag filled with fiber-free adhesive tape. External placement:*

*4 impact paper or cotton;*

*5 Waterproof solid container; 6-Screw-on, adhesive-adhesive or special-clamp cover.*

The patmaterial has a solid and clear label, and the writing cannot be done with a pencil on the piece of glass. It is safe to stick labels on the test tubes and vials with adhesive tape and a simple (graphite) pencil to indicate which animal the material was obtained from.

A label made of cardboard or plywood is hung on the sample thermos with the name of the farm, type of animal, type of material and date.

The thermos must be sealed. Once the patmaterial has complete information about the animal from which it was obtained, the epizootiological information of the farm, the probable diagnosis and the measures to be taken to eliminate the disease (treatment, vaccination, etc.). as well as the date, surname of the doctor is indicated and sent by a special person. A rapid test is needed to separate the virus from the sample brought to the laboratory.

If, for some valid reason (experimental animals, chicken embryos, the inspection is delayed due to the absence of cultured cells, then it is necessary to store the material at minus 40-70 °C.) cerebrospinal fluid dies quickly in the urine, when the nasopharynx is scraped and rinsed, parainfluenza in large horned animals, and respiratory syncytial viruses are frozen. Therefore, it is necessary to carry out inspections very quickly when separating them.

If there is no certainty that the infectious disease being tested is caused by a virus, then a portion of the material is given for bacteriological and mycological examination.

**Questions to check**

1. What is the main focus in the process of obtaining pathological material?
2. In how many hours will the pathological material be delivered to the laboratory for examination?
3. What antibiotics are added to the obtained pathological material?

## Topic: The main methods of conservation of pathological material.

The following methods of virus preservation are used:

1) When storing viral material (a piece of organ or tissue), a 50% solution of glycerin in saline is often used. This solution has a bacteriostatic effect and provides good protection against viruses. Viruses can be stored at 4 °C for several months;

2) In most cases, viruses are stored in refrigerators with a temperature of minus 20, minus 30, minus 70 $^0$C. At such temperatures, the addition of protective additives to the composition of viruses very quickly loses its infectious properties.

It is known that the lower the protein content of a virus-containing mixture, the lower the stability of the virus, so viruses in their pure form lose their biological activity.

The addition of the following components serves a good protective function when freezing viruses.

Inactivated blood serum, skim milk (10 to 30%), gelatin (0.5-1.5%), DMSO (10%) and others.

The virus freezes quickly at -196 $^\circ$C (liquid nitrogen) and then stays titrated for several months.

The rate at which viruses dissolve has almost no effect on its activity.

Viruses can be re-thawed at room temperature or in a 37 $^0$C water bath. In order to reduce the frequent thawing and re-freezing of one type of virus, it is advisable to store the virus-containing material in small quantities or in such a way that it is sufficient for a single titration, for example a neutralization reaction.

3) Drying under vacuum, lyophilization is a good way to preserve viruses. Lyophilization requires the necessary equipment, certain (depending on the type of virus) fillers, and especially the drying process in full.

The stability of the lyophilized virus depends not only on the choice of filler, but also on the gas content in the ampoule. 0.5% oxygen quickly destroys the virus, while 2-3% humidity is almost unaffected. The storage temperature of the lyophilisate should not exceed 4 $^0$C.

It is preferable that the lyophilization work be carried out in organizations that are well acquainted with the method of lyophilization. Viruses can be stored for several years when lyophilized. *The virology laboratory must have the following documents.*

1. Journal of virological examination (examination, agricultural accounting №13-vet.forma).
2. Journal of reception of infected animals.
3. Log to record the isolation and destruction of viruses.
4. Log of production or museum strains movement according to calculations and other approved instructions.

Rules and safety of students working with antiviral material at the department

The following requirements must be met when working with virus protection material: to prevent the spread of viruses to the external environment; take measures not to contaminate the virus-containing material with foreign microflora; ensuring personal safety;

The following operating rules are followed to meet these requirements:

1. It is necessary to be very vigilant, to dress modestly, and to adhere strictly to the order;
2. After changing clothes in the closet, enter the laboratory room only wearing a robe and go out in a robe;
3. A buttoned gown, a special hat and a gauze mask are used during operation;

4. Cleanliness and order are strictly observed in the laboratory. There should be no foreign objects on the desktop. Smoking and eating are prohibited;
5. The student on duty takes the tools and materials for the work from the laboratory assistant of the department and distributes them to students;
6. Only sterile instruments and containers are used;
7. Opening and closing of test tubes, vials, plates, etc. is carried out in the flame of the burner;
8. The pipette is not taken orally;
9. Used instruments, syringes (separately) are placed in a sterilizer and sterilized by boiling;
10. Used pipettes are placed in a container with disinfectant solution and collected in one place;
11. Hard and soft waste (cotton, paper, etc.) are placed in a specially designed container and then sterilized;
12. It is forbidden to dump or dispose of waste in toilets and sinks;
13. If a student suddenly touches a virus-containing material, he must notify the teacher and jointly decontaminate the workplace;
14. At the end of the lesson, the student should clean the workplace and wash his hands thoroughly with soap after handing over all materials and equipment to the duty officer.

**Questions to check**

1. What percentage of glycerin is used in the preservation of pathological material?
2.What is the purpose of Trilon, (DMSO)?
3. What is the purpose of freezing the virus at 196 $^0$C (liquid nitrogen) and then diluting it?

## Topic: Preparation of pathological material for examination, isolation of virus-containing material.

The obtained patmaterial is freed from preservatives in the laboratory, melted, washed with glycerin, weighed or weighed. Some of the material is stored in the refrigerator as it may be necessary for virological examination and the rest for additional examination. An inspection plan is then developed for the submitted material.

### Organ and tissue preparation

After separating the virus from organ cells and tissues, phosphate is added to a buffer solution or Hanks solution. To do this, the material is cut from the cells with scissors and crushed, then crushed in a funnel filled with sterile quartz sand. It is not possible to put crushed glass, as it has an alkaline nature and can lose the activity of virus particles.

Crushed sand or glass particles have a large surface area, and as a result of this adsorption, the virus passes into the sediment where it is spilled.

A suspension is prepared from a material prepared by crushing in a phosphate buffer or Hanks solution. The resulting suspension is centrifuged at 1500-3000 rpm

for 15 minutes, after which the liquid on the surface of the precipitate is absorbed and poured into sterile vials. will be released.

The amount of antibiotics used for this purpose can range from 100 to 1-2 thousand units or more, depending on the nature of 1 ml of test material.

The use of high doses of antibiotics should be avoided because the accumulation of high doses of antibiotics in cultured cells can lead to non-specific degeneration in the cell.

The amount of which antibiotics to use and the optimal centrifugation regimen will be specified in the manual issued to diagnose a particular viral disease.

After 30-60 minutes of exposure of the suspension with antibiotics at room temperature, the material is inoculated into GPA, GPSH, GPJB and Saburo medium for bacteriological control of bacteria, fungi, depending on the results of bacteriological control, the laboratory animals, chicken embryos, or cultured cells.

If the suspension shows a positive result in bacteriological control, then it is further treated with antibiotics and re-controlled. The suspension is stored at minus 20-70 °C.

## Preparation of nasal secretions

Tampons soaked in a special solution are shaken for 10-15 minutes, squeezed well, the resulting liquid is 2-3 thousand ail / min. Centrifuge for 20 minutes. After the liquid on the precipitate is absorbed, it is filled into sterile solutions, each milliliter of liquid is maintained by adding 500-1000 units of penicillin and streptomycin. Used for infection after bacteriological control. Greases for IFR are prepared from cell sediments.

## Preparation from feces

When sampling feces, about 1 gram of beads is placed in a jar and 10 ml of Hanks solution or phosphate buffer solution is poured. The material is shaken and then 2-3 thousand rpm. Centrifuged for 30 minutes for homogenization, after the liquid on the precipitate is absorbed, 500-1000 units / ml of penicillin and streptomycin, 30 units of nystatin and 200 mcg of tetracycline are added to each milliliter of liquid. After sowing to know that it is sterile after 30-60 minutes of addition, it is stored frozen at minus 10-20 °C.

The material under test is thawed and re-centrifuged on the day of infection, with the aim of removing the sediment formed by freezing. Unused material is stored frozen until the end of the inspection. Fecal examination can also be replaced by preparing a grease from the rectum, as less time is spent preparing the grease.

**Urine** is used for infection after treatment with 500-1000 units / ml of antibiotics. In the growths on the skin are examined the composition of the papule, blisters and pustules, the upper part of the solidified wounds. Papules and vesicles are diluted in saline in a ratio of 1: 5. After the solid part of the wound and the skin is well crushed, it is dissolved in saline solution in a ratio of 1: 5-1: 10 and mixed, then 2-3 thousand rpm. The material treated with penicillin and streptomycin, 200-500 units / ml centrifuged for 10-15 minutes, is used for infection.

**Blood preparation** - Blood isolated from fibrin or anticoagulant added is used to isolate the virus. After 5-6 drops of heparin are added to the solution, 5-6 ml of

blood is taken and frozen. After re-thawing of hemolyzed blood, 2-3 thousand rpm. It is centrifuged for 15 minutes, then 100-200 units / ml of penicillin and streptomycin are added and used for infection after sterility testing. Coagulated blood can also be used for this purpose. Once the blood is well crushed in the mortar, a 1: 1, 1: 2 ratio of Hanks solution is added.

## Blood sampling for serological testing

To make a serological diagnosis, a double serum is taken from the blood (two samples) at the beginning of the disease and at the end of the disease. The first sample is taken as early as possible, ie during the latent period of the disease or as soon as clinical signs of the disease appear, the second sample is taken during the recovery period or 2-3 days after the disease.

Attention is paid to sterility in blood collection and preparation of serum, the addition of anticoagulants or preservatives can make serum anticomplementary, lose viral activity in the neutralization reaction, toxic effect on the cultured cell, in general, cause loss of sterility will be After 10-15 ml of blood is taken into sterile solutions and sealed with a rubber stopper, the blood is kept at room temperature until it coagulates, then separated from the test tube wall with a sterile glass rod and stored in a refrigerator at 4 °C for 18-20 hours.

After complete retraction of the blood, the serum is absorbed and cultured in bacteriological media after the addition of 100 units / ml of penicillin and streptomycin to each milliliter of serum.

In addition to freezing the blood in the refrigerator, centrifugation is also possible after separating the blood from the test tube wall. In making a virological diagnosis, the serological method requires a double serum test, so the first sample taken is kept until the second sample is tested.

Whey is stored at 4 °C in the refrigerator or frozen in strict compliance with the numbering procedure, and the relevant information is recorded in the journal.

## Homework

1. To acquaint students with the rules of receiving and transporting pathological material for examination in the laboratory.
2. Preparation of a virus-protective suspension from the organs of dead or intentionally killed animals.
3. Preparation of washing from sick animals for virological examination.

## Material supply:

Sterile scissors and tweezers, sterilizer; alcohol lamp, sterile cotton swabs; cotton; alcohol rectifier; 3-4 ml vials of penicillin filled with Hanks solution; thermos with cooling mixture; leukoplastr; graphite pencil; cuvette; penicillin vials in one piece from parenchymatous organs; with a sterile mortar crusher; sterile sand; 5 and 10 ml pipettes; sterile centrifuge solutions; antibiotics; penicillin and streptomycin; GPA; GPSH; Hanks or Erla solution; centrifuge.

## Lesson plan.

1. Questions for control.
2. Teacher's explanation.
3. Demonstration: a) a set of utensils and tools needed to obtain material from sick and dead animals;

b) scraping of the nasal mucosa, conjunctiva, rectum of calves and other animals, methods of obtaining ointments;

c) affixing a label to the received material and sending it by transport.

4. Independent work of students: a) scraping and greasing of the mucous membranes of the respiratory tract of calves, sheep or other animals;

b) fetses (feces) - taking;

c) conservation of the obtained material;

d) label affixing;

e) preparation of virus suspension from virus-retaining tissue;

f) obtaining scrap and grease from an animal brought for virological examination.

5. Complete the lesson.
6. Assignment for the next lesson.

## Control questions.

1. Describe the general rules for obtaining material from sick and dead animals.
2. How is the pathological material preserved and shipped by vehicle?
3. What do you mean by preparation for examination of pathological material?

## Methodical manual.

This session can be conducted as follows. In the first hour, methods of obtaining material from animals in the institute clinic will be demonstrated and explained. In the second hour, students will be busy preparing the material for review.

Organs or tissue from any laboratory animal can be used instead of organs taken from dead animals.

After the animal is killed, a piece of its organs is placed in penicillin vials, sealed with a rubber stopper, labeled, frozen, or poured into a 50 percent glycerin solution and then placed in a polyethylene bag and placed in a thermos filled with the cooling mixture.

During the lesson, students will prepare a virus-resistant suspension using this material. The cuttings and greases obtained during the demonstration are used during operation. This session is limited to demonstrating the acquisition of material from animals, the rest of the process is performed by students during the internship.

## TOPIC: Indication of viruses by encountering virions and invading bodies in pathological material

Viruses multiply in single-celled and multicellular organisms. When viruses accumulate in a cell, the molecules are in the state of an unrelated RNA or DNA molecule, in which the genetic information about the virus protein is encoded.

As a result of this information, a viral protein is synthesized in the cell and its molecules accumulate. Molecules of viruses are inside the cell (DNA, RNA, protein) and are protected from extraneous destructive factors (enzymes, acids, temperature, radiation, etc.).

If the virus is outside the cell, it will break down quickly. Most viral proteins are called structural proteins and have the property of accumulating spontaneously under the influence of the intermediate forces of the molecules.

Each aggregate (assembly) contains one molecule of viral DNA and RNA. In some cases, cell-derived lipids are also involved. The particles formed in this way are called virions.

In virions, protein molecules are intertwined and are not affected by proteolytic enzymes. The nucleus cannot reach the DNA and RNA molecules of the virus, but the formation of each individual virus virion, which is protected from the physical factors of the environment, occurs in cells belonging to a particular type. Virions can be thought of as dormant inactive viruses. Therefore, the virus can remain in the form of a virion for some time without losing its biological activity outside the cell. In particular, in the form of virions, viruses migrate from cell to cell, from one organism to another.

The viability of viruses in the form of virions is much better studied than in the cell, and intracellular life is related to the technical side of the study. The virion shape of each virus differs in size and structure. But the virus also has common symptoms and characteristics specific to virions.

Each virion retains a single complete or incomplete DNA and RNA molecule, is tightly wrapped with a capsomer, and consists of one or more protein molecules.

The sum of capsomeres collected in a certain order forms a capsid. The capsid together with the nucleic acid is called the nucleocapsid (chemically nucleoprotein).

In addition to the nucleocapsid, the virions of some viruses are also surrounded by a supercapsid shell, in which the virion attaches to the cell shell as it exits the cell. There are also viruses that have another intermediate shell (M-shell) in their virion, which consists mainly of lipids and proteins (Figure 5).

The capsomer is wrapped in a spiral around the nucleic acid molecule to form a long nucleoprotein filament. la takes. But there are also viruses, such as animal orthomyxoviruses. In these, the nucleoprotein strip is round, wrapped in a shell, and the shape of the virion is round or ovoid, in some cases axillary.

In animals, most of the disease-causing viruses have a cubic symmetry of the virion, reminiscent of a polygonal-shaped icosahedron.

The virions of some viruses do not have a clear symmetry, such as T-pair phage, smallpox virus. Virions in the form of scales or quasifers (icosahedrons) occur. They range in size from 10 to 350 nm, so they cannot be seen under a light microscope. Viruses at 300-400 nm can be seen under a light microscope . An electron microscope is used to see the virion of viruses. Distinguishing an object with a size of 0.2 to 0.4 nm is unique to an electron microscope.

Seeing a virion using an electron microscope in material taken from a sick animal can help detect the presence of a virus in that material. It is important in the

diagnosis of viral diseases of some animals. However, this method is technically complex and expensive, it may not be able to accurately identify the isolated virus, but imaging under an immunoelectron microscope is devoid of the above shortcomings.

Only smallpox virus virions can be seen using a light microscope. Because compared to other viruses, the virions of this virus are giant, 300-390 nm in size. The detection of smallpox virus using a light microscope is called viroroscopy.

As many viruses reproduce in cells, virus cells form inclusions in the cells. They may be specific to the cytoplasm or formed within the nucleus. (Figure 11-12).

Depending on their nature, many thousands of virions may remain in the cell and accumulate in one place, or may be due to its reproduction, or may be an excess protein or a combination of these elements that it does not contain. The size of the cells is the same as the size of the cell nucleus, 10-12 cells per cell.

Inserted bodies formed by some viruses have a special name.

Formed in the cytoplasm of nerve cells by the rabies virus

corpuscles Babesh-Nergi corpuscles, corpus luteum formed in the cytoplasm of the epithelial cells of birds by smallpox, Gvarnieri in smallpox in mammals, Lentsa in smallpox in carnivores, Zeyfred corpuscles in infectious laryngotracheitis in chickens. RNA-storing viruses In the cytoplasm, DNA-storing viruses form inserted cells inside the nucleus.

A small group of viruses has been found to form invading cells inside the cytoplasm and nucleus. Each virus in the cell has its own specific input cells and the shape, size of the structure has the property of staining with one or another dye.

The presence of the virus in the test material indicates the presence of the virus in the patmaterial, which is mainly due to the presence of the virus in the material from which the virus is derived. The incidence of rabies is specific to rabies, and it is possible to think about what kind of infection it is. In most cases, the inclusion of inclusions is an additional tool in the diagnosis. In order to meet the incoming carcasses, an ointment or seal is prepared while the animal is alive or after it has been killed, and it is examined under a microscope after being stained by special methods.

The staining of the inserted bodies generated by different viruses is also different. Many recipes for dyeing have been developed. The most universal of these is staining with hemotoxylin-eosin.

## Homework

1. Find and draw inclusions using a light microscope.
   a) Cytoplasmic inclusions;
   b) Inserted bodies inside the nucleus;
   c) smallpox virus virion stained by Morozov method;
2. To get acquainted with the principle and structure of the electron microscope.
3. Schematic study of electron microphotography of viruses of different viruses. Supply of materials | stained drugs that protect the cytoplasmic inclusions; stained drugs that preserve the inclusions inside the nucleus; Grease prepared from the vesicles or follicles of the flower stained by the Morozov

method; With microscope illumination; immersion oil; electron microscope, electronic microphotography of virions of various viruses.

**Control questions.**

1. What is a virion and how can it be encountered?
2. Talk about the shape and structure of the virion of different viruses.
3. What are virus-infected bodies and how can they be encountered?
4. What is the diagnostic value of the detection of virus entry bodies and virions?

**Methodical instructions**

1. A drug with cytoplasmic incisions is made by placing a piece of the animal's brain in a paraffin block and making a histological incision, which is then examined by looking at the body of Babesh-Negri.

Any epithelial cell grown on the vitreous and infected with the smallpox virus can also be stained with hemotoxylin-eosin. But it is very difficult to look for inclusions in such a drug.

2. An epithelial cell tumor infected with Aueski virus (VGNKI virus vaccine or vaccine made from BUK strain) grown on a glass slide and stained with hematoxylin - eosin is a drug that protects intracellular inclusions. DNA-storing viruses can also be used to grow cells.

3. In the case of smallpox can be limited to the demonstration of 1-2 drugs from the ointment stained by the method of Morozov. Large quantities of such drugs can then be prepared during a session on the topic of diagnosing smallpox, and these drugs will need to be retained until the next school year.

4. If the department does not have an electron microscope, then the structure of the electron microscope can be used.

5. A set of electronic micrographs of various virions in the lesson should be given to each student at least one. Such an image can be made by ordering an organization that works with an electron microscope. For the first time use, you can reproduce the image using a well-printed book.

**TOPIC: Laboratory animals and their use, storage, care in virology.**

The purpose of the use of laboratory animals in virology is the use of the organism of laboratory animals bred in special conditions for the cultivation, testing of viruses in the developmental stages of virology, as viruses multiply in living cells.

In virology, laboratory animals are used for the following purposes:

- when encountering the virus in pathological materials;
- in the first isolation of the virus from the pathological material;
- in the accumulation of viral mass;
- active storage of the virus in the laboratory;
- in titration of the virus;
- as a test object in the neutralization reaction;
- in hyperimmune serum.

First of all, laboratory animals are used to indicate the virus in the pathological material by biological experiments. For this purpose, a suspension was prepared from the patmaterial and injected into the laboratory animals and how they reacted to the infected material was observed.

In the laboratory practice of virology, biological testing is performed in mice to diagnose rabies, and in chickens in infectious bronchitis in chickens. Often the presence of the virus among animals gives less specific signs, so we cannot conclude which virus is present. Further inspections are required to determine its type.

In a particular disease, in some cases, biological testing occurs in a specific clinical setting that is specific. At that time, based on the results of biological testing, it is possible not only to know the presence of the virus in the pathological material, but also to draw conclusions about the type of virus. For example, injecting a suspension prepared from a parenchymal organ of a dead piglet into a rabbit's muscle and causing unbearable itching at the injection site, biting and scratching the skin and muscle tissue, and death indicate infection with the Aueski virus. In this case, a positive result of a biological test not only helps to determine the presence of the virus, but also what type it belongs to.

Biological testing often shows specific symptoms when chickens or pigeons are infected with smallpox virus, and in chickens, lambs - sheep are infected with smallpox virus, and similar naturally susceptible animals are infected with the virus. characters.

A virus is a virus isolated from an infected animal. The virus is identified experimentally after the virus has accumulated in the body of infected animals and can then be used in the production of a vaccine against the virus.

As a living system, a protein-lapinized hydroxyapatite aluminum saponinformal vaccine is prepared using newborn rabbits to collect the virus.

Laboratories are often required to keep viruses active for long periods of time. The virus is stored in living systems, including by passage in the body of laboratory animals, and placed in conservative conditions for storage.

It loses its activity even when preserving viruses at any speed. Due to re-passage, the virus recovers. Infection of a living system that is susceptible to a new population of virus is called passage. When working with a virus, it is often necessary to know the infectious titer of the virus or to determine its concentration in the material. To detect it, various diluted virus is observed to infect a living system, including laboratory animals, that are susceptible to the virus being tested, with protective material. The issue of titration of viruses is discussed in Topic 7.

In the diagnosis of viral infection, laboratory animals are used as an indicator, so the virus is neutralized by mixing with antibodies and used in the production of hyperimmune serum.

## TYPES OF LABORATORY ANIMALS

In virology, rabbits, guinea pigs, white rats, white mice, and golden hamsters are used. but it is possible to grow some viruses in animals of the listed species. For this purpose, in most cases, other sensitive animals are used: chickens, pigeons, cats, puppies and others.

Diagnosis of smallpox in poultry - in chickens, in sheep - in sheep, in pigs - in pigs.

Table 2. Use of laboratory animals for biological testing in viral diseases.

| Type of animal | Susceptibility to the virus | Method of infection | Signs of virus replication |
|---|---|---|---|
| **White mice** | Rabies | Intraserbal subcutaneous | Paralysis, death |
| | Protein | intracerebral | Spastic paraplegia, paralysis, death |
| | Aueski's disease | Interacerebral subcutaneous | Paralysis, death |
| | Vesicular stomatitis | Abdominal, interacerebral | Symptoms of encephalitis, death |
| | Influenza of horses | Into the nose | conjunctivitis, signs of toxicosis, mortality up to 50% |
| | Influenza of pigs | Intracerebral into the nose | Thus, the symptom of encephalitis is death |
| | African plague of ungulates. | Intracerebral | Symptoms of encephalitis, death |
| **White rats** | Influenza of pigs | Into the nose | Respiratory injuries, death |
| | Aueski's disease | Under the skin, into the nose | Paralysis, death |
| **Sea pigs** | Rabies | intracerebral | Paralysis, death |
| | Protein | Into the skin | Weeks at the place of delivery |
| | Vesicular stomatitis | Into the skin | Injuries of vesicles, kidneys, liver. |
| | Rhinopneumonia in horses | Into the abdomen | Abortion |
| | Plague of carnivores | Under the skin, through the mouth | Temperature rise |
| **Rabbits** | Rabies | Intracerebral, intramuscular | Paralysis, death |
| | Protein | Under the skin | |
| | Aueski's disease | Into the muscle, into the thorax | Clinical symptoms: encephalitis, pruritus, meningitis, in the form of death: |
| | Contagious ecthyma of sheep | Irritation of the mucous membranes of the skin | A smallpox-like injury at the site of delivery; |

| | | | |
|---|---|---|---|
| | Myxoma of rabbits | Subcutaneously, subcutaneously | In the head, swelling of the genitals |

## Animal care and care

Laboratory animals should be positioned in such a way that all systems of the body are able to perform their function in accordance with the physiological norm, while on the other hand, the spread of infection outside the vivarium and the mutual transmission of disease should be prevented. In Vivariate, special attention is paid to the physiological requirements of animals, lighting, temperature.

So for mice and rats it is semi-dark and the air temperature is around 20 °C, daylight for guinea pigs, rabbits, chickens, the temperature is 16-23 °C, 14-18 °C, from 0 °C should not be low. The placement density should correspond to 1 cm $^{2\ of}$space per 1g mass of laboratory animals . The animals are provided with timely nutritious food and constantly drinking water.

If there is only one special place, keeping the healthy animals separate from the infected animals, cleaning, cleaning, feeding the room starts from the room where the healthy animals are. Separate equipment and manure are used in the care of infected animals.

It is desirable to have two vivars to keep healthy and infected animals. The employee working in the vivarium is provided with a special gown, rubber gloves, apron, waterproof shoes during the work. Every day, the inventory in the vivarium is disinfected, and the room is disinfected with a disinfectant after spraying with water. At the end of the experiment, the dead animals are burned in an oven or sterilized in an autoclave, and the cages and containers in which the animal is kept are disinfected.

### Questions to check

1. Which animals are included in laboratory animals?
2. What conditions are needed for the care of laboratory animals?
3. What ration is required to feed laboratory animals?
4. What is the main purpose of using laboratory animals?

## Topic: Requirements for laboratory animals, identification of animals in the experiment

The following requirements must be met when dividing animals into groups for testing in virology. Animals should be sensitive to the virus being tested; its age is of great importance for the growth of most viruses. Many viruses multiply well in young, newly born animals.

For example, non-dairy mice are used for biological experiments in rabies and proteinuria, and chickens are used in laryngotracheitis in poultry. At this point, it should be noted that when the Aueski disease virus is transmitted to adult rabbits, it leads to the appearance of clear clinical signs specific to the disease.

Animals of a certain age and the same weight are selected to achieve standard sensitivity. In terms of sensitivity, animals that have been fertilized several times through close kinship have a standard trait. Because of the genetic similarity of such

animals, the reaction or other effects are also affected in the same way. Currently, animals bred by close relatives are used in research.

One of the most important requirements for laboratory animals is their health. Animals brought to the virology laboratory should be obtained from farms that do not have infectious diseases. White mice, rats are quarantined for 14 days and other species for 21 days. During this period, the animals are clinically examined daily. If an animal is suspected of having an infectious disease, it is tested in a laboratory. If an infectious disease is detected among quarantined animals, all animals in this group will be killed.

Such control is not enough to make sure the animals are indeed completely healthy. Latent infection specific to viral etiology may be prevalent in laboratory animals. We know that latent infection is permanent in the body and does not give a clinical picture. If there is a factor that adversely affects the body, the clinical signs of the disease may appear as a result of the rapid proliferation of the pathogen.

In virological examination, infection of laboratory animals with the virus leads to the appearance of clinical signs of the disease due to the transformation of a pre-existing latent infection into an acute one, making it difficult to determine the outcome of the animal reaction.

The most common of the latent infections of viral etiology in laboratory animals is ecteromelia disease of white mice. Its causative agent belongs to the family of smallpox virus. When the disease spreads to all organs with necrotic inflammation of the legs, it is accompanied by the formation of necrotic centers in the lungs, liver and spleen. Viruses close to it cause viral pneumonia in laboratory animals. The most common of these is the Sendai virus. The third group of latent viral infections is neuroinfection, which occurs in a state of convulsions, paralysis, paralysis. Lymphocytic choriomeningitis, encephalomyelitis and other laboratory animal viruses of white mice are latent encephalitis. One way to control latent infection in individual animals is to prepare a suspension from the body of an animal that has been intentionally killed. with l). If the virus pasteurized in this way is a latent infection, it leads to an acute course of the disease.

## Identification of laboratory animals

Determining the animals used in the experiment is one of the most important tasks. A label shall be affixed to the cages in which infected animals are kept, stating the number of animals infected with the virus (or the examination number of the pathological material being examined), the date of infection, and other information if necessary.

Different specific methods of marking are applied to different species of animals. Metal labels with numbers printed on large animals and chickens are used.

The ears of rabbits are attached to the root part, the ear of the guinea pig is attached to the ear, and the hen's foot is marked in the form of a ring. the hair is cut.

In distinguishing guinea pigs, attention is paid to the color, which is also recorded in the work log. White mice, white rats can be identified by cutting the front and back toes, legs separately. Each of them corresponds to this or that sequence number. Represents one number on the front foot and ten on the next foot. But in most cases unpigmented junga is marked by the appearance of colored spots. For all

dyes (fuchsin solution, diamond green), a saturated solution of picric acid is the best defining dye and can be stored for a long time on wool and skin. Colored symbols are placed on a specific sequence number of the animal. we start at the corner, so it's a paddle, and it's going to be 1, so if we move on, we're going to have a left side 2, a left number 3, then 4, shoulder 5, buttocks area 6, right shoulder 7, right side 8, the right number is 9. Using two colors, the first color is denoted by a unit and the second color by a decimal number (Figure 13).

**Methods of virus transmission to laboratory animals**

Laboratory animals can be infected with virus-storing material in a variety of ways. Most often we use the following methods of infection: subcutaneous (t / o), subcutaneous (t / i), intramuscular (m / i), abdominal (q / b), intravenous (v / i) ), into the nose (b / i), intracerebral into the brain (m / i). But in any particular case, the examiner must choose one of these methods when infecting the material.

The tropism of the virus is taken into account when choosing the method of infection. the multiplication (reproduction) of a virus in a particular type of cell in an organism is called viral tropism.

A virus that reproduces in a nerve cell is called a neurotropic virus (for example, in rabies), a virus that reproduces in skin cells is called a dermatrope (eg, smallpox virus), and a lung virus is called a pneumatic virus (influenza virus). Polytropic viruses that reproduce in several types of cells (viruses that cause infectious rhinotracheitis in large horned animals are reproduced in the respiratory and reproductive organs), viruses that reproduce in all types of cells are called pantropic viruses.

An example of a pantropic virus is a virus that causes plague in dogs. Knowing the tropism of viruses, viral material is sent to the cells of organs that are sensitive to that virus. For example, the flu virus is transmitted into the nose, the smallpox virus into the skin, and the rabies virus into the brain.

Pantropic viruses spread well into the body only when they are given intravenously or into the peritoneum. Several groups of animals can be infected in different ways if the test material does not have information about the tropism of the virus.

The size and quantity of the material to be shipped depends largely on the type of animal and the method of shipment (Table 3).

**Table 3. The maximum amount of material that can be sent to laboratory animals**

| Method of infection | Rabbits | Sea pigs | White rats | White mice |
|---|---|---|---|---|
| Into the skin | 0.1 | 0.1 | 0.05 | 0.02 |
| Under the skin | 5.0 | 3.0 | 3.0 | 0.5 |
| Intramuscularly | 5.0 | 2.0 | 1.0 | 0.3 |
| Into the abdomen | 10.0 | 5.0 | 2.0 | 1.0 |
| Into Vienna | 5.0 | 2.0 | 2.0 | 1.0 |
| Into the nose | 1.0 | 0.3 | 0.1 | 0.03 |
| Into the brain | 0.3 | 0.05 | 0.03 | 0.02 |

The methods of fixation, methods of infection are not the same when holding different types of animals in one way or another.
The skin on the scapula of the rabbit is held with one hand and the next part of the body with the other hand. Irritation is prevented during such fixation.
The guinea pigs are held from the breast with one hand to the hind legs with the other hand.
Holding the rat and mice by the tail, they are given the opportunity to climb into the metal cage, cage with their front legs, holding the skin of the neck with two fingers of the left hand, the animal is slowly pulled.
At this time, the rat is held firmly and securely by the cornice, and the head is always held by its skin layer by means of two cornices. Hold the two corsets with the helper's left hand and the corset holding the tail with the right hand.
White mice are fixed without an assistant, for which they are pinched from the layer of skin between the ears using Peano tweezers. The tweezers ring are attached to the Bunzen tripod holder or act as a holder for the test tube on the stand.
Mice can also be fixed with one hand. The material is thoroughly treated with a 3% alcohol solution of iodine before infection.
**Subcutaneous Infection - The** skin layer is examined by holding the thumb and forefinger of the left hand and inserting a syringe needle parallel to the body into the lower part. In most animals, the injection site is the neck, hips, shoulders, shoulder blades, in dogs it is the hips, in guinea pigs it is the knees, and in chickens it is the neck.
**Subcutaneous Infection - In** rabbits, this method **involves** cutting the hair on the side or abdomen to transmit the virus, and then scraping the remaining hair with a sharp diamond or razor.
The prepared area is wiped with alcohol and saline solution. The syringe needle is inserted a few mm into the surface of the skin at an acute angle. The material is sent to the skin layer until a round swelling is formed.
In small laboratory animals, material is injected into the skin on the plantar surface of the next foot. After fixation on the index finger of the left hand, the syringe needle with the right hand is inserted into the skin with the finger pointing at the knee joint.
In order for dermotropic viruses to multiply in the body, the virus-protective material is applied to the scratched skin (e.g., the causative agent of smallpox).
The surface of the skin is prepared as if infected inside the skin, scratched several times with broken needles of a needle and pasteurized tube until drops of lymph fluid appear. The material is then dripped and rubbed with a spatula, glass rod or toothbrush. When the virus is transmitted to the scratched skin of large animals, it is immediately transmitted to the side or abdomen, and to the waist of small animals.
**Intramuscular infection** - In this method, the thigh muscles are often selected for infection, and in chickens, the pectoralis major muscle. After the injection site is disinfected, the needle is injected through the skin, into the subcutaneous tissue, and then into the muscle perpendicular to the body surface. After infecting the material, the needle is removed and the injection site is re-disinfected.

**Infection of the abdomen** - When animals are infected in this way, the head is fixed in a vertical position with the head down, as the organs in the abdomen

approach the diaphragm and do not injure the intestine when the needle is inserted (Fig. 14).

The skin of the abdominal wall is pierced with a small needle in the space between the head of the breast and the cloaca of the hen , and is sent at an angle of 45 $^{0}$ to the transverse axis of the body .

At this point, the chicken leg is slightly pulled with the left hand to tighten the injection side of the abdominal wall muscles.

The penetration of the needle can be seen from the weak resistance of the abdominal wall.

**Intravenous Infection -** Most importantly, care is taken to ensure that air bubbles inside the syringe do not fall off pieces of material, as air bubbles can cause embolism and death in the animal.

The lateral vein of the tail is used to infect white mice and rats.

Prior to infection, wipe with a swab dipped in xylene or hot water to dilate the vein. The assistant squeezes the root of the tail with his left hand, holding the animal by the skin of the neck with his right hand and fixing it. The needle is sent to the lower third of the tail at an acute angle, tilted outwards (Fig. 15).

If the needle falls into a vein, the fluid inside the syringe will flow slightly and the vein will flow lengthwise.

Once the root portion of the tail is released, the material is slowly released. The needle is then removed and the injection site is squeezed with dry cotton.

The virus can be transmitted to the bloodstream by injecting a needle into the heart of guinea pigs 1 cm above the left side of the sword-shaped tumor in the rib cage. To do this, a needle without a syringe is inserted to determine where the heart is beating. If blood is seen in the needle, then the syringe is attached to the needle and the material is injected.

When the material is injected into the rabbit vein, the peripheral vein of the ear is selected and the hair is pre-shaved and the vein is pressed just below the needle insertion site. The virus-protective material is injected into the axillary vein of birds.

Infection **into the** nose- except rabbits to the noses of most laboratory animals virus due to axial impact when dropping materialthe protective suspension is displaced. Material instilled into the nose when inhaled, enters with air. The virus-containing suspension is instilled by injecting the rabbit's anesthetized head back. Infection of the **brain - The** scalp of the mouse is pulled with the index finger of the left hand towards the neck. Foreign grants you o'rtanchisagital line passing through the eye and formed perpendicular to the square between the point restraint SYRINGES added to the needle 1-2 mm (Figure 16). Infected through the trepanation hole into the brains of white rats, young rabbits and guinea pigs are infected by piercing the thinnest skull above the eyeball. In this case, a needle with a limiter is used to prevent the needle from entering more than 4-5 mm. It is transmitted through a trepanation hole into the brain of older animals (Fig. 17).

Once an animal has been infected with a virus, it is placed in a room and a label with the examination number of the infected virus or the material being tested, the number of infected animals, and the time of infection is posted.

The work log will include the name of the virus or the examination number of the material being tested, the number and description of the infected animals, the mark, the method of infection, and the amount of the virus.

By observing the animals, attention is paid to their external structure, mobility, diet, and so on. It should be borne in mind that the death of animals in the first hours after infection may occur due to trauma or toxic effects of the material being examined.

**Signs of reproduction of viruses in the body of laboratory animals**

After infection, the animals are monitored daily and their clinical condition is monitored. As a result of the proliferation of viruses in the body's susceptible cells, the cells are injured or die. If the viruses blian injury is small, then part or all of the organ function is completely destroyed. This is accompanied by a certain change in the behavior and condition of the animal .

Reproduction of the virus in the cells of the respiratory tract causes wheezing, coughing, shortness of breath, in the cells of the brain due to the multiplication of the virus is observed convulsions, paralysis, paralysis, etc.

The appearance of visible changes in the condition and function of the body are called clinical signs of the disease. Their appearance as a result of infection for experiments is evidence that the virus has multiplied. (Figure 18). Not only does this take into account the specific change that has occurred, but the length of the latent period is specific to a particular disease.

The latent period depends not only on the nature of the pathogen, but also on the amount of virus, the route of entry into the body, and the condition of the organism.

Biological experiments, ie the appearance of clinical signs of the disease in infected laboratory animals to detect the virus, indicate the presence of the virus in the examined material.

For example: symptoms of fatigue, loss of appetite, shortness of breath, etc. are not characteristic of most periods, and at this stage of the examination it is not possible to conclude what type of virus caused the disease.

The virus encountered in this case is identified using a serological test. In this case, it is an unknown antigen, and the virus for the experiment is a virus contained in the material obtained by dissecting infected animals. In some cases, the disease ends in death, a similar condition that occurs after infection with the virus and is considered one of the signs of the virus multiplying in the body.

Not only the appearance of clinical signs of viral replication in the body and the death of the animal, but also the appearance of visible changes in cells and tissues that have died due to viral infection.

Pathological changes are characterized by discoloration, size, shape and consistency of the organ, as well as the appearance of abnormal inclusions.

The presence of the virus in the material when infected in laboratory animals is indicated by symptoms of three diseases, pathological changes and death. The virus

in the pathological material obtained from the horse cannot reproduce easily in the body of white mice, causing clinical signs.

In the first passage, some parts of the virus find sensitive cells that are compatible with it, which is very small for this organ and no visible changes occur in the body. Such a passage is called a "blind passage".

If there are no signs of disease in the infected organism, the animals are killed after a certain two intervals, and after autopsy, pathological material is obtained. In this material, the virus is accumulated as a result of reproduction. The material obtained from the first passage is transmitted to the animal of the same species by suspension.

At this time, more virus particles enter the body than in the first passage and begin to multiply under such conditions. But even in the second passage, the virus may not cause a visible change without accumulating to an infectious amount. In that case there will be a second passage.

Based on the above, a third passage will be conducted. The appearance of symptoms of the disease indicates the presence of the virus in the material being examined. A virus derived from an animal that has given such a response is a virus isolated from the protective material. Biological experiments based on the above point of view are performed in other living systems of the laboratory to detect the virus. Naturally susceptible animals are used to encounter and isolate viruses. Because they don’t need to be pre-adapted, they create certain characters right from the first passage.

**Questions to check**

1. What dyes and solutions are used in the designation of laboratory animals?
2. What is the main focus of the transmission of the virus to laboratory animals?
3. Describe the methods of transmission of the virus to laboratory animals.

## Topic: Control of infected animals, taking into account clinical signs, obtaining pathological material by autopsy.

For experiments, the virus is dissected to see pathological-anatomical changes in infected animals and to obtain virus-retaining material. Organs and tissues are dissected immediately after death so that the animal is not personally contaminated with the microflora on the intestinal mucosa during life.

If the infected animal does not die, then at the time when the symptoms of the disease appear in full, if the symptoms do not appear, it is deliberately killed 8-10 days after infection. Applying large amounts of anesthesia to kill animals can cut the spines of small animals. To do this, the right hand is held by the body of the animal, ie the neck, and the left hand is held by the tail, moving quickly and briefly, pulling as if breaking the rope. Decapitation is not a sensible method.

The animal's body is fixed to make it easier to see. Specially designed tables for large animals or a wooden device for fixing the legs and head are used. Small animals are fixed in a hardened cuvette with melted paraffin.

We use an injection needle or a stylus for fixation. Sterile instruments are used for dissection.

The abdomen and thoracic cavity are ruptured after the animal is placed on its shoulder and its anterior and posterior legs are fixed. The wool at the cut is treated with a disinfectant solution. Small animals are caught by the tail and completely immersed in a disinfectant solution to dissect. Cutting the skin continues from the white line on the pelvis to the neck. In this process, the skin is pulled and cut transversely over the pelvis using tweezers in the left hand to avoid cutting the abdominal walls.

One end of the scissors is inserted into the hole and cut to the neck of the animal, then cut to the four legs separately. It is separated from the skin in an impenetrable manner, as if opening the door of the closet on both sides. The cut pieces of skin are fixed with a pin on the top and bottom.

When the instruments are replaced, the abdominal cavity opens. To do this, the abdominal wall is cut along the white line from the base of the diaphragm to the pelvis. It is fixed to the periphery by pulling from the corners of the abdominal wall.

The virus is taken from the abdominal cavity (entire organ of small animals) as a protective material, as well as from the liver, spleen, kidneys, spleen, lymph nodes, part of the intestine in case of pathological changes. When opening the chest cavity, it is taken into account that it consists of a solid wall. To get to the organs in this space, you need to get the “Cover” here. To do this, the ribs are cut transversely and the sternum is also removed together (Figs. 19, 20).

After the animals are placed on their sides on the abdomen, the skull and neck are treated with a disinfectant solution. The trunk is cut perpendicular to the axis from the back of the ear to the left and right eyes. The skin is torn off along with the ears, the skull is stripped and thrown to the front. Bring one end of the scissors into the large hole in the skull and cut towards the left and right sides of the bones.

The bone between the eyes is then cut and all the cut area is removed. If the skull is thick, it is sawn according to the instructions above. Animals with a soft slippery consistency

the brain is removed when the base of the skull is raised with the tip of a pair of scissors and the cranial nerves are cut.

The main requirement for a virus-storing material is that it retains the virus as much as possible in its composition, which determines the tropism of the virus. Their proliferation in cells of a certain type indicates that the virus has accumulated in that organ of the animal. Once the animal is dissected, it is examined which organs have pathological changes and it is predicted that the virus may be stored there. Modified organs are used as virus-protective material. However, it is also obtained from the regional lymph nodes of the affected organs for this purpose.

Pneumotropic viruses are obtained from infected animals as a virus-protective material in the lungs, interstitial lymph nodes, trachea.

Viscerotropic viruses accumulate in the abdominal parenchymal organs, liver, spleen, rectal lymph nodes, and intestinal walls.

When testing for neurotropic viruses, the virus-protective material is also removed from the brain and, if necessary, from the spinal cord.

Each obtained material is divided into two parts, placed separately in sterile solutions and sealed with a rubber stopper. If the pathological material placed in the first solution is intended for virological examination, the tissue in the second solution is intended for histological examination. It is therefore added to the solution from the required fixative. In a particular infection, tests are performed to detect the virus microscopically. If the virus is to be seen under a light, luminescent microscope, ointments and seals are prepared from the virus-storing organs.

Viral-specific changes may be located in different parts of the organs. For example, in rabies, a stamp from the brain is prepared as follows. Once the skull of the small animal is opened, a (10x10) size filter is placed on top of the paper without disrupting the brain structure. Here it is firmly fixed. With scissors used for the eye, a portion of the brain is cut vertically and placed on a piece of paper on the side.

The rest of the brain is then cut out and placed alternately on a piece of paper on which the previously cut brain is standing.

A stamp is made on a piece of paper fixed in the left hand by taking a piece of the brain and touching the degreased glass window with the right hand.

## Homework

1. To study the methods of fixation of experimental laboratory animals by all methods and virus transmission.
2. Infection of ectromelia virus and ospavaksina virus in rabbits into the skin of white mice.
3. Identify the symptoms of the disease in infected animals.
4. To dissect infected animals to see pathological changes and obtain virus-protective material.
5. Making a stamp from the brain.

## An approximate plan of the lesson

**Lesson 1 (2 hours)**

1. Control questions.
2. Teacher's explanation.
3. Demonstration: a) methods of working with sterile instruments, preparation of the syringe and filling with infectious material; b) methods of virus transmission to rabbits and white mice for experiments.
4. Independent work of students: a) study of methods of fixation and transmission of saline solution to white mice and rabbits; b) infecting white mice with ectromelia virus, smallpox vaccine virus into the skin of rabbits and marking them with a solution of picric acid; c) placing infected animals in separate cages to indicate which virus was infected and what method was used to infect them, the number of animals, the number of the study group and the duration of infection by hanging special labels on them.
5. Completion of the lesson.
6. Assignment for the next lesson.

**Lesson 2 (2 hours)**

1. Control questions.
2. Teacher's explanation.

3. Demonstration: a) clinical signs of the disease in infected laboratory animals; b) methods of killing laboratory animals; c) cleavage technique (students pay attention to the condition of the internal organs and learn how to obtain virus-containing material); d) brain stamping techniques; e) an attempt to decontaminate the place where the dead animal was dissected;
4. Independent work of students: a) detection of infected mice on the basis of color, analysis of clinical status, killing, fixation in a paraffin-lined cuvette, dissection; b) analysis of pathological changes, obtaining virus-protective material from parenchymal organs, preparation of a layered stamp from the brain; c) Swelling in the foot of animals, described in mice ectromelia, should be taken from the soles of the feet as a virus-protective material and placed in a sterile solution covered with a rubber stopper to detect necrosis of the skin.
5. Completion of the lesson.
6. Assignment for the next lesson.

**Control questions**

1. What are the types of laboratory animals and the purpose of their use in virology laboratories?
2.Which of the most commonly used methods of infection for laboratory animals do you know?
3. What are the signs of viral replication in the body of laboratory animals?
4. What is the positiveness of biological experience and its importance in diagnosis?
5. What is a “blind” passage?
6. What is the basis for the selection of the organ in the extraction of viral material?

## TOPIC: THE use of chicken embryos in the practice of virology, methods of virus transmission.

Beginning in the 1930s, the chicken embryo began to be used in virology practice as a living system. The chicken embryo has played an important role in the cultivation of viruses in the laboratory, and has succeeded in solving many of the tasks facing the science of virology. Chicken embryos have a number of advantages over laboratory animals. Reliable protection of chicken embryos from the infection of bacteria in the external environment of the shell and subcutaneous shell. One of the important achievements of the fetus is its high sensitivity to a wide range of viruses, which means that the defense mechanism is not fully developed. Chicken embryos are an object that is easy to find due to the large number of poultry factories and incubators. In addition, chicken embryos are economical, do not require care and feeding, and do not produce antibodies in response to the virus. However, the sterility of a living system cannot be fully guaranteed, and fetuses can store viruses and pathogenic agents (chickenpox, Newcastle disease, influenza, leukemia, chlamydia, and mycoplasmas) in their composition. The presence of viruses in these diseases may misrepresent the test results. In virology,

we use the chicken embryo for the same purpose as we used laboratory animals. These are:

- In case of encountering an active virus in the material due to biological experiments;

-in the first isolation of the virus

Very easy to grow and isolate pathogenic viruses in individual mammals, poultry, chicken embryos;

- in the storage of viruses in the laboratory;

-with titration of viruses;

-collection of the virus in laboratory tests and preparation of vaccines;

-as a test object in the neutralization reaction.

When infecting a chicken embryo with a virus-protective material, the following requirements apply to it;

fetuses should be obtained from farms free of infectious diseases, the outer lime shell of the egg should be unpigmented, clean (not washable).

The age of the fetus should be appropriate to the method of infection chosen. ***The structure of the chicken embryo.*** The hens lay almost fertilized eggs, in which case the fetus is at the stage of blastula or tomorrow gastrula. If the egg is heated to the same temperature as the chicken body, then the fetus will continue to develop. After 5–12 days of development of the chicken embryo, it can be infected with the virus (Fig. 21). The fetus is developing

The chicken egg is wrapped with a lime egg shell with small holes on the outside, to which the bottom shell of the shell is firmly attached. The shell of the pan divides the egg into two sheets in the impermeable part, forming an air chamber between them. Inside the egg, the body of the fetus lies in the eccentric position, with the shoulder side close to the lime shell and the head facing the air chamber:

The fetus is immersed in the fluid around it, fills the amniotic cavity, and is connected to the yellow sac through the umbilicus. The yolk sac is also located in the eccentric position and is located on the second opposite side of the egg relative to the fetus. There is an allantois cavity under the shell of the pancreas, which wraps around the amnion and the yolk sac and joins the sharp part of the egg after 10-11 days.

The allantois cortex merges with the chorion during growth to form the chorion allantois cortex ( HAP ).

In the sharp part of the egg, a protein residue is stored. The composition of the cell will be able to increase the structure of all viruses, including the fetus LOWER and yellow backpack.

The accumulation of viruses is also in these structures, and several viruses accumulate in the allantois and amniotic fluid to form a ready-made viral suspension.

Infection of the virus in one or another part of the fetus is carried out at the time when it is most developed, that is, when there are the most sensitive cells. During the incubation period, the size of the fetal structure also changes, which in most cases determines the optimal age of the fetus at the time of infection. The yellow sac is a large source of nutrients before incubation, and after 12 days it becomes smaller

due to fetal growth. The yellow bag is infected with the virus on days 5-7 of incubation.

The amniotic cavity is a buffer medium for fetal growth and surrounds the fetus on day 5 of incubation.

By the middle of the incubation period, the amount of fluid is around 1 ml. To infect the amniotic cavity, the fetus is used from the age of 6-10 days.

The allantois cavity collects the products formed due to metabolism. At this time, urinary salts accumulate phosphorus and nitrogen compounds. During fetal growth and development, allantois fluid undergoes an acidic reaction.

During the 9–12-day growth period of the fetus, the allantois cavity has a maximum size, so infection of the allantois cavity is carried out during the 9–11-day incubation period.

The cortex of the chorionic villus is rich in blood vessels and is located close to the inside of the surface of the ovary with holes. This acts as a respiratory organ in the fetus, ensuring that the fetal body is saturated with oxygen. 11-13 days is the maximum developed time of the PILL .

Infection of the bark of the chorioniclantois is carried out on days 10–12 of incubation.

**PREPARATION OF CHICKEN EMBRYOS FOR VIRUS TRANSMISSION**

The fetus is brought from the incubator room, without cooling on the way. In the laboratory, the fetus is incubated in a thermostat at 37 °C and humidity 60-70%. Water is placed in wide-mouthed containers on the thermostat to ensure a constant supply of moisture.

The ventilation holes of the thermostat must be open. The fetus is placed on special tripods with the air chamber facing upwards.

During the day and night before infection, the fetus must adapt to the newly brought conditions and return to normal functions after the stress of transport.

If the laboratory has a personal incubator, the hen is considered suitable for laying eggs for 10 days after laying.

Before infecting the chicken embryo, the part of the ovary that is examined under an ovoscope is disinfected and a suitable place to work is also selected.

Adequate light source is needed to look at the ovoscope, and in the unlit part of the egg, the shadow of the internal structure is visible (Fig. 22).

The room is darkened for viewing on an ovoscope. In this case, from the top of the egg shell with a graphite pencil mark the location of the fetus in the air chamber and a place of 0.5 x 0.5 cm, which is less than the blood vessels.

This is a sign indicating the location of the virus when sending protective material.

When viewed on an ovoscope, the fetus is determined to be alive or dead. THE capillaries are filled with blood and the fetus in active movement is alive.

Chicken fetuses are infected with the virus in the most convenient boxes under aseptic conditions. In the anterior chamber of the box, the fetus is treated with alcohol with iodine, and in the box, it is rubbed again.

The enameled cuvette is covered with 3-4 layers of gauze and the disinfectant is soaked in this gauze.

Sterilized instruments are used as a result of boiling during operation. If the instruments are to be reused, the alcohol is heated in a lamp flame.

**Methods of virus transmission for experiments on chicken embryos**

Six different methods of viral infection of the fetus mumkin.Eng frequently used methods of infection by leaders of the allantois and xorionallantois peels, less the trunk of a fetus in the amnion of the vacuum and the yellow bag, and LOWER the blood vessels infected.

The choice of method of infection depends on the tropism of the virus and the intended purpose of the infection.

0.1-0.2ml of infectious material is also transmitted when infected by any method.

**Infection of the allantois cavity virus** .

When infected with this method, the viruses of influenza, Newcastle disease, equine rhinopneumonia, vesicular stomatitis and other diseases multiply well. There are several options for this method.It is fixed in a vertical position with the impermeable part of the fetus facing upwards. On the lying side of the egg, in some cases on the opposite side of the fetus, a hole 1 mm in diameter is opened 5-6 mm above the border of the air chamber. The needle is inserted at a depth of 10-12mm parallel to the long axis (Fig. 23).

**Viral infection of the allantois cavity of a chicken etus**

After injecting the myrrh preservative, the needle is pulled out and the resulting hole is filled with dissolved drops of paraffin. Another option is to punch a hole in the air chamber and let air out of that hole.

For infection, a small portion of the blood vessel in the chorionic villus membrane is selectively perforated by the fetus. The needle is no more than 2-3mm

0.1-0.2ml of infectious fluid is injected at a depth and the hole is closed with paraffin (Fig. 27).

**Infection of the chorionic villus.**

Infection of chicken embryos in this method is used in the cultivation of epitheliotropic and pantropic viruses, smallpox, infectious diseases of poultry, catarrhal fever viruses in sheep. The loading can be done by natural or artificial air chamber.

When transmitted through the natural air chamber, the impenetrable part of the fetus is mounted vertically upwards, and a round window with a diameter of 15-20 mm is cut against the center of the air chamber. Using tweezers, the underside of the shell is removed through this window .

A 0.2 mm virus-retaining suspension is injected into the opening of the chorionic villus (Fig. 24). The hole is closed with adhesive tape or closed glass and reinforced with melted paraffin.

**Infection through an artificial air chamber.**

In most cases, it is used in the first place, because in this case the virus-containing maternal PILL is accompanied by a large surface area, which leads to the formation of more viruses.

In this method, the fetus is placed in a horizontal position with the fetus facing upwards on the tripod for infection. Two holes are drilled in the egg shell, the first from the center of the air chamber (designed to suck air), the second from the side of the side where there is a fetus with a diameter of 0.2-0.5 cm.

Qiyinchilgi of this method is that the preparation of the second hole, first of all, is distinguished by a slow pit a slice, then slowly LOWER THAN injured peel the shell will be underground and open from the air.

The air in the air chamber cavity is then sucked out using a rubber suction cup (Fig. 25).

Infectious fluid is introduced into the surface of the XAP through a hole in the side and the hole is closed with a piece of adhesive tape. With no need to close the first hole, the subcutaneous cortex is not injured when infected in this way, but acts as a barrier and prevents the fall of microflora in the external environment. In this method, the virus is placed in an infected fetus for incubation in a horizontal position with the hole facing upwards

**Infection of the yellow sac virus**

This method is widely used in the cultivation of chlamydia, Marek's disease, rhinopneumonia of horses, catarrhal fever of sheep and other viruses.

Viral fever of the reef valley is transmitted to fetuses aged 5-7 days, in some cases 2-3 days. Two variants of infection are used.

**1-variant.**

The embryos are mounted vertically on a tripod. A needle is inserted into the fetus on the opposite side at an angle of 45 $^{0\ \text{to the}}$ vertical axis to a depth of 3.5-4 cm by piercing the hole in the center of the air chamber (Fig. 26).

**2-variant.**

In the manner described above, the fetus is infected by placing it horizontally on a tripod; in which the fetus is located at the bottom and the yellow sac is on top of it. The hole in the egg shell is covered with melted paraffin.

**Infection of the virus into the amniotic cavity.**

Fetuses aged 6-10 days are used for this purpose. This method is used in the cultivation of influenza virus nyukasl disease, equine rhinopneumonia and other diseases virus.

**There are two ways of infection.**

**Closed method.** Infection is performed in a darkened box. The egg is placed horizontally on the ovoscope with the fetus facing up.

From the top of the air chamber, a needle is inserted vertically into the fetus through a hole in the egg shell (Fig. 27).

The entry of a needle into the amnion can be detected by the movement of the fetal body in the direction of the needle movement.

**Open method.** A hole 1.5-2.5 cm in diameter is cut in the hole above the air chamber. This test

the subcutaneous shell is separated using tweezers through the hiccup.Then the XAP is pressed on the fetal side using 14 cm long tweezers. As a result of pressing with tweezers, the amniotic membrane is squeezed and pulled together towards the hole opened together with the XAP. Holding the tweezers in the left hand, the amniotic sac is pulled and the virus-protective material is injected (Fig. 28).

The cortex is then released, the opening hole is closed with adhesive tape, and the fetus is placed in an incubation in a vertical position. The methods described above are widely used in laboratory practice.

Viral infection of the fetal body and XAP blood vessels is rarely used in practice.

**Infection of the fetus with the virus.**

Fetuses aged 7–12 days are used for infection. Two variants of this method are known.

1-variant. It is performed in the same way as the amnion is infected in a closed manner. Although with some differences, a sharp needle is removed and inserted according to the indication of the ovoscope.

The fact that the needle has entered the fetus can be detected by the movement of the fetus in accordance with the movement of the needle.

2-variant. It is performed in an open manner as if infected with an amnion, through which the body of the fetus is pulled using tweezers. The material is transmitted to the brain and certain parts of the body. Non-specific fetal mortality is higher when infected by this method.

Infection of the virus into the blood vessels of the chorionic villus.

Large blood vessels are identified by looking at an 11-13 day old fetus on an ovoscope. When 1-2 drops of alcohol are dropped on the egg shell in the direction of the blood vessels, the egg shell becomes clear.

In the ovoscope, a needle is inserted into a blood vessel under visual control, and when you move the needle to the side, the vein also moves, indicating that the needle has entered the vein.

The open part of the subcutaneous shell is covered with adhesive tape. The material can also be sent into the vein in a number of different ways: the egg shell above the air chamber is cut, the shell under the shell is softened with alcohol, and the visible XAP material is sent. The hole is closed with a piece of sterile adhesive plaster.

While the methods of infecting a chicken fetus for experimentation are not unique, there are several options for it.

Prior to incubation, other information is recorded on the egg shell with a graphite pen, in which way, if necessary, the virus is infected.

Fetal fetuses infected with the virus are then placed in a thermostat for incubation. Then the process of reproduction of infected viruses begins and begins to accumulate in the corresponding structures.

The incubation temperature of fetuses ranges from 33 °C to 38 °C, depending on the nature of the infected virus. With the help of an ovoscope, the fetuses are always monitored and the dead ones are removed.

Fetal death within the first 24 hours of infection occurs due to the proliferation of fungi, the bacterial microflora that accompanies inoculation, or injury from infection. In this case, death is not considered specific. The fact that the fetus dies long after the virus has been infected indicates that it died as the virus grew.

As soon as the fetus is seen dead, it is placed in a refrigerator with a temperature of 4 °C.

Such conditions, firstly, help to maintain the activity of the virus accumulated in the fetus, on the other hand, it hardens the tissues, makes it easier for the blood vessels to bleed and then open the fetus.

Embryos are incubated until viruses accumulate to their maximum. For each virus, this period ranges from 2 days to 7–8 days, with 2–3 days for the H-strain of Newcastle disease and 5 days for the B-strain. All fetuses are then killed and exposed to cooling at 4 °C for 3-4 hours .

**Signs of viral replication in chicken embryos.**

The fact that the fetus is infected with the virus indicates that each virus will die within a reasonable time. Another sign that the virus is multiplying is the appearance of pathological changes in all structures of the fetus.

XAP is the presence of tumors, bleeding, the appearance of nodules (blisters). Chicken
infection of the fetus with avian influenza virus, avian infectious laryngotracheitis, Aueski disease, and other viruses leads to the appearance of such lesions (Fig. 29). The shape of the flowers is visibly different from the growth of different types of viruses. The fetus itself shows the phenomenon of stunted growth more than those that are not infected.

All areas of the fetal body are characterized by varying degrees of dehydration or waxing, with twisting of the neck. The above symptoms are similar to those of infectious bronchitis in birds (Fig. 30). The skin of the fetus is red and bleeding (Fig.31). There are also signs of the virus multiplying in the internal organs.

Fetal growth and waxing in virus-infected chicken embryos. Above is an uninfected fetus of the same age (according to Mairu et al.).

If the liver is yellowish green or dark green in the chicken embryo, it is a sign that the duck hepatitis virus is growing. Virus neukasl disease in strain $B_1$ does not kill the fetus by growing in the chicken embryo and does not cause pathological changes. Such viruses can be found only by their ability to agglutinate erythrocytes using the hemagglutination reaction (HAR).

The phenomenon of hemagglutination occurs due to the addition of a suspension of hemagglutination viruses to the composition of erythrocytes. Hemagglutination properties are possessed by viruses that have receptors on the surface of their virions and that bind to receptors in the shell of erythrocytes.

Such virions can be adsorbed on the surface of erythrocytes. Because one virion is adsorbed on two erythrocytes at the same time, the adsorbed virion acts as a bridge between the two erythrocytes.

The formation of such bridges in the interstitial space of most erythrocytes results in the adhesion of erythrocytes and the formation of a ruptured mass.

The formation of a lumpy mass can be seen with the naked eye. To do this, one drop of washed erythrocytes is added to the virus suspension on the glass of the essel and mixedAs a result of mixing the virus and erythrocyte suspension, the erythrocytes in the solution precipitate in a single layer, and an umbrella-like shape appears at the bottom.

GAR is used to detect and titrate the virus.

The formation of a lumpy mass from erythrocytes is formed by mixing a mixture of erythrocytes in a drop of virus-containing fluid within 5-10 minutes (Fig. 32).

Positive hemagglutination not only indicates the presence of the virus, but also serves as an aid in diagnosis due to the fact that its hemagglutination activity is carried out by erythrocytes of a particular species. At the time of fetal opening, there are usually no signs that the virus has multiplied, but the virus is present in the material being examined. Such a passage is called a "blind" passage, as mentioned above.

**Obtaining virus-containing material by opening the chicken embryo.**

The purpose of opening chicken embryos is to know if the virus has multiplied and to obtain virus-retaining material. Opening the fetus to obtain virus-protective material follows the rules of asepsis.

To determine which virus is infected in the fetus, attention is paid to the tropism of the virus in the fetal structures. Virus-protective material serves as XAP, fetal tissue, yellow sac walls, and allantois and amniotic fluid.

It is very convenient to isolate the virus from the amniotic fluid because allantois, amniotic fluid is a ready-made virus suspension. Before opening the shell of the embryonic egg is treated with alcohol with iodine, in some cases it is possible to fill.

Opening is performed in a sterile box, using a sterile instrument and container. The egg shell on the air chamber is cut from the infected area. Such an egg is held at an angle and is not allowed to fall into the inside of the shell. The shears should be cut above the upper limit of the air chamber so that the shears do not damage the shell under the air chamber. Opened XAP is examined using tweezers to detect pathological changes. Significant changes are observed in the infected part of the XAP virus-protective material. For careful inspection, a portion of the XAP is lifted using tweezers and the changed area is cut using scissors.

For HAP observation, the embryo is separated from the yolk sac, protein, and the chorionic villus shell is removed from the inside of the egg shell and placed in a Petri dish filled with saline.

After shaking the shell, it is flattened using two tweezers and a one-sided spread is observed. A black paper is placed under the Petri dish for a clear view of the pathological changes in the cortex.

A volume of 10 ml of allantois fluid is aspirated using a pipette after the peritoneal cortex is punctured by the XAP on the fetal body (Fig. 33).

Sending the pipette in this case prevents the yellow sac wall from being accidentally punctured and mixing with the removable allantois fluid.

Up to 1ml of amniotic fluid can be absorbed. To do this, after removing the allantois fluid, a pipette is inserted into the head of the fetal body, i.e., under the neck and into the amniotic space (Fig. 34). In order to obtain the yellow bag wall as a virus-retaining material, after the yellow bag is removed on the Petri dish, the wall is cut with scissors and cleaned by washing it with saline solution from the contents. The fetus is removed from the neck by tweezers (Fig. 35).

Chicken embryos are cultured in GPSh, GPA, GPJSh, Saburo media for bacteriological control of virus-containing material during exposure. Virus protection material is stored at a temperature of minus 25 $^{0}$C and below.

Homework

1. Preparation of chicken embryos for viral infection.
2. Infection of chicken embryos with Newcastle disease and chickenpox virus of pigeons, chickens.
3. Opening infected chicken embryos, obtaining XAP and allantois fluid.
4. Taking GAR drops from Allantois fluid.
5. Count the XAP flowers and draw a picture.

**Provide training material**

9-11 day old chicken embryos; B $_{1}$-shtammdagi n'yukasl disease virus; The pigeon virus of pigeons in the New Jersey strain; ovoscopes; Enameled and gauze napkin cuvettes 24-36 cm in size; tripod for test tubes; fetal fixation tripod; alcohol and gas burners; cotton swabs made of rubber, alcohol with iodine; paper-wrapped and sterilized cotton swabs, test tubes with rubber stoppers; Petri dish; 2-5 ml pipettes; sterilizer in combination with sterile instruments (1 ml syringes, anatomical tweezers, punches, needles for infection, scissors used for the eye); saline solution; disinfectant solution; 5% erythrocytes of chicken; glass or ceramic tile for drop GAR; gauze face masks; 10x10Cm black papers; medical leukoplasty; diagram showing chicken embryos and methods of infection.

**Approximate lesson plan (4 hours)**

*Lesson I*

1. Questions to check.
2. Teacher's explanation.
3. Demonstration: a) organization of the workplace; b) ovoscopic examination and disinfection of chicken embryos; c) demonstrate all methods of transmission in chicken embryos; d) show its structure in the opened chicken embryo.

4. Independent work of students: a) viewing three chicken embryos on an ovoscope; b) disinfection of these chicken embryos; c) preparation of special clothing and workplace for the transmission of the fetus; d) practicing infection by all means in a single chicken fetus; e) infection of the allantois cavity of a 9-day-old chicken fetus with strain $B_1$, or H of Newcastle disease ; f) infecting and recording the 11-day-old chicken embryo with the XAP chicken pox virus through an artificially opened air chamber; g) placing the infected chicken embryo in a thermostat for incubation.

5. Complete the lesson.

6. Assignment for the next lesson.

**II. Training (after 5-7 days)**

1. Questions to check.

2. Teacher's explanation.

3. Demonstration: a) viewing a dead fetus on an ovoscope; b) the organization of the workplace for the opening of the fetus; c) opening the embryo of an infected chicken and obtaining virus-containing material; d) signs of viral replication in the chicken fetus, pathological changes, GAR drop; e) demonstration of the method of sterilization of ceramic plates, exposed fetuses and instruments used in the treatment of the virus by boiling sterilization; f) affixing a label to the obtained virus-protective material.

4. Independent work of students: a) preparation of special clothing and workplace for the detection of infected chicken embryos in the previous lesson; b) opening the embryo of a chicken infected with Newcastle disease, absorption of allantois, amniotic fluid and instillation of GAR; c) opening the embryo of a chicken infected with the smallpox virus, separating the XAP, counting the smallpox and drawing a picture; d) preparation of instruments, fetus, vessels for disinfection.

5. Complete the lesson.

6. Assignment for the next lesson.

**Questions to check**

1. Why are chicken embryos used in virology?

2. What is the structure of a developing chicken embryo?

3. Explain the methods of transmission of the virus to chicken embryos.

4. How do you know how to indicate viruses in a chicken fetus?

5. How do you know how to get virus-resistant material from a chicken embryo?

6. Describe the hemagglutination properties of viruses and their use, as well as the mechanism of hemagglutination.

**Methodical instructions**

It is advisable to hold two sessions on this topic, the time between sessions is a few days. Because during this time, students will be able to detect infected fetuses.

When strain $B_{1\ of}$ Newcastle disease is used for infection , the virus with the maximum titer accumulates on day 5 of incubation and the fetus does not die.

As an antiviral material, 10 ml of allantois fluid can be absorbed. This liquid is clear and slightly yellow. The virus in the fluid produces large spores from erythrocytes as a result of GAR. Because the virus is a vaccine, it can be obtained

from livestock or poultry farms. In any case it is passaged in chicken embryos; $10^{-3}$, $10^{-4}$ diluted, $10^{5}$-$10^{6}$ HYUM50 quantities are used in the exercise.

To study the method of infection XAP, the pigeon virus of the pigeons, the New Jersey strain is used, which, as a result of its proliferation, does not cause fetal death, the XAP produces white flowers 2-3 mm in diameter.

Dilution of the virus in the amount of $10^{-2}$, $10^{-4}$ CHXB can be observed by enumerating the individual flowers and obtaining a good result to show if the fetus is infected.

The recommended virus is widely used for vaccine-specific prevention of smallpox in poultry.

An electric lamp is placed in the parcel box instead of an ovoscope for training, and the plywood cover is pushed aside. A slightly smaller hole is made in the lid part from the egg. Instead of such ovoscopes, a microscope illuminator can also be used.

The view on the ovoscope is carried out in a darkened room and a black curtain is installed on the windows of the room.

The student workplace is organized as follows. An enameled cuvette is placed in front of each student and a napkin soaked in 3-4 layers of disinfectant solution is placed under it. A tripod for the fetus is placed inside the cuvette and an alcohol lamp is placed closer to it. On the right side is a jar filled with iodine and sterilized utensils.

Before use, the tools removed from the jar are ignited in the flame and, after use, are placed back in the jar.

Students work in a gauze cover, and the cover is washed and sterilized after each group use. To drill a hole in the egg shell, a stainless steel drill with a diameter of 0.4-0.5 cm and a length of 9-10Cm is used. If there is no perforator, it is also possible to pierce the egg shell with a № 18-20 needle inserted into a rubber stopper used for injection.

Such needles are immersed in a jar filled with alcohol after use. It is also possible to use scissors used for sharp-edged eyes to drill a hole in the egg shell.

It is convenient to use paraffin sticks to close the hole in the egg shell: after dissolving the paraffin in a container, pour into 10 ml test tubes.

Hold the test tube in a vertical position until the paraffin solidifies. The test tube is then immersed in hot water to the top and the paraffin wand is quickly shaken onto the paper. The resulting stick is used for a long time to close the hole in the egg shell.

A stick standing on the stove is used to close the hole in the egg shell. Quick-setting paraffin in the form of drops remains on the egg.

**Topic: Signs of virus multiplication in chicken embryos Obtaining virus-retaining material.**

The fact that the fetus is infected with the virus indicates that each virus will die within a reasonable time. Another sign that the virus is multiplying is the appearance of pathological changes in all structures of the fetus.

Presence of XAP tumors, bleeding,
is the appearance of nodules (flowers). Chicken

infection of the fetus with avian influenza virus, avian infectious laryngotracheitis, Aueski disease, and other viruses leads to the appearance of such lesions (Fig. 29). The shape of the flowers is visibly different from the growth of different types of viruses. The fetus itself shows the phenomenon of stunted growth more than those that are not infected.

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The formation of such bridges in the interstitial space of most erythrocytes results in the adhesion of erythrocytes and the formation of a ruptured mass.

The formation of a lumpy mass can be seen with the naked eye. To do this, one drop of washed erythrocytes is added to the virus suspension on the glass of the vessel and mixed.

As a result of mixing the virus and erythrocyte suspension, the erythrocytes in the solution precipitate in a single layer, and an umbrella-like shape appears at the bottom.

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5. Complete the lesson.
6. Assignment for the next lesson.

**II. Training (after 5-7 days)**

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2. Teacher's explanation.
3. Demonstration: a) viewing a dead fetus on an ovoscope; b) the organization of the workplace for the opening of the fetus; c) opening the embryo of an infected chicken and obtaining virus-containing material; d) signs of viral replication in the chicken fetus, pathological changes, GAR drop; e) demonstration of the method of sterilization of ceramic plates, exposed fetuses and instruments used in the treatment of the virus by boiling sterilization; f) affixing a label to the obtained virus-protective material.
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5. Complete the lesson.

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## Questions to check

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3. Explain the methods of transmission of the virus to chicken embryos.
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The view on the ovoscope is carried out in a darkened room and a black curtain is installed on the windows of the room.

The student workplace is organized as follows. An enameled cuvette is placed in front of each student and a napkin soaked in 3-4 layers of disinfectant solution is placed under it. A tripod for the fetus is placed inside the cuvette and an alcohol lamp is placed closer to it. On the right side is a jar filled with iodine and sterilized utensils.

Before use, the tools removed from the jar are ignited in the flame and, after use, are placed back in the jar.

Students work in a gauze cover, and the cover is washed and sterilized after each group use. To drill a hole in the egg shell, a stainless steel drill with a diameter of 0.4-0.5 cm and a length of 9-10Cm is used. If there is no perforator, it is also possible to pierce the egg shell with a № 18-20 needle inserted into a rubber stopper used for injection.

Such needles are immersed in a jar filled with alcohol after use. It is also possible to use scissors used for sharp-edged eyes to drill a hole in the egg shell.

It is convenient to use paraffin sticks to close the hole in the egg shell: after dissolving the paraffin in a container, pour into 10 ml test tubes.

Hold the test tube in a vertical position until the paraffin solidifies. The test tube is then immersed in hot water to the top and the paraffin wand is quickly shaken onto the paper. The resulting stick is used for a long time to close the hole in the egg shell.

A stick standing on the stove is used to close the hole in the egg shell. Quick-setting paraffin in the form of drops remains on the egg.

## Topic: Nutrient media and solutions.

There are natural and artificial (synthetic and semi-synthetic) nutrient media that differ from each other. Natural environments consist of a mixture of saline solutions (Hanks, Erla) blood serum (human and animal), tissue (embryo) extract (chicken embryo, human embryo) cow amniotic fluid, etc. The number of each component in a mixture of different media is different. may be different. These environments are rarely used.

Nowadays, mainly artificial environments are widely used. Semi-synthetic nutrient media include enzymatic hydrolysates and various protein products:

Lactalbulin hydrolyzate, muscle enzymatic hydrolyzate, fermentative-casein yeast hydrolyzate, 5% and 2.5% solutions of hemohydrolyzate are widely used in virology practice.

The most widely used of the synthetic media are 199 and Igla media, with 199 media consisting of more than 60 components:

20 amino acids, 17 vitamins, nucleic acid components, lipid sources, 8 mineral salts and other substances. The Igla environment also contains no less than 60 components, as it contains amino acids, vitamins, carbohydrates and more.

All nutrient media and some saline solutions add a red phenol indicator (0.002%) to determine the concentration (pH) of the hydrogen ion. It does not have a toxic effect on cells and viruses in the form of the above mixture.

As a result of the decrease in pH, the medium turns yellow, which indicates that it is oxidized by metabolic products, which requires mixing of the nutrient medium. The change in pH of the solution to the alkaline side is reminiscent of red-raspberry color. When the pH is neutral (7.2 - 7.4), the color of the medium is orange-red. A 3% solution of 7.5 $NaHCO_3$ sodium bicarbonate and $CH_3COOH$ acetic acid is used to control and balance the pH in saline solutions and nutrient media .

Penicillin and streptomycin from antibiotics are added at 100 units / ml before use in the nutrient medium to kill microorganisms.

Attention is paid to sterility when extracting whey. Each series of serum associated with the cultured cell is monitored for sterility and toxicity.

To stop the growth of fungi, 100 mcg of 1 ml of the sodium salt of nystatin is added to the nutrient medium.

It is accepted to divide all food environments into two groups:

a) is used in the first days of cell growth, containing 2-10% of serum, which is cultured, ensuring cell viability.
b) The blood serum of large horned animals is a constant component of the growing nutrient medium, which is not related to cell proliferation, but provides vitality, but does not contain serum. It contains a number of substances necessary for the in vitro growth of biologically active cells. The active albumin and fetuin fractions in the serum ensure cell adhesion to the glass surface. In practice, whey from large horned animals is widely used in meat processing plants. The best way to grow a cell is with the serum of a cow's fetus.

Strict sterility should be taken into account when extracting whey. Each series of serum associated with the cultured cell is monitored for sterility and toxicity.

Solutions. Hanks and Erla solutions with the addition of various salts and glucose are widely used in the cultivation of cells by preparing them in bidistilled water.

Hanks solution: 8.0 NaCl in 1 liter of bidistilled water; 0.4 KCl; 0.1$MgSO_4 \cdot \square 7H_2O$; 0.14 $CaCl_2$; 0.06 $KH_2PO_4$; 0.06 $Na_2HPO_4$; 1.0 glucose; 0.02 phenolrot; 0.07 $NaHCO_3$ is added.

Erla solution: 6.8 NaCl in 1 liter of bidistilled water; 0.4 KCl; 0.1 $MgSO_4$; 0.2 $CaCl_2$; 0.125 $NaH_2PO_4$; 2.2$NaHCO_3$; 1.0 glucose is added.

These balanced saline solutions can be used in the preparation of all nutrient media as they maintain the pH and maintain the appropriate concentration of inorganic substances needed by the cells.

In addition, they are used to perform various functions in cultured cells (diluting the virus by washing the culture medium). Dispersing trypsin and versen solutions are used in cell growth. Trypsin solution (0.25% phosphate buffer solution) is used to separate the tissue into individual pieces, to remove the cells adhering to the glass surface.

Versen solution. Ethylenediaminetetrauxic acid (0.02% in Hanks solution) is used to separate the cell from the glass surface. All solutions are sterilized in the appropriate mode.

Vessels The quality of the vessels used to grow a cell outside the body is of great importance.

Containers should be sterile, degreased, and non-toxic. To grow the cells will need test tubes 50,100,250, 500, 1000, 1500 ml, mattresses 500, 1000, 2000 ml roller tubes, various pipettes, vials for nutrient media and solutions, tubes of different sizes, funnels.

There are many methods of processing containers, and each laboratory uses one of these methods to save money and give good results.

In the cultivation of the cell, a great deal of effort is put into the preparation and sterilization of the flasks of the vessels.

In most cases, washing dishes, improper organization of sterilization can lead to non-adhesion of the cell to the glass surface or damage to single-layer cells.

When processing dishes, it is necessary to take into account the sensitivity of the cell to toxic salts of heavy metals.

Particular attention is paid to water quality for successful work with the cell. Distilled, preferably double-distilled or ionized water with an electrical conductivity of 2-10 $^{-6}$ ohms / cm pH 6.2-6.8 is used to shake the dishes. Processing of glass containers consists of several stages:

1. The infected vessel is immersed in 2-3% NaOH solution for 5-6 hours;
2. rinse 3-4 times with water;
3. At night, 0.3-0.5% is soaked in Lotus, Losk or B soap powder;
4. The heat is thoroughly washed in a solution of "Lotus", "Losk" and using a wire brush;

Rinse with water 5.8-10 times;

The 6.0.5% HCl preservative is shaken with distilled water.

Rinse with distilled water 3 times after shaking 7.4-5 times with water;

8.dried in a drying oven;

9. In a drying cabinet (excluding rubber stopper) 180 $^{0}$C sterilized for 3-4 hours or autoclaved for 2 atm, 1.5-2 hours.

Fresh dishes are washed in warm soapy water, rinsed with water and immersed in chromium for 3 hours, washed in running water for 9 hours, washed several times in distilled water, dried and sterilized. Pre-used old dishes are treated with chromium for 1 hour.

Fresh rubber stoppers are boiled by adding 5% soda for 1 hour, then washed with hot water and boiled in distilled water for 1 hour, during which time the distilled water is replaced six times.

Used plugs are autoclaved or boiled for 1 hour. Clean with a brush several times, rinse once in distilled water after washing. It is then boiled in distilled water for 1 hour and sterilized in an autoclave after washing with 3 layers of distilled water.

Metal tools are washed in hot water with soap and then with water, and then with distilled water, in distilled water

Sterilize by boiling for 30 minutes.

When working in a sterile box, the instruments are stored in a 96 $^{0}$- ethyl alcohol beaker, and the instruments are heated in an alcohol lamp flame before use.

**Questions to check**

1. What are nutrient media?
2.Henks, 199, Gla, Igla solutions are used for what purpose?
3. What is the purpose of trypsin, Versen solutions?

## TOPIC: Cultivated cells

At present, no virology laboratory can function without a cultured cell. In laboratory animals, cultured cells have the following advantages over chicken embryos:

- Due to the virus infection in all cultured cells, it is possible to obtain a high concentration of virus-retaining material without protein ballasts;
- The infectious process can be constantly monitored;
-you can get a ready-made suspension of the virus in the form of growth fluid;

- complete sterility of the growth fluid against fungi and bacteria is maintained;

- The method of transmission is simple, it is easy to obtain virus-containing material;

-relatively cheap;

-growed cell is a convenient laboratory system for growing viruses.

The purpose of the use of cultured cells in virology: to detect viruses for the first time, to isolate them from pathological material, to prepare vaccines and diagnostics by collecting viruses, to keep virus strains in the laboratory, to neutralize the virus by titration, test object is to use as.

**A cultured cell** is a cell derived from a multicellular organism and living and **multiplying** separately outside the organism under artificial conditions. The method of cell growth has been developing successfully since the 1940s.

This was due to the discovery of antibiotics, which prevented the transmission of bacterial infection to the cultured cell.

Huang (1943) and Enders (1949) discovered that viruses cause a change in cell structure as a result of cell growth (cytopathic effect). The fact that viruses can grow in a cell and thereby induce the virus, and finally Dalbecko and Vogt (1952) proposed the trypsin method and the single-celled cell growth method. The following cultured cells are used in virology practice.

Preservation of cell culture

The three main types of cell cultures used in virology examinations — primary cultures, diploid strains, and creeping rows — often have to be conceptualized because prolonged in vitro passage can control bacterial contamination and control the cell. may cause irreversible changes.

The simplest way to conserve cultured cells is to keep them at $4^0$C for 1-6 weeks. Dry ice (minus $78^0$C) or diluted nitrogen (minus $196^0$C) has been used successfully in the storage of cell strains .

To do this, the cells are separated from the mattress and mixed in 1 ml of nutrient medium to a concentration of $10^6$. 10-40% whey and 10% purified sterile glycerin (DMSO-dimethylsulfoxide instead of glycerin) can be used as a protection.

The cell suspension is then poured into ampoules, roasted, and kept at 4 $^0$C for 1–3 h, where the cells are frozen with dry ice mixed with ethyl alcohol. The cooling rate should not exceed 1 $^0$C per minute .

After lowering the temperature to minus 25 $^0$C, the ampoules are placed on dry ice for storage.

If dry nitrogen is used for storage, then the cell ampoule is cooled to minus 70 $^0$C and then placed in liquid nitrogen.

Storage of cells in liquid nitrogen for several years does not change their proliferative activity, susceptibility to viruses. The ampoule containing the frozen cells is quickly immersed in a water bath for 1-2 minutes, shaken lightly, then after pouring the cells into a mattress, a certain amount of culture medium is added and left to grow in a thermostat at 37 $^0$C.

The nutrient medium is changed the day after cell transplantation to isolate glycerin or DMSO.

When the cells are transported, a layer grown on the mattress is poured over the cell with additional nutrient medium and then covered with a rubber stopper.

In the laboratory, the nutrient medium is poured and used as an additional nutrient medium in the growth of these cells. The cell suspension can be sent through a 4 $^0$C carrier.

In the absence of heating and freezing, 80-90% of the cells retain their viability for 7-8 days during transport.

Containers used when working with cultured cells are perfectly clean, solvents, which require the purity of the nutrient medium and high-quality water.

To successfully isolate the virus, the following rule must be followed:

1) The cell used must be sensitive to the virus under study. Sensitivity to the virus is greater if the cells are derived from young animals (embryos);

2) The transmitted virus should not be old and should not be stored for a long time. A virus population that has lost its activity stops the proliferation of virulent fragments of the virus.

The virulence of viruses is increased due to a series of passages that are carried out sequentially due to a certain dilution;

3) When the virus is transmitted to the cell, it is grown in equal proportions. $10^6$-$10^4$ $TST_{50}$ per 10mln cell is recommended for medium size;

4) Once the virus has settled in the cell and is adsorbed, it is added from the supporting medium.

Often 22-37 $^0$C occurs after 1-2 hours is highly dependent on the virus. In a single layer of cells, the virus must be transmitted evenly;

5) The optimum temperature for the multiplication of viruses is 36-38 $^0$C. The presence of the virus freely in a warm environment leads to the loss of its activity. It is advisable to obtain 75% cytopathogenic effect of the virus.

## Control questions

1. For what purposes do we use cells grown in virology?
2. What are the advantages of cultured cells over other living systems?

3. How is the preparation of the vessels used in the cultivation of cells carried out?

## Topic: **Preparation of single-layered growing cells by processing in trypsin.**

Obtaining primary trypsinized cells from the skin and muscle tissue of growing chicken embryos

9-11 day old chicken embryos are examined under an ovoscope. An egg with a well-visible, mobile fetus with blood vessels is selected. With a simple pencil, the location of the air chamber and the fetus is determined. Iodized alcohol is rubbed on the egg shell and then burned.

It is cut with sterile scissors 2-3 mm above the border of the air chamber, the parietal, chorionallantois membrane is torn, and the fetal neck is removed and placed on a sterile Petri dish (pictured).

The head, wings, legs and internal organs of the fetus are removed. The remaining skin-muscle sac is placed in a sterile jar and cut with scissors to a size of 3-4 mm.

The crushed tissue is washed 2-3 times with a Hanks solution until a clear liquid is formed from the mucus and blood elements, and after cleaning is poured into a flask for trypsinization.

A 0.15% solution of trypsin is poured into a flask heated to 35-37 $^0$C (1/3 of the ratio of tissue and trypsin) and then placed in a magnetic stirrer with a sterile magnet (Fig. 47).

Trypsinization is performed in stages, every 3-5 minutes the separated cells are poured into centrifuge solutions together with trypsin and placed on ice or in the freezer to prevent trypsin from affecting the cell. A new portion of trypsin is added to the remaining mass in the tubes, a magnetic stirrer to prevent bubbles from forming. This process is repeated 3-5 times until the tissue is completely thin.

1000 try / min after trypsin cell suspension in trypsin solution. Centrifuge for 10 minutes.

The liquid on the precipitate is mixed in a nutrient medium at 37 $^0$C and filtered through a 3-layer gauze filter. When the cells are well mixed, take 1 ml and determine the number of cells.

Success in growing cells depends in many ways on the amount planted. Even when cells are poorly planted and incubated for a long time, a single layer (monosloy) is not formed.

In a very large implanted cell, there is intensive proliferation, and the resulting layer ages rapidly, leading to non-specific degeneration.

The counting of cells is done in Goryaev's net. To 1 ml of cell mixture is added an equal amount of 0.1% crystalline violet solution prepared in 0.1 N citric acid.

When the chamber is ready, it is filled with a cell mixture, and all the cells whose nucleus and cytoplasm are not damaged are counted; a group of cells in a clear contour is counted at the expense

of a single cell. The arithmetic mean is obtained by counting the cells in the two chambers.

The number of cells (x) in 4 ml of suspension is determined by the following formula: X = (Ax2x1000): 0.9;

where A is the average number of cells in a cell;

0.9 - volume of Goryaev net, $mm^3$;

1000- $1cm^3$ da $mm^3$ soni ;

2 is the coefficient of dilute suspension in the volume of paint added.

When the cells are counted, they are diluted in the nutrient medium in this way, that is, from 700,000 to 1 million in 1ml. let the cell (for chicken fibroblasts).

For example. If 1 ml of cell suspension contains 4 million cells, then the total number of cells in 100 ml of suspension is 400 million. Planting concentration is 1ml to 1mln cells. Add 100 ml of cell suspension to 400 ml of nutrient medium.

It is then poured into mattresses or test tubes. Pour 1 ml of test tubes, 100, 40 and 15 ml of cell mixture into 1000, 250, 100 ml mattresses. Mattresses and test tubes with sterile rubber stoppers (tightly closed so that the environment does not become alkaline, and the type of culture, date is written).

A long line is drawn on the test tubes with a wax pencil, the line is placed on a special stand on a slope of $5^0$ with the upward direction and placed in a thermostat at $37^0$C. Every day, the growth process of the cell is determined on a small magnifying glass. If the cells are round, granular, without proliferation, and the cell separates from the glass in layers in black, this indicates the toxic effects of serum in the environment. The proliferating cell grows as a single-layered plastic, fused with clear, cytoplasmic tumors. During cell proliferation, the products of metabolism are released, such that the pH of the medium changes to an acidic one, turning the environment yellow. This has a detrimental effect on the cells, even causing the cell to die. Such an environment is replaced by a new one.

Chicken fibroblasts form fully monolayer cells (monosloy) in 36-48 hours. 70-120 million cells are obtained from a single chicken embryo.

Cells made from chicken fibroblasts are used to treat Aueski disease virus, avian plague, Newcastle disease, avian influenza, Raus sarcoma virus and other viruses.

Homework

1. Obtaining primary cultured cells from fibroblasts of chicken embryos.
2. To get acquainted with the method of transmission of viruses to the cultured cell.
3. To determine the multiplication of the virus in the cell by cytopathic effect.
4. Setting the hemadsorption reaction.
5. Getting acquainted with the method of toasts.

Material supply: sterilized special clothing (gowns, hats, face masks); 9-11 day old chicken embryos; ovoscopes or OI-19 lighting; a device for laying eggs; alcohol lamps; sterilizers with sterile instruments (straight and curved eye scissors, anatomical tweezers); magnetic stirrer; centrifuge; sterile centrifuge solutions; ice container; microscopes; Goryaev camera; device for placing test tubes; sterile containers (petri dish, jars, magnetic tube for trypsin; gauze filters, graduated 1, 2, 5

and 10 ml pipettes, rubber stopper tubes, 100-1500 ml mattresses, roller tubes); solutions and media (Hanks and Erla solution, 0.25% trypsin solution, 0.02% versen solution, 7.5% soda solution, bovine serum, 199 medium, Igla medium, lactalbumin hydrolysis medium) ; penicillin; streptomycin; containers with disinfectant solution; tripod for test tubes; test tubes of normal cultured cells, chicken fibroblasts (SHB, BT), intertwined tissue cultures - L (PPT or Hep-2) and viruses (Newcastle disease, YU RT, Pg-3); 0.5% of erythrocytes - suspension or guinea pig; virus protection material; mattresses with plaque; primary cultured cells and interstitial tissue cultures showing SPT of various forms in the norm and micropreparations prepared from them; tables and slides.

Approximate lesson plan (6 hours)

Session 1 (2 hours).

1. Control questions.

2. Teacher's explanation.

3. Demonstration: a) from solutions: Hanks, Erla, trypsin, versen; b) from nutrient media: 199, Igla, hydrolyzate of lactalbumin; c) vessels used for cell growth.

4. Independent work of students: a) viewing of primary and intertwined growing cell culture under a microscope (living cell culture and fixed micropreparations); b) draw a picture of the drugs seen in the notebook.

Lesson 2 (2 hours)

1.The teacher explains the method of trypsinization of chicken embryos.

2. The teacher demonstrates each stage of trypsinization.

3. Independent work of students: a) preparation of the workplace for trypsinization; b) preparation of chicken embryos for trypsinization; c) After trypsin, take the required concentration from the cell suspension and pour into solutions.

Lesson 3 (2 hours)

1. The teacher's explanation: a) the method of transmission of the virus to the cultured cells; b) methods of indicating viruses in the cultured cell.

2. Demonstration: a) method of infection in the cultured cell; b) GADR placement method; c) basic forms of SPT (speed, slide, drug); d) on mattresses with rash.

3. Independent work of students:

a) viewing and drawing under the microscope of normal primary and intertwined cell cultures (living cells and fixed micropreparations);

b) study the SPT form of various viruses (virus-infected cultured cells and micropreparations) and draw;

c) placement of GADR for the purpose of indicating the virus.

4. Completion of the lesson.

5. Assignment for the next lesson.

**Control questions**

1. Talk about the types of cells grown and describe them.

2. What solutions and nutrient media are used in cell growth?

3. What is the method of obtaining primary-trypsinized, cultured cell?

4. How is a cultured cell used in virology?

5. What is the method of transmitting the virus to the cultured cell?

6. How do you know how to indicate a virus in a cultured cell?

7. Compared to other laboratory systems, what are the advantages of a grown cell.

**Methodical instructions**

It is advisable to divide the time allocated for training as follows. In the first 4 hours, the teacher explains, after the demonstration, students work independently on trypsinization of the chicken fetus. Divide into 2-4 groups depending on the number of materials available in the department to perform trypsinization. The most important preparation for this exercise is to provide a sterilized container, instrument, medium, and solution, which must be prepared in advance. The last 2 hours are devoted to the indication of the virus in the cultured cell.

a) normal cells made from chicken fibroblasts and Newcastle disease vaccine virus-infected or normally cultured cells of SHB or MDVK, including those infected with PG-3 vaccine virus, should be prepared in advance;

b) cultured cell micropreparations should be fixed, stained normally, and in various SPT and GADR forms.

If there are no conditions for permanent extraction of the cultured cell, then fixed drugs can be prepared. To do this, it is necessary to remove a cell previously grown (from SHB or any intertwined growing cell lines) in an average of 100 test tubes. Drain the medium from a well-grown single-layer cell in 50 test tubes, wash with a solution of Hanks, pour 70 $^{0}$ alcohol. The cultured cell in the remaining 50 test tubes is infected with the virus you want to show SPT.

The virus is stored in infected test tubes for several months and is used by students to study normal SPT and NR virus titration. If it is not possible to provide the training with all the necessary things, then some parts can be simplified:

1) if it is not possible to provide students with a robe, hat, face mask, it is allowed to work in the classroom in non-sterile gowns, but it is required to follow the rules of asepsis during work;

2) in the absence of a magnetic stirrer, the tissue mixture with trypsin added can also be shaken by hand;

3) in the absence of trypsin is pipetted several times to separate the fetal tissue into individual cells;

4) For cultured cells in the absence of standard nutrient media, Erla or Hanks solution from natural nutrient media is used by adding serum and fetal extract.

5) In the absence of Erla and Hanks solutions, Tirode and (even 0.85% if necessary) sodium chloride solution can be prepared and used. The most important tools for obtaining primary cultured cells are that the containers and materials must be completely sterile, as well as sterile storage during use.

The main time in the training is spent on the preparation of the cultured cell, so at least 2 hours should be allocated for this training.

**Topic: Infection of tissues with viruses.**

The method of cultivation is as follows:

1) selection of the cultured cell;
2) obtaining virus-protective material;
3) preparation for infection;
4) infection of the virus-containing material in the cell;
5) growth of viruses in the cell;
6) indication of the virus in the cultured cell;
7) Identify the virus by collecting growth fluid

Growing Cell Selection - Different cells are not susceptible to any virus. The adaptation of viruses to primary cultured cells is successful if they are made from an animal organ that is sensitive to this virus. However, the adaptation of viruses to invading cells is complex and in most cases does not take place. To date, some viruses have been unable to use cultured cells to grow.

Young cells are used to grow the virus, and in some cases (in pig parvoviruses) from the first day, the virus is transmitted during cell transplantation because the viruses also begin to multiply effectively in the dividing cell.

**Cell infected** belong to a layer of cells formed by the tube, depending on the mattress microscopically small kattalashtirgichida taken, will be selected. The culture medium is infused and then washed 1-2 times with a Hanks solution to separate the cell from serum antibodies and inhibitors.

0.1-0.2 ml of antiviral material is poured into each test tube and spread evenly on the cell surface. In this case, the test tubes are left on the mattress for 1-2 hours at 22-37 $^0$C to adsorb the virus on the cell surface.

The virus-containing material is then poured from a test tube, mattress, and 1-2 ml of the support medium into the test tubes at a rate of 10% of the mattress volume. In the isolation of the virus from the pathological material, some samples (fecal, etc.) can be toxic to the cell, so after the virus is absorbed into one layer, it is washed 1-2 times with a solution of Hanks, and then the supporting medium poured.

**Growing viruses -** Tubes, mattresses are tightly closed with a rubber stopper and placed in a thermostat at 37 $^0$C for incubation .

Incubation of viruses in the hospital is now widely used. Under such conditions, the mattresses are placed in a horizontal position, the test tubes should be laid at an angle of 5 $^0$and the cell should stand at the bottom of the monolayer nutrient medium.

In a number of laboratories, the virus-infected cells are incubated in a rotating Roller system. Due to the use of such an inpatient method, the virus can be obtained in large quantities by growing at high titers. Each sample of material will require 4–10 test-grown culture cells.

For control, uninfected cells are left in 4-6 test tubes and replaced with a medium that supports their culture medium.

Although the nutrient medium of virus-infected cells cannot be replaced for 7 days, the nutrient medium can be maintained using a 7.5% sodium bicarbonate solution with a pH (6.9–7.4).

Adenoviruses are replaced by a nutrient medium due to the long-term growth of infected cells.

All test tubes are examined every day after the virus has been infected in the cells in the mattress, and the cells under the control of the virus are examined under a microscope to compare the cell.

At the thermostat, virus particles adsorbed into the cell begin to reproduce as a result of their entry into the cell.

New virus fragments formed inside the cell are completely or partially isolated from the cell. It then enters uninjured new cells, reproduces there, and infects them as well. This condition continues until no undamaged cell remains.

In this process, the cells in the test tube, the mattress are infected with the virus. But we cannot say that absolutely all cells are infected with the virus.

Viruses accumulate in the growth fluid, and some virions may remain inside the cell where the virus has not been damaged.

To separate the virus from the rest of the cell, the cell is frozen several times 2-3 times and then isolated by thawing or using ultrasound.

**Questions to check**

1. How to infect viruses in the tissues of the mattress?
2. What is an indicator added to the nutrient medium?
3. What does the change in color of the environment indicate?
4. What should be the pH of the nutrient medium?

## Topic: Cultivated cells and their types

Primary - cells treated with trypsin

They are cells that grow in a single layer derived from an organ or tissue. Cultured cells can be made from any animal or human organ or tissue (embryo). When made from as much fetal tissue or organs as possible, the growth potential of the cells is strong. Therefore, it is most often used to remove the kidneys, lungs, skin, thymus, testicles of the fetus from young animals. In order to obtain a primary cell, 2-3 hours after slaughtering a healthy animal, the appropriate organ and tissue are removed, crushed to a size of 1-4 mm and treated with trypsin, pancreatin, collagenase enzymes.

Enzymes break down substances in the intercellular space and isolate cells. Individual cells are placed in a nutrient medium and incubated at 37 °C. The cells begin to divide by sticking to the test tube and mattress walls.

The period of cell growth consists of several phases: adaptation, logarithmic growth in the stationary, and death due to cell aging. During cell growth, it stops dividing as a result of contact with each other after covering the entire presence of the glass. A layer the thickness of a cell is formed inside the vessel, which is called a single-layer growth. (Figures 36-38).

The nutrient medium is replaced, taking into account the contamination of the cell with the products it secretes during its life. A single layer of growth maintains its viability for 7-21 days. Young cultured cells are used to grow viruses.

*Subcultures* - In virology practice, primary cells are isolated from the glass wall of grown mattresses using trypsin and versen and re-diluted in a nutrient

medium and transplanted into other mattresses or test tubes. Within 2-3 days, a single layer of cells is formed.

In practice, subcultures are obtained from primary cultured cells. Subcultures are not inferior to primary cultures in terms of susceptibility to viruses, in addition they are economical and can contaminate cells with the virus. Sub-cultures are obtained after 2–5 passages and in some cases after 8–10 passages.

Subsequent passage may result in a change in the shape of the cell and then death. The cultured cells are in the transition phase to the intertwined growth tissue after 10 passages.

2. Tissue-growing tissue cultures - These cells have the ability to multiply outside the body for long periods of time.

Tissue cultures are produced from primary cultured cells that have high activity in growth and have been transplanted for a long time in a certain order. The mechanism of origin of interstitial tissue cultures in a new cell line is explained as a result of genetic modification of the cell or in the selection of individual cells - a cell that is present in the original prepared cell.

The connective tissue is in the same shape, and some of the growths even have oncogenic activity. The ability of connective tissue to have oncogenic activity limits the ability of viruses to grow and produce vaccines.

Tissue-growing tissue cells can be made from healthy animal tissue or malignant tumor tissue. The following rows of cells are widely used:

Hela - (from the cervical cell of the female uterus, in cancer);

Hep - 2 (in human red right cartilage) (Fig. 39);

KB - (in cancer of the oral cavity);

BNK - 21 (in the kidneys of newborn hamsters);

PPES - the growing kidney of a pig embryo (perevivaemaya pochka embryo swine);

PPT (perevivaemaya kidney telënka) - creeping pig kidney;

PPO (perevivaemaya pochka ovets) - a creeping sheep kidney;

TR (iz slizistoy trachei korov) - mucus of the cow's trachea;

L (mishinie fibroblasts) - mouse fibroblasts;

COS (trace serdsa obese sinomolgus) - sinomolgus from the heart of a monkey and others.

Cross-growing vaccine cells have a number of advantages:

Their preparation is almost simple, saving labor and material resources;

These cultures can be pre-tested for the presence of a latent virus or microflora;

Clone lines provide standard conditions for growth, while primary cells have a mixed population of cells.

Compared to primary cultures, most squamous cells are sensitive to a wide range of viruses. However, regardless of the origin of the tumor cells and the reduced susceptibility to viruses, it is necessary to use the tumor cells in the line of malignant tumors.

Crystal growth cells are maintained at all times due to replanting. In most cases, the centrifuge method is used.

The next transplant is covered with a 0.02% - versen solution, heated to 35–37 $^{0}$C , after pouring the nutrient medium to obtain a good layer of culture for 2–3 days .

Versen dispersion effect $Mg^{++}$, $Ca^{++}$ divalent cations improve cell adhesion to glass and ensure cell integrity.

Under the influence of Versen, the cells begin to round out and separate from the glass wall. 10-15 minutes after the cell is rounded, the versen is poured, 10-15 ml is left in a 1 liter mattress, 2-3 ml in 0.1 liter, and shaken periodically for 5-10 minutes, then a little the amount of nutrients is filled from the environment.

Once the cell is mixed in the nutrient medium, it is counted in the Goryaev net. 1 ml of 80-200 thousand cells is mixed with the nutrient medium, poured into test tubes and mattresses, covered with a rubber stopper, then placed in a thermostat at 37 $^{0}$C for 3-4 days to grow until a single layer of cells is formed. .

In most cases, the Goryaev network is planted in a ratio of 1: 2, 1: 6 without counting the cells, in which case the type of cell is taken into account.

The composition of the nutrient medium depends on the type of cell, and Igla medium, 199, or the hydrolyzate lactalbumin is often used to grow the squamous cell.

In order to replant the growing cells in an orderly manner, a mattress is always kept in the laboratory, and the cell is transplanted from this mattress if the previous planting was unsuitable.

3.Diploid cell culture - The International Committee on Cell Culture defines diploid cells as follows - the cell population is morphologically identical in vitro - adapted to the growth process, has limited viability, three-phase growth, karyotype as a result of passage preservatives are cells that are free of tissue-like contaminants and do not have tumorogenic activity when transplanted in hamsters.

Diploid cell culture is also derived from a primary cultured cell, as are cells that grow by intertwining. The cell karyotype is very labile and changes from day one when grown in normal methods. Therefore, the use of special methods in tissue processing is required.

In the diploid state, high-quality nutrient media are used to maintain the cell in vitro for a long time.

This task was first successfully solved by American scientists Heiflik and Murched (1961). Diploid cells (lungs, kidneys, skin and muscle tissue, heart, etc.) are derived from various tissues of the human embryo and are made from the kidneys of large-horned animals, pigs, kidneys of BHK-21 hamsters, etc. .

The difference between diploid cells and squamous cells is that they have limited passage.

The maximum number of passages is 50 ± 10, then the number of dividing cells decreases sharply and then dies.

However, diploid cells can be used for a long time because the cells in each passage are partially frozen to minus 196 $^{0}$C and can be regenerated if necessary. Diploid cells have an advantage over overgrown and primary cells:

Even when changing the nutrient medium, they retain their viability for 10-12 days;

Once a week, the nutrient medium is renewed, maintaining a state of viability for up to 4 weeks; it is suitable for long-term growth of viruses whose susceptibility to this tissue has been preserved.

Suspended cell culture.

In 1953, Owens and his staff demonstrated the free proliferation properties of a cell in a suspended state.

In recent years, this method has been improved several times: modern devices with perfectly defined parameters (temperature, pH, rate of change) have been invented. .

The cultivation of viruses in suspension cultures has proven that vaccines and diagnostics can be prepared in the manufacturing industry.

But only creeping cells grow well in suspension. Cell growth in suspension is a new direction (cefadex, silica gel, cytos, etc.) began to use micro-carriers. Cells grown in microtubes (monosloy) form a single layer.

Thus, in the method of suspension cultivation is carried out by sticking to a solid substrate: primary, subculture, diploid cells.

It is accepted to call such cells superficially dependent.

The method of cultivation in microtransmitters is now very popular and is a major direction in the production of cells, biotechnology, vaccines or other biologically active substances (interferon, hormones, etc.).

**Control questions**

1. Talk about the types of cells grown and describe them.
2. How many days is the life cycle of cultured cells and what factors does it depend on?
3. Under what conditions are cultured cell cultures stored

**Topic: Evaluation of cytopathic effects by indicating viruses.**

There are the following main ways to indicate the virus in a cultured cell:

By cytopathic effect or cytopathic effect (SPE, SPT); On GADR positive;

On the formation of rash (plaque);

Encounter intracellular inclusions; Virus imaging using IFR immunofluorescence reaction; see the interference of viruses;

Subjugation of cell metalbolism (color pattern);

On the electron microscope and others.

SPT. The multiplication of the virus in cultured cells is often determined by the cytopathic effect or cytopathic effect.

SPT refers to any change that occurs due to the multiplication of viruses in a cultured cell.

Physiologically, it is much more difficult to detect changes in a cell, and it is much easier to detect morphological changes. To do this, the microscope is viewed on the instrument table, the test tube, the upward-facing cell surface on the mattress in a small magnifying glass (lens 8-10, eyepiece 7-10).

It is advisable to compare the virus in the solution with the infected cell. The occurrence of any change in the cell in a test tube infected with the virus relative to the cell in the control solution is understood to be the occurrence of SPT.

This difference includes the appearance as a result of occupying the cell on the entire surface or in the form of small foci on the normal cell surface.

SPT-intensity is characterized by which part of the cell layer is altered by viruses.

SPT does not have a commonly used grading system and is often graded with marks or points. In a test tube, a single layer of mattress on the mattress is applied to the controlled change of the SPT to four targets, if 3/4 to three targets. If 1/2 is rated for two goals, 1/4 is rated for one goal. But this is a conditional assessment.

The SPT-form depends on the biological properties of the virus, the type of cell, the amount of infection, the growing conditions. Some viruses (enteroviruses) produce SPT 2-3 days after infection, while adenoviruses produce SPT 1-2 weeks later.

A number of authors have attempted to group SPT-like forms. Some turned out to be 23 shapes, others 11, and still others 5 shapes.

SPT consists of three forms for radical differentiation: cell fragmentation, cell rounding, and simplast formation (Figure 40-41).

*.Cytopathic effect of adenoviruses of large horned animals on the cell prepared from the testicle of the bull*

*The cytopathic effect of the virus that causes smallpox in sheep on cells prepared from the lungs of a sheep fetus*

Fragmentation is the separation of cells from the glass wall as a result of the fragmentation of the cells into the growth fluid, like cell detritus (vesicular stomatitis virus).

Rounding - as a result of the loss of the cell's ability to adhere to the glass wall, the cell has a spherical shape on the glass wall, floats freely on the surface of the growth fluid due to separate separation of the glass and then dies (enteroviruses, adenoviruses, etc.).

Simplast formation - as a result of the melting of the cell membrane, the adjacent cell cytoplasms merge to form a single whole, in which case the cell nucleus is located on one side.

The formation of such a multinucleated cytoplasmic mass (giant multinucleate) is called simplast.

Their appearance can be explained in two ways: the action of viruses disrupts the process of cell division, in some cases due to the retention of the enzyme lecithinase in the cytoplasm adjacent to the cell membrane.

In the cell, SPT is widely used to indicate most viruses in cultured cells.

However, some viruses do not reproduce in cultured cells and do not show SPT, such as rabies virus, swine fever virus, and viruses that cause diarrhea in large horned animals. As the cells survive, the division of the cells decreases, and over time, their shape also changes.

In the neoplastic transformation of damaged cells, solid white foci of various sizes (in Raus sarcoma virus) are formed in a single layer of cell. The absence of an SPT in the first passage does not indicate the absence of the virus, as the virus does

not show a visible SPT because it does not develop rapidly. Therefore, a "blind" passage is held. A "blind" passage is performed at least 3 times to determine the presence of the virus in the test material.

GADR Hemadsorption - The adhesion of erythrocytes to the surface of a virus-infected cell was first observed by Fogel and Shelkov (1957) in a tissue culture infected with the influenza virus. It was later discovered that smallpox and smallpox virus, Newcastle disease, and mammalian and avian influenza viruses had this ability.

This reaction is very valuable in the identification of animal parainfluenza viruses ( PG -3 of large horned animals , parainfluenza of sheep, Sendai virus).

On the basis of the reaction, with the virus on the infected cell, a hemagglutination reaction takes place because the receptor of the erythrocytes is related.

The positive advantage of this reaction is that it shows a positive result before the cytopathic changes that should occur after the virus enters the cell. Erythrocytes from guinea pigs, monkeys, humans (in the o-group), and other erythrocytes are used to initiate the reaction. These erythrocytes are sensitive to the hemagglutination effect of the virus.

GADR consists of the following methods

Three to four days after infection, two test tubes with uniformly grown cells are taken, the first being infected with the virus and the second being the controller. Erythrocytes are placed on the cell in two test tubes for 5-10 minutes (lying horizontally on a table), then lightly washed with saline solution, and after washing is examined under a small magnifying glass under a microscope. In a controlled solution, the erythrocytes are completely washed using saline.

As a result of washing the cell in the infected test tube with saline solution without removing erythrocytes, and therefore sticking to the cell surface, the GADR is positive (see Figure 82).

Depending on the virus and the type of cell, the location of erythrocytes can be 3 different:

Erythrocytes are located at the periphery of the cell (African plague virus in pigs);

Erythrocytes accumulate in the cell layer (influenza virus);

Erythrocytes are diffuse (parainfluenza virus) in the cell layer.

Each virus is capable of adsorbing to erythrocytes in the blood of a particular species of animal. Viruses capable of hemagglutination of erythrocytes also have the ability to hemadorsorb.

If the virus shows SPT in the cultured cell, GADR appears earlier than SPT. This method is widely used in the indication of some cultured viruses. However, in the indication of a number of viruses (African swine fever, parainfluenza-3, etc.), no reaction can replace this reaction.

If there is no hemadsorption for 3-4 days after infection, the next test tubes are taken every 2-3 days and GADR is applied to the infected cells according to the above method.

Solutions containing the grown cell will be under observation for 14-20 days. If the hemadsorption reaction is negative in the first passage, the next passage and GADR are performed.

GADR is used to detect the presence of a virus in a cultured cell. Animal blood serum is titrated to detect antibodies and a neutralization reaction is performed.

Method of rash (plaque) formation

This method is technically very complex to see strokes and is mainly used in titrating viruses. In 1954, Dalbecko and Vogt proposed a method of obtaining rashes using the western encephalomyelitis virus of horses in the culture of chicken fibroblasts under agar. In recent years, many authors have used this method in the study of several viruses.

Examples are proteinuria, vesicular stomatitis, Newcastle disease, avian plague, polio, coxsackie, and others.

The reason for the widespread use of the rash method in virology is to obtain a pure population of the virus, mainly based on the study of the genetic characteristics of the virus. At present, Dalbekko and Vogt have simplified the preparation of rashes and developed methods for studying a variety of different viruses.

The rash method is negative colonies or rashes formed by viruses in single-layered cells, if the medium is infused and contains vital-dye neutral (see Fig. 48). Rashes are discolored areas in culture that consist of cells that have died as a result of exposure to the virus. If it is necessary to relocate the virus, starch or methylcellulose can be used instead. Some viruses cause rashes even if they are not covered with agar, for example, some representatives of the plague virus of large horned animals, smallpox, herpesvirus.

Particular attention is paid to the quality of the culture when laying the rash, the cell should be a flat growth without signs of degeneration.

It is best to use cultures grown in vials or on different types of mattresses. The virus, washed with a solution of Hanks, is placed in contact at 37-38 $^0$C (1-2 hours) and constantly shaken. The unabsorbed virus is washed off using a Hanks solution, or sucked up using a pasteurized pipette, and then a special agar coating is applied to the cell layer.

The choice of envelope depends on the type of cell and the virus.

The usual components of agar to be sealed are: agar, Erla solution ($NaHCO_3$), medium and antibiotics.

If after 30-60 minutes of solidification, if the condensate on the surface is drained of moisture, the vials are placed in a thermostat and incubated with the cell facing upwards. The incubation time and temperature should be optimal for this virus to form a rash.

Follow-up is performed for several days to see if a rash has formed. During this time, the viruses adsorbed into the cell enter the cell, undergo a reproductive cycle and then leave the cell, injuring neighboring cells.

In a whole series of living cells, islets of dead cells appear as a result of the virus multiplying. The dye solution only stains the living cell.

Therefore, flat heating on the mattress - colorless spots appear on a red background, which are called Dalbekko's negative spots or rashes (English

plack). Each rash appears according to the dead islands of cells. In cultured cells, many viruses cause rashes. When placed too tightly, the rashes will merge with each other.

The timing and shape of the rash depends on the type of virus strain, the type of cell, and the growing conditions. Dalbekko and Fogt's observations on the titration of viruses show that the number of plaques formed is directly proportional to the amount of virus transmitted. It has been proven that a single fragment of an infectious virus is sufficient for the formation of a rash.

However, this rule is clear under certain conditions, when a highly diluted virus is first injected into a culture, there is no chance of much damage to the cell.

Color Sample - A color sample was first proposed in 1954 by Solk, Yangner, and Ward in laboratory tests. The development of this method was prompted by the observations of Enders, Weller, and Robbins, who reported that the pH turned to an acidic side as a result of the metabolism of uninfected tissue culture, a condition that is due to yellowing of phenol added to the medium. In this case, the fluid in the infected tissue culture killed the living cells and retained its red color. In slow-growing cells, viruses that multiply at great speed give visible results when grown.

The color sampling method is not distinguished by its high accuracy, so it is rarely used in practice.

**View the inclusions formed inside the cell**

In most viral diseases, special compounds appear in the cell (cytoplasm and nucleus) in certain organs or tissues, which are called inclusions.

They are classified according to their location in cells, nucleic acid composition, tinctorial properties and homogeneity. Inflammatory bodies are located selectively: cytoplasmic infiltrates appear in smallpox, influenza, rabies, parainfluenza and other diseases.

In rhinotracheitis of large horned animals, laryngotracheitis of birds, adenovirus infections, etc. - inclusions are formed in the nucleus. In order to see the insertion bodies, the cells are grown in closed glasses, test tubes or penicillin vials, the test material is infected and after incubation at 37 $^{0}$C the glass is removed and washed in warm Hanks solution or saline (pH 7.0-7.2). , with one of the fixing solutions after drying on filter paper; Buen solution is fixed for 10-15 minutes, Carnua fixative -10, Senker 20-30, methyl alcohol 15 minutes or other fixatives. Then the drugs are stained.

In preparations stained with hemotoxylin-eosin stain, the virus cells are well visible. To do this, the cells fixed in the cover glass are washed with distilled water and immersed in a solution of hemotoxylin for 5-15 minutes (Mayer, Erlix, Karakki hemotoxylin) / for each grown cell and dye, the staining time is chosen empirically. The drug is then washed with water and immersed in ammonia water for 1-2 minutes (200 ml of distilled water with the addition of 2-3 drops of ammonia

In an alkaline environment, the cell nucleus is blue. The preparations are then stained in an aqueous solution of 0.1% eosin for 30-60 seconds, after the excess moisture is removed with filter paper and passed through an increasing

concentration of alcohol 70, 80, 96 (1), 96 (2), 100 $^0$+ ends with xylene (1: 1), xylene 2 and embalming.

Drugs are stored in any alcohol and xylene for up to 1 minute. When transferring the drug from one box to another, be sure to soak up excess moisture using filter paper, otherwise the alcohol in the next box will increase.

When hemotoxylin is stained with eosin, depending on the virus, the cell nucleus stains blue and the cytoplasm stains red (Fig. 42).

In influenza, the cultured cell is often stained by the Klisenko method to see the insertion bodies. To do this, the virus-infected cells are washed with heat at 37 $^0$C saline solution and fixed in Dyuboska-Brazila-Buena fluid for 20 minutes to several weeks.

Items thoroughly washed 3-4 times in distilled water are stained with 1% acridine yellow solution for 10 minutes, then thoroughly washed with distilled water, then stained again with 1% eosin solution for 30 minutes. washed with distilled water and soaked in methylene blue (1: 1000). Before using methylene blue, a 1% head (matochnaya) solution is prepared.

The stained preparations are washed with distilled water (2-3 drops of glacial acetic acid in 50ml of alcohol) and differentiated until absolutely reddish-blue in alcohol.

It is dehydrated with absolute alcohol, passed through xylene, and embalmed. The cytoplasm is stained thin-red, the nucleus is stained red-light purple, the nucleus is stained blue, and viral inclusions are stained light red. The Romonovsky-Gimza method is used to stain blood cells, bone marrow, or cells grown from lymphoid organs. In the practice of virology, a simple fluorochromization method is used to see the incoming bodies, acridine, acridine orange. (The use of the method and its essence is described in 12 topics).

Viewing the virus through an immunofluorescence reaction

The multiplication of the virus in cultured cells has a cytopathic effect, if not accompanied by hemadsorption, its presence can be seen using fluorescent antibodies. This method is widely used in the diagnosis of plague in pigs, parvovirus infection of pigs and other diseases (this method is described in 12 topics).

## Viewing the virus using an immunoperoxidase reaction (immunoenzyme assay)

The immunoperoxidase reaction is similar to immunofluorescence, but the difference is that an antibody labeled with the peroxidase enzyme is used to set up the reaction, not with fluorochrome.

The calculation of the reaction results is performed under a light microscope, not under a luminescent microscope. The reaction is put in direct and indirect variants. Antiviral conjugates are used to detect the antigen using the direct immunoperoxidase method, the conjugates are taken from the antibodies, separated from the specific serum and identified by an enzyme. Conjugates are produced by specially adapted biological industries. To find the virus antigen in a direct way, the steps shown in Figure 44 are performed. To do this: a cell grown in a closed window

and infected with the virus is fixed in acetone cooled to minus 10-20 $^0$C for 10 minutes ; the drug is air-dried; 0.2-0.3 ml of working solution of immunoperoxidase conjugate is instilled in it, incubated for 1-2 hours in a humid chamber at 37 $^0$C (the incubation period is extended to 6 hours if necessary); the drug is thoroughly washed with saline for 15 minutes, rinsed with distilled water and air-dried; the drug is instilled a few drops of diaminobenzidine-tetrachloride (3.3-DAB · 4HCL), after incubation for 5-10 minutes, washed with saline for 10-15 minutes and rinsed with distilled water.

In the positive case, if the drug under test contains an antigen, an antigen + antibody complex is formed with the identified enzyme.

After pouring the substrate on the drug, it begins to decompose under the action of the enzyme, forming a blue product of the reaction, which quickly turns brown, which can be seen under a light microscope. In the drug can be seen yellow-brown diffuse dyed brown or black granules.

Controlled drugs do not have such staining. In the indirect immunoperoxidase test, anti-type immunoperoxidase conjugates are used (Fig. 45) for which the cell grown in a closed glass is fixed in acetone cooled to minus 10–20 $^0$C for 10 min ; the drug is air-dried; 0.2-0.3 ml of serum specific for the desired antigen is added to it and incubated in a humid chamber at 37 $^0$C for 1-2 hours; The drug is washed with saline for 5 minutes and air-dried; in which 0.2-, 03 ml of working diluted immunoperoxidase against the type is instilled from the conjugate, incubated at 37 $^0$C for 1-6 hours. Then the work written for the direct method is done. In the test material, a specific antigen for the virus, a specific serum tonic is formed, if an antigen + antibody complex is formed, an antimicrobial or secondary antibody determined by the enzyme is used to see them;

A more complex complex is formed than the first layer: antigen + antibody + secondary antibody + enzyme.

Because the resulting complex can be seen by adding substrate decomposes under the action of an enzyme and forms a colored product of the enzymatic reaction. The calculation of the results is carried out under a light microscope. The advantage of the indirect method is the universality of globulins against the species, as well as a stronger sensitivity than the direct method.

Viewing viruses using an electron microscope

This method reduces the ability of some viruses to reproduce another virus in cultured cells based on the interference of viruses.

For example, the plague virus of pigs reduces the infectious activity of the protein virus, the infectious activity of the Newcastle disease virus-vesicular stomatitis virus.

Almost this method is used to detect viruses that do not show SPT in cultured cells.

To see the swine plague virus in a cultured cell (because it does not show SPT), a second protein virus of at least 100 $TST_{50\ is}$ injected into the infected cell and then placed in a 37 $^0$C thermostat. After a few days, the result is examined under a microscope.

## 3.3. LEARNING MATERIALS FOR LABORATORY ACTIVITIES

**"APPROVED"**
Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“____” _____ 2021.

**« Laboratory work on the titration of viruses (2 hours)**
**PASSPORTS**

***M ashg'ulotning goal:*** laboratory work, biofabrikalarning production and veterinary practice, is always this or that material should be determined by the number of virus

Without determining the number of viruses, it is impossible to infect live laboratory systems for experiments, to prepare live and reduced activity antiviral vaccines, to produce diagnostic drugs, to evaluate the activity of live virus vaccines, to obtain immune serum and many other things. The amount of virus in a material is determined by the titer of the virus in that material.

***Required equipment, reagents and instrumentation:*** Examples for determining the titer of the virus NM $_{50}$ based on accurate data ; each student is given at least one sample sheet of 10 options; allantios fluid of a chicken embryo infected with Newcastle disease virus; 1% suspension of washed erythrocytes; saline solution (isotonic NaCl solution); plexiglass panels with recesses; Pipettes divided into 1 ml levels; rubber dots; container with disinfectant solution; pens for writing on glass.

***To calculate the amount of a 50% effective (SBM $_{50}$) virus mixture on Reed and Mench :***

Mice that survived when a certain amount of virus was infected, mice that survived when a small amount of virus was infected, would certainly have survived if a small amount of virus was infected.

The number of survivors and deaths in such an interpretation increases with the addition of the former in our minds with each mix. Let’s look at what happens in our example.

To do this, write the result as in Table 6. To find out if viruses accumulate in the body and have a strong effect, we think as follows. The actual information that reacts negatively to the infection is all taken in a row (we have mice that survived the virus) and goes from low to high.

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4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.

5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**

## TOPIC: Vibration of viruses

In laboratory work, in the production of bio-factories, and in veterinary practice, it is always necessary to determine the number of viruses in a given material.

Without determining the number of viruses, it is impossible to infect live laboratory systems for experiments, to prepare live and reduced activity antiviral vaccines, to produce diagnostic drugs, to evaluate the activity of live virus vaccines, to obtain immune serum and many other things. The amount of virus in a material is determined by the titer of the virus in that material.

The titer of a virus is defined as its expressive concentration in the material.

The amount of virus stored in material per unit volume is called the titer of the virus.

The amount of virus cannot be expressed in units (volume, mass, etc.) as usual, which means that the measurement must rely on a unit of exposure or a unit of activity.

Viruses have infectious and hemagglutination effects. The units of infectious and hemagglutination quantities of viruses are derived from this.

The size of these units depends on the ratio of full-value and total-valueless virions in the suspension used, the object, the titration method, and other factors.

In practice, the amount of virus is in three different units;

1- Infectious units that injure a specific area are evaluated by a single result called by viruses;

2- static evaluation of the effect of 50% of infectious units of viruses on a live susceptible object;

3- hemagglutination units.

Almost familiar lesions at a specific site caused by viruses (cell islets obtained in a living cell layer) are nodules, plaques (Fig. 48), smallpox (Necrotic nodules) of chicken embryos due to infection of cultured cells with smallpox or other viruses (Fig. 48). Figure 49).

Occurrence of infectious activity of viruses in such a case makes it possible to measure the amount of viruses with a rash (plaque) forming unit (THB) or smallpox (CHHB) . One THB is equivalent to one rash, one (CHHB) is capable of forming a rash. Detection of virus titer THB and CHHB is performed as follows.

The virus is transmitted to the cells grown on the mattress with the same amount of virus virus material being tested, or to the chicken embryo XAP.

The arithmetic mean is then calculated by counting how many rashes have formed on the mattress covered with each neutral red added and agar . In this case, THB and
It becomes clear that CHB is equal to the amount of virus-infected material.

In any case, it is not difficult to calculate exactly how much THB or CHHB corresponds to a specific unit volume of virus-containing material in a given volume. It's the same it is the expression or titer of the virus concentration in that material. The titer (T) of the virus can be calculated using a simple formula.

Here, n-rash on a mattress or smallpox in a chicken coop
arithmetic mean coni; dissolving and mixing of virus-containing material obtained for a-infection; V is the volume of the infected quantity.

For example. A suspension was prepared from a piece of infected skin of a chicken infected with smallpox. It is necessary to determine the titer of smallpox virus in this suspension. We took 0.5 ml of suspension and added 4.5 ml of saline, so we mixed 10 times (1:10).

The suspension has a much thicker concentration and is sticky. We took XAP of 5 chicken embryos by taking 0.2ml of the diluted suspension. We counted 5 chicken embryos incubated in a thermostat by tearing them all after 6 days and the flowers formed by XAP. As it turns out, 10, 11, 13, 18 and 8 are arithmetic averages.

The result obtained (n = 12 smallpox, a = 1:10 = 0.1. V = 0.2ml.

is formed.

Thus, the titer of the virus in suspension is 600 ChHB / ml, which means that each milliliter of suspension contains 600 smallpox viruses, each of which is capable of producing one smallpox XAP. In the example, the titration of the virus is simplified, which does not take into account the high concentration of the virus in the material, in which case it is impossible to count due to rashes or XAP rashes in the cultured cell. If their number does not exceed 50 on the mattress or XAP, rashes and rashes can be counted.

However, the titer of the virus is usually unknown in the material being tested (we need to identify it) and it is also unknown how to dilute the material to infect it, as we need to prevent the addition of rashes or rashes.

In this case, several mixtures are prepared from the test material (usually with a coefficient of 10) in the same amount as each mixture, infected in a cell or chicken embryos grown in equal groups, then the arithmetic mean number of rashes or rashes in each diluted mixture is calculated. , which in some places cannot be calculated will be removed.

In this case, the titer of the virus is calculated by the following formula.

This formula is similar to the previous ones, but a bit more complicated.

For example. The titration results are presented in Table 4.

**Table 4. Results of titration on THB.**

| Mixing the virus | Amount of infection (ml) | The arithmetic mean number of rashes on the mattress |
|---|---|---|
| $a_1$ = 1:10 | 0.2 | $n_1$ = 134 |
| $a_2$ = 1: 100 | 0.2 | $n_2$ = 28 |
| $a_3$ = 1: 1000 | 0.2 | $n_3$ = 5 |

Vibration of viruses by the THB method provides reliable data on virus concentration, but there are technical difficulties associated with counting rashes.

The titration of smallpox refers to viruses that are less commonly used, and not all viruses produce XAP nodules of the chicken fetus, so they are used sparingly. Detection of the infectious effect of the virus in 50% units is a widely used universal method. In this way, the amount of the virus such as the amount of qilinqdiki, 50% of the infected test objects infectious effect, $NM_{50}$-50% natijalimiqdordebaytiladi.

This amount of viruses in a given unit of material represents the titer of the virus in that material.

Laboratories typically use white mice, chicken embryos, and cultured cells as test objects, to which the infectious effects of the virus manifest themselves in the form of death, clinical signs, pathological changes, and cytopathic outcome.

A sensitive test object is selected for each virus and its infectious effect is evaluated depending on the form of computation.

Depending on the type of test object and the form of exposure, one of the species shown in Table 5 is accepted.

In other words: $1O'M_{50}$ is the amount of virus that kills 50% of laboratory animals (usually white mice);

$1YUM_{50}$ - in laboratory animals infected with the virus 50% - the amount of virus causing clinical symptoms or pathological changes;

$1HO'M_{50}$-50% of the amount of virus that kills a chicken embryo .

$1HYUM_{50}$ - the amount of virus that causes pathological changes in 50% of infected chicken fetuses;

Table 5. 50% is the type of quantitative unit of viruses in the detection of infectious effect.

| Test objects | Manifestations of the infectious effects of viruses | Quantitative units of viruses | |
|---|---|---|---|
| | | Name of the unit | Abbreviation |
| Laboratory animals | Scientist | 50% is the lethal amount of lethal | $O'M_{50}$ |
| That's it | Clinical signs or pathological-anatomical changes | 50% -infectious amount | $YUM_{50}$ |
| Chicken fetus | Scientist | 50% is the amount that kills the fetus | $HO'M_{50}$ |
| That's it | Pathological changes | 50% is the infectious | $HYUM_{50}$ |

| | | | |
|---|---|---|---|
| | | amount of the fetus | |
| Cultivated cell | Cytopathic exposure | 50% -cytopathic amount | SPM $_{50}$ |

1SPT $_{50}$-The amount of virus that has a 50% cytopathic effect when infected in cultured cells (usually in cells grown in a test tube).

NM $_{50}$ school ( Yum , RCD $_{50\,50\,50\,50}$ Human or CPT $_{50}$), the amount of virus in a size unit in the structure of the protective material of the virus content to the amount of the virus, the same virus (T) represents a subtitle. For example, T = $10^{3.48}$ SPT / 0.1 ml means that for every 0.1 ml of virus-containing material $10^{3.48}$ ( i.e. more than 1000 but less than 10000, personally $10^{3.48}$ = 3020) retains the virus in quantities, each of which has the property of having a cytopathic effect of 50% of the cultured cell transfusion solutions.

50% of the infectious virus known as the effect of school units ( Yum , RCD $_{50\,50\,50\,50}$ Human CPT $_{50}$) using a statistical evaluation of the effect of a contagious virus that kills the contagious effect of the virus, plays an important role in accounting for effects, clinical symptoms, pathological changes, or cytopathic effects. Titration on 50% of the infectious effects of viruses is a universal method to titrate all viruses, even if we can select a live sensitive system (test object).

But titrating viruses in this way is labor-intensive, far-reaching, and requires statistical computation.

The problem of determining the titer of a virus in a 50% infectious unit leads to finding the level of virus-protective material being tested. $_{50}$ school ( YUM $_{50}$, RCD $_{50}$, Holly $_{,50}$, SPT $_{50}$) for the amount of infected size NM $_{50}$ and then to maintain the same volume of material in the amount of virus protection several units of the store and to such an extent that these materials will be an indicator of virus titer.

To solve the problem, the virus-protective material being tested is first diluted 10 times in a row. The 10th dilution is taken for 2 reasons:

First, the infectious effect of the virus depends on the amount of virus shown in the graph (Fig. 50) .The curved line NM $_{50}$ is close to the corresponding point and approaches the straight line after a slight intersection. This is up to a certain section, with the center at NM $_{50}$ points.

There is a linear relationship between the quantitative logarithm of the virus and its effect, which means that the logarithm of the infectious effect of the virus is proportional to the quantitative logarithm of the virus. In small amounts and almost in large quantities this connection is broken.

The calculation performed after the second is facilitated by 10-fold dilution.

With every 10 times diluted virus protective material, the same amount of test objects (mice, chicken embryos, or cultured cells) that are susceptible to this virus are infected.

In this case, each group should have at least 4-6 test objects, if this number is less, a very large error in the magnitude of the measurement of the virus titer will be made when statistically calculating the titer of the virus . By calculating the outcome of exposure to the virus after infection (death, clinical signs, pathological changes,

or SPT), it is determined which type of virus was mixed that affected 50% of susceptible objects.

The 50% affected mixture is calculated by the linear interpolation method. When this is the case, a virus mixture in an infectious volume is found, the amount found due to mixing (corresponding to 50% of the effect) retains one $NM_{50}$. It is determined how many times the same amount of undiluted virus-retaining material ($NM_{50}$) is stored, and how many times the material given by $1NM_{50}$ is mixed.

We then calculate how many such units the virus, which is 50% contagious, store in a (ml) volume of virus-storing material, which represents the titer of the virus in that material. We solve the above in concrete examples.

So, we took a 12ml ectromelia virus suspension and made sure it was free of fungi, during bacteriological control. Our task is to determine the titer of the virus in the specified suspension.

First, we select from living laboratory systems that are sensitive to this virus. We explain that the ectromelia virus kills when mice are infected inside the peritoneum.

We begin to titrate the virus in our suspension using white mice. To do this, we select 60 mice of the same weight and with no signs of disease. We put 6 mice in 10 cages (or 10 liter wide-mouthed jars) and then each box is numbered.

From the virus suspension being tested, we prepare a series of mixtures 10 times in a row.

The amount of dilution depends on the titer of the target virus (the higher it is, the more mixing is needed). They should be mixed in such a way that the most recent (much higher) mixing does not have an infectious effect at all.

If it is difficult to know the probable titer range of the virus, it is better to dilute it a lot at that time, excessive dilution will never interfere with determining the titer of the virus, if the last mixed zero does not affect, then it is difficult or impossible to determine the titer of the virus .

Depending on the size of the mixing level, laboratory animals are also selected accordingly, in which the virus is titrated (in our example, 10 mixtures of the virus were prepared, according to which we divided the mice into groups of 6 to 10).

To prepare 10 consecutive mixtures of the tested virus suspension, take a test tube with 10 stoppers, number each and pour 9 ml of sterile saline solution into each, then pour 1 ml of the tested virus suspension into the first test tube, inflate the suspension with a rubber bulb to drop the last drops. the tip of the pipette should not touch the saline solution.

Using a new sterile pipette, the liquid in the solution is pipetted and mixed well as it is added back to the solution.

In turn, take 1 ml of the mixture in the first solution and pour into the second solution without touching the saline solution. It is then transferred to a third sterile pipette, and after the mixture in the second solution has been thoroughly mixed, 1 ml is transferred from the second solution to the third solution, and so on until the tenth solution.

The result is a 10-fold series of viral mixes.

It is not necessary to add 9 ml of saline solution to the solution, then 1 ml in a row. It is also possible to reduce this volume by 2.5 or 10 times. This means pouring 4.5 ml

of saline into 0.5 ml or pouring 1.8 ml of saline into 0.2 ml, or pouring 0.9 ml of saline into 0.1 ml. It is also possible to transfer. It should be noted that the smaller the volume, the more inaccurate the measurement and the lower the accuracy in determining the titer of the virus.

We can imagine the process of diluting 10 times in a row as in the table below.

| **Number of test tubes** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
|---|---|---|---|---|---|---|---|---|---|---|
| Physiological solution | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| The virus being tested | Consecutive transfer from 0.5 to 0.5ml. | | | | | | | | | |
| The resulting mixture | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ | $10^{-5}$ | $10^{-6}$ | $10^{-7}$ | $10^{-8}$ | $10^{-9}$ | $10^{-10}$ |

Once the mixture is prepared from the virus suspension, the amount of infection is selected so that it is technically convenient and has a clear effect when infected.

Since the laboratory facilities are almost large, the amount of infection is also less selective. Even for mice (when infected inside the peritoneum) it is from 0.1 to 0.5 ml.

Assume that 0.3 ml of infectious material is administered in different concentrations within the peritoneum of each mouse. In that case, 0.3 ml of the first mix of the virus ($10^{-1}$ or 1:10) should be given to 6 mice in the first group, and $10^{-2}$ (1: 100) 0.3 ml to 6 mice in the second group.

Infected mice were monitored in a timely manner (at least once a day) and deaths were recorded. It is difficult to say that those who died within the first 48 hours after being infected with the virus died due to the effects of the virus (mainly at high dilution), it is not considered specific and is not taken into account in the calculation. If no more deaths are observed among the mice within 2–3 days after the death of the infected mice has ceased, the result can be said to be complete. The results of the experiment are recorded in a notebook. Suppose we get the following result

| **Dilute the virus** | **tirik** | **died** |
|---|---|---|
| $10^{-1}$ (1:10) | 0 | 6 |
| $10^{-2}$ (1: 100) | 0 | 6 |
| $10^{-3}$ (1: 1000) | 1 | 5 |
| $10^{-4}$ (1: 10000) | 4 | 2 |
| $10^{-5}$ (1: 100000) | 5 | 1 |
| $10^{-6}$ (1: 1000000) | 6 | 0 |
| $10^{-7}$ (1: 10000000) | 6 | 0 |

Because of the calculation, we need to find a mixture of viruses that the virus must have killed 50% of the infected mice . There are several (graphical) methods for this, but in most cases we use the Reed and Mench or Kerber method.

## Calculate the amount of a 50% effective ($SBM_{50}$) virus mixture on Reed and Mench

This method assumes that viruses accumulate in the body and have a strong effect. Mice that survived when a certain amount of virus was infected, mice that

survived when a small amount of virus was infected, would certainly have survived if a small amount of virus was infected.

Or, conversely, the death of a mouse infected with a certain amount of virus would also occur when a low-diluted (large amount) virus was infected.

The number of survivors and deaths in such an interpretation increases with the addition of the former in our minds with each mix. Let's look at what happens in our example.

To do this, write the result as in Table 6. To find out if viruses accumulate in the body and have a strong effect, we think as follows. The actual information that reacts negatively to the infection is all taken in a row (we have mice that survived the virus) and goes from low to high.

**Table 6. Consequences of virus infection in mice**

| Dilute the virus | Actual information | | Consequences of strong effects accumulated in the body | | | |
|---|---|---|---|---|---|---|
| | tirik | died | He survived | He is dead | The ratio of the dead to the living | Scientist, % |
| $10^{-1}$ | 0 | 6 | 0 | 20 | 20:20 | 100 |
| $10^{-2}$ | 0 | 6 | 0 | 14 | 14:14 | 100 |
| $10^{-3}$ | 1 | 5 | 1 | 8 | 8: 9 | 88.8 |
| $10^{-4}$ | 4 | 2 | 5 | 3 | 3: 8 | 37.5 |
| $10^{-5}$ | 5 | 1 | 10 | 1 | 1:11 | 9 |
| $10^{-6}$ | 6 | 0 | 16 | 0 | 0:16 | 0 |
| $10^{-7}$ | 6 | 0 | 22 | 0 | 0:22 | 0 |

No mice survived when diluted $10^{-1}$ in a volume of 0.3 ml ; Survivors when diluted $10^{-4}$ 4, survivors when diluted $10^{-3}$ 1, $10^{-4}$ survivors (less than $10^{-3}$, $10^{-4}$ less) it is added to 4, survivors $^{5}$ to $10^{-5}$, dead 1 , $10^{-3}$ would have survived without dying, 4, $10^{-4}$ would have survived less than $10^{-5}$.

All of them are added to the 5 survivors. The same is true of the rest of the mixture. A feedback that responds positively to infection (i.e., dead) is conducted in reverse order, and a large amount of information is accumulated in a small amount.

After accumulating in the body and receiving strong exposure data, the percentage of those who responded positively to the infection (those who died in our example) is calculated for each mix (e.g., $10^{-4}$ mixed, 3 died, and 5 died). 3 out of 8 died, which means 3/8 * 100 = 37.5%). The results show that 0.3 ml of virus suspension does not kill any of the 50% mice in the mixtures we obtained. It is necessary to calculate such a virus mixture (or the amount of $OM_{50}$ virus).

As can be seen from Table 6, 0.3 ml of virus suspension mixed with $10^{-3}$ kills 50% more mice (88.8%) and less than 50% (37.5%) mixed with $10^{-4}$ o. 'ldiradi. Hence, the mixture sought is in the range of $10^{-3}$ (1: 1000) and $10^{-4}$ (1: 10000). To find it, we need to use the following formula.

where $OM_{50}$ is a mixture of the viruses sought; B-50% high performance compound; bB is the percentage corresponding to the mixture; a-50% percentage of the mixture giving less results; d-mixture coefficient (our dilution rate is 10 times, so the coefficient is 10). Putting the numbers in our example into the formula:

This means that 0.3 ml of the virus mixture is capable of killing 50% of infected mice, where $10^{-3.76}$ or 1:10 equals $^{3.76}$.
In other words, 0.3 ml of virus diluted 10 to $^{3.76}$ times stores one $OM_{50}$ (50% of the amount of virus capable of killing mice) .
In this case, 0.3 ml of the based (tested) virus suspension retains $10^{3.76}$ of this amount .
Hence, the titer of the virus is T = $10^{3.76}$ $OM_{50}$/ 0.3 ml, or T = 10/3 ; 10 will be $^{3.76}$ $OM_{50}$/ ml.

The 50% result is the effective amount of unknown virus mixture sought ($NM_{50}$).

This can be found in another way. In our example, $OM_{50}$ lies between a mixture of $10^{-3}$ and $10^{-4}$. The difference between the percentages is more than 50% and 50% 88.8–50 = 38.8 The difference between the high and low is 88.8–37.5 = 51.3 .

38.8: 51.3 ratio of $10^{-3}$ which is greater than $10^{-3}$ any size if it is distinct, with the logarithm diluted coefficient multiplying (lg10 = 1) which will be the following: 38.8: 51.3 = 0.76 Hence, the $OM_{50}$ compound sought is $10^{-3-0.76} = 10^{-3.76} = 1: 10^{3.76}$. The titer of the virus is T = 10 / 3x$10^{3.76}$ $OM_{50}$/ ml

The titer of the virus, represented by a fractional pointer, is left almost the same. But it is possible to convert to an absolute size using an anthilogarithmic table (a four-digit mathematical table of VMBradis).

In our example $10^{3.76}$ = 5754. So we can express and write the virus titer. Hence, T = 10 / 3x5754. $OM_{50}$/ ml, or T = 19180 $OM_{50}$/ ml.

The Reed and Mench method requires some information relative to a positive 50% (e.g., 0 to 100%, 10 to 90%, 20 to 80%, and so on). Each virus mixture has a fixed number of animals and should not show a positive result for non-specific reasons.

Disadvantages of this method include:

1) high amounts of the virus do not always show a very high infectious result;

2) it is not possible to calculate the standard error;

3) gives the impression that work is being done on a larger number of test sites than is actually the case.

This method also gives quantities whose indicators are closer to the ones obtained by the exact methods.

Calculate the amount of virus that gives a 50% result ($NB_{50}$) according to Kerber.

This method is simple and requires the calculation of evidence of strong effects accumulated in the body, valid only in cases where it shows a positive result for a non-specific reason.

But to get highly reliable results, positive data must be 0 to 100% accurate. Based on the titration results in the previous example, we calculate $OM_{50}$.

| Dilute the virus | He survived | He is dead |
|---|---|---|
| $10^{-1}$ | 0 | 6 |
| $10^{-2}$ | 0 | 6 |
| $10^{-3}$ | 1 | 5 |
| $10^{-4}$ | 4 | 2 |
| $10^{-5}$ | 5 | 1 |
| $10^{-6}$ | 6 | 0 |
| $10^{-7}$ | 6 | 0 |

Here we use the following formula to calculate $OM_{50}$ (our modification):

;

where D – 100% effective virus is highly diluted;

d is the dilution coefficient;

n is the number of any infected, test objects of the diluent;

r-respond positively to the effects of any dilution;

-the ratio of the value of all positive test objects, all diluted and the result from 0 to 100%.

We put the letter symbols in the formulas:

So $10^{-3.83}$ diluted (or $10^{3.83}$ times) 0.3 ml of virus stores an $OM_{50}$ virus.

Then we think as we calculated on Reed and Mench. If $lg\ O'M_{50} = -3.83$ then $O'M_{50} = 10^{-3.83}$ or $1:10^{3.83}$.

So 1:10 justifies an $OM_{50}$ in 0.3 ml of $^{3.83}$ diluted virus, but in the original 0.3 ml virus based on that amount is $10^{3.83}$ times more, as well as $10^{3.83}$ $OM_{50.}$

So, suspenztyada viral titer $T = 10^{3.83} O'M_{50}$ / 0,3ml, or T = (10: 3) * $10^{3.83}_{50}$ O'M / ml, or T = (10: 3) * 6761 O'M school mlö t = 22537/ $_{50\,50}$ / ml.

The insignificant difference in the titer of the virus is due to the calculation of the two methods, both of which are due to the closeness of the absolute accuracy.

When titrating viruses in laboratory animals, the result of the reaction is determined by the titer of the virus (instead of OM) $YUD_{50}$, replacing the table "dead" instead of "dead" with "positive" .

Titration of viruses chicken embryo is also carried out in laboratory animals titrlagandagidek above, but Titze $RCD_{50}$ or $_{50}$ HUMAN RIGHTS expressed.

When viruses are titrated in cultured cells, the results are written in the table as "SPN" closed "no SPN" (or "+" and "-") and the titer is expressed as $SPT_{50}$.

Some viruses, under certain conditions, have the property of agglutinating the erythrocytes of a particular species of animal. The hemagglutination titer of such viruses is expressed in units (GAB).

1 GAB is assumed to be such that a certain amount of virus is able to agglutinate 50% of a 1% washed erythrocyte suspension.

To titrate the viruses on the hemagglutination effect, we use a series of test tubes or a series of plexiglass panel grooves .

The sequence of work to be performed is as follows:

- 1% suspension of washed erythrocytes obtained from animals with agglutination of the titrated virus;
- 2 times in a row diluted series of test-containing virus material of equal volume;
- the virus is added to the entire dilution of the protective material from a washed 1% suspension of exactly the same volume of erythrocytes ;
-The rate of hemagglutination in any solution (0 in the test tube) is estimated by crosses according to the following indicator (Fig. 51).

| Appearance of erythrocyte sediment | GAR evaluation with crosses. |
|---|---|
| All erythrocytes were agglutinated and completely formed a single layer of flat "umbrella" | + + + |
| The main mass of erythrocytes is agglutinated and formed an umbrella, but it is clear that there are unegglutinated erythrocytes gathered in one place in the center. | + + |
| The main mass of erythrocytes is not agglutinated, centered like a "button", and around it a few erythrocytes are agglutinated and have a small "umbrella", reminiscent of an uneven "button". | + |
| All erythrocytes are not agglutinated and sink to the deepest part of the test tube in the "center" around the uneven button . | |

*Procedure for evaluating GAR with crosses.*

If the high dilution of the virus-protective material is less than two crosses, then GAR (corresponding to 50% agglutination of erythrocytes) retains 1 GAB of the virus. This amount of test material (undiluted) retains 1 GAB of the same amount of material diluted. If the high dilution of hemagglutination is evaluated on two crosses, it is 1: 128, which means that the virus diluted 128 times is 128 GAB in the same volume, so the titer (T) of the virus in this material is 128 GAB (Table 7).

Table 7. Vibration of the virus for GAR.

| Indicators | The number of the test tube | | | | | | | | | | Control of erythrocytes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| Dilute the virus | 1: 2 | 1: 4 | 1: 8 | 1:16 | 1:32 | 1:64 | 1: 128 | 1: 256 | 1: 512 | 1: 1024 | |
| Physiological solution, ml | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Virus protection material | 0.5 | Transfer 0.5 ml in a row | | | | | | | | | - |
| 1% suspension of erythrocytes, ml | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Exposure | 30-40 minutes at room temperature | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| The result | +++ | +++ | +++ | +++ | +++ | +++ | ++ | - | - | - | - |

* 0.5 ml of the last diluted virus preservative is taken and poured into a disinfectant solution.

A mixture of erythrocyte suspension and virus-retaining material is obtained in equal volumes, as it does not matter what volume 128 GAB corresponds to, as the volume of one component increases as the volume of the other component increases. Therefore, even if the volume of erythrocyte suspension and virions in the virus-storing material changes, the result does not change, i.e. the number of GABs does not change.

## Homework

1.Calculate the titer of 50% infectious virus based on the recommended accurate data.

2. Determination of the titer of Newcastle disease virus in allantois fluid in units of hemagglutination.

## Material supply:

Examples for determining the titer of the virus $NM_{50}$ based on specific data ; each student is given at least one sample sheet of 10 options; allantios fluid of a chicken embryo infected with Newcastle disease virus; 1% suspension of washed erythrocytes; saline solution (isotonic NaCl solution); plexiglass panels with recesses; Pipettes divided into 1 ml levels; rubber dots; container with disinfectant solution; pens for writing on glass.

## Approximate lesson plan (4 hours).

1. Control questions.
2. Demonstrate the calculation of the virus at $NM_{50}$ based on accurate data .
3. Independent work of students on the calculation of the titer of the virus on $NM_{50}$.
4. Show each student the shortcomings in solving the example and correct the mistake.
5.Discuss the image of titration of Newcastle disease virus on GAR.
6. Preparation of Plexiglas panels for work, demonstration of methods of sequential transfer of material with a pipette.
7. Independent work of students:

a) preparation of material, pipettes and panels;
b) show two consecutive dilutions of 0.5 ml or 0.2 ml of virus;
c) 1% - addition of erythrocyte suspension;
d) Calculate the result and interpret them.

8. Copy the titration image of GATR antibody to Newcastle disease virus from the board or table to the notebook during the exposure.
9. Concluding the session.
10. Assignment for the next lesson.

## Control questions

1. What is the titer of the virus?
2. In what unit is the amount of virus measured?
3. Tell us about the detection of the titer of the virus on CHHB and BXB.

In 4.50% infectious units, what is the essence of calculating the titer of the virus?

5. What is the method of calculating the titer of the virus in 50% infectious units?

6. What is the point of view in determining the titer of the virus according to GAB?
7. What are the advantages and disadvantages of titrating viruses in different ways?

## Methodical instructions

1. It is also possible to conduct a virus titration session for 4 hours or 2 times for 2 hours (two methods of virus titration). It doesn't matter which session is held first.
2. To calculate the titer of the virus according to $NM_{50}$, a sample with at least 10 specific pieces of information is created before the lesson. Whenever possible, if the sample is structured according to different test objects and different infectious effects, it will be firmly established in the student's memory. Each example should have pre-solved and ready answers. This makes it easier to check. It is convenient for the student to write each issue on a numbered sheet.
3. There is no difference between calculating a mixture that gives 50% results by any method according to Kerber or Reed and Mench, as they are equally and widely used in practice.
4. It is advisable to use the allantios fluid of the chicken fetus when titrating the Newcastle disease virus. It is also possible to use a suspension of the viral vaccine used against Newcastle disease when it is not possible. (GAR gives a good visible result H-strain).
5. Given that the next session will be GATR, it is possible to give a GATR image to save time. Because based on this image, students will react in the next lesson.
6. Copying a GATR image will help students think and remember.

**"APPROVED"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____ Z.J. Shapulatova
“ ____ ” _____–
2021.

**" Titration of antibodies using hemagglutination inhibition test (GATR) for viruses "**
**laboratory work (2 hours)**
**PASSPORTS**

***M ashg'ulotning: The aim of*** this reaction, antibodies, met with the homologous virus (antigen), not only infectious, but the effect is based on the ability to neutralize the ability of gemagglyutinatsiyalovchi virionning gemagglyutinatsiyalovchi receptors, and it is surrounded with antigen + antibody complex does. The action of the GATR line is that after mixing the same amount of serum and virus suspension in a test tube, after a certain time the erythrocyte suspension is poured and the presence of the virus in the mixture is determined.

***Required equipment, jet and instrumentation:*** Newcastle disease virus with clear titer (from previous training); rabbit blood serum treated with $CO_2$ immunized against nyukasl disease ; saline NaCl solution; 1% suspension of washed rooster erythrocytes; plexiglass panels; 1 ml marked pipettes; rubber dots; Kipp apparatus.

***To prepare the whey:***

It is a Newcastle disease virus (most conveniently strain H) that is easy to find and can respond to a goal. In training, it is used to transmit the virus to fetuses, as well as to determine the titer of the virus.

It is also possible to use a dried virus vaccine against Newcastle disease. If a large amount of serum specific for Newcastle disease is needed, 1-2 rabbits are taken and given a diluted virus vaccine. The virus is injected 5 ml into the abdomen and intramuscularly (the titer of the virus should be as high as possible) and immunization is repeated after 12-14 days.

After 7–10 days, the rabbit is anesthetized and the blood is poured into a sterile container to obtain serum.

Activity is checked in GATR and titration (ranges from 1: 160–1: 1280).

It is then poured into ampoules of 1-2 ml and placed in the refrigerator compartment. The activity of whey is maintained for several years. For GATR, a dilution of whey (1:10) is used.

4 GAB of virus titer is pre-titrated for training. Methods of serum release from non-thermostable antiviral inhibitors should be demonstrated to all groups.

***Books:***

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.

2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**

## TOPIC: Titration of antibodies using hemagglutination inhibition reaction (GATR) for viruses.

When high-molecular-weight foreign substances are administered parenterally to warm-blooded animals, the proteins produced by the body against them are called antibodies. When antibodies are sent to the body, they are called antigens.

Viruses are almost antigens. By interacting with the antigens they produce, the antibody (antibody specificity) neutralizes its biological activity. Thus, antibodies protect the body from infectious agents, which is the essence of their formation.

Antibodies can interact with homologous antigens not only in vivo but also in vitro. Because the source of the antibody is usually the blood serum, the reaction of antibodies and antigens that occurs in vitro outside the body is called a serological reaction.

The hemagglutination cessation reaction is one of the simplest GATR reactions.

This reaction is based on the fact that the antibody meets a homologous virus (antigen) and neutralizes not only its infectious effect, but also its hemagglutination ability, surrounds the hemagglutination receptors of the virion and forms an antigen + antibody complex with it. The action of the GATR line is that after mixing the same amount of serum and virus suspension in a test tube, after a certain time the erythrocyte suspension is poured and the presence of the virus in the mixture is determined.

Agglutination of erythrocytes in the mixture indicates the presence of the virus, and sedimentation indicates the absence of the virus. The disappearance of the virus in a mixture of virus and serum is a sign of an interaction between the antibody in the serum and the virus.

Hence, the antibody interacts to a certain extent with antigens. Therefore, a clear minimum amount of antibody is required to eliminate the hemagglutination ability of a given amount of virus.

As usual, one of the GATR components is always unknown, so the reaction is put in a series of solutions with different amounts of antibody.

To do this, a different diluted volume of serum and the same diluted volume of the virus or a different diluted volume of the virus and the same diluted volume of the serum are obtained.

GATR solves the following problems: determines the titer of the antibody in the serum in relation to the hemagglutination effect of the virus; distinguishes an

unknown virus that hemagglutinates using clear serum; determines the degree of similarity of two different viruses. The superiority of the GATR; The procedure is simple, quick, does not require antiseptic conditions, is extremely specific and inexpensive. The disadvantage of GATR is that this reaction is carried out only by hemagglutination viruses.

The titration procedure for GATR antibodies is as follows: Prepare a series (usually 2-fold) dilution of the test serum in a series of equal volumes (usually 0.25 or 0.2 ml); Add 4 GABs of the same amount of homologous virus to each dilute;

The mixture is kept at a certain temperature for a certain time (40-60 minutes at room temperature for Newcastle disease virus). Add to the whole mixture an equal volume of 1% washed erythrocyte suspension; after a certain time, the hemagglutination in each mixture is assessed by crosses.

The reaction is controlled by serum, virus and erythrocytes. The ability of the highest dilute level of serum to completely stop hemagglutination was taken as the titer of the antibody in the serum.

The scheme of GATR is shown in Table 8. In the example given, since the high titer of serum that completely stops hemagglutination is 1:32, the titer of the antibody is written as T = 1:32.

We recall that the titer of an antibody in serum is always expressed by its high dilution with a certain result due to its interaction with a homologous antigen. The titer of the antibody represents its concentration in the serum.

It should be borne in mind that the lower the titer of the GATR virus, the lower the concentration of antibodies in the serum can be detected (hence their higher titer). A 4 GAB titer of the virus is the lowest amount that causes reliable hemagglutination, because when it is mixed with an equal amount of serum, its titer drops to 2 GAB in each test tube.

Table 8. Titration of antibodies against the N'ykasl disease virus using GATR.

| **Components of the reaction** | **Experience** | | | | | | | | **Control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Dilute the whey** | | | | | | | | **zar-dob-lar** | **Erythrocytes** | **GAB of the virus** | | | |
| | 1:2 | 1:4 | 1:8 | 1:16 | 1:32 | 1:64 | 1:128 | 1:256 | | | 2 | 1 | ½ | ¼ |
| Saline solution, ml | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Whey, ml | 0.2 | Consecutive transfer of 0.2 ml * | | | | | | | - | - | - | - | - | - |
| Virus T = 4GAB, ml | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | - | - | 0.4 | 0.4 weed digging ** | | |
| Adding a virus-infected dice (contact) | Leave for 40-60 minutes at room temperature | | | | | | | | | | | | | |
| 1% erythrocytes | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Save (exposition) | Leave for 40-60 minutes at room temperature | | | | | | | | | | | | | |
| The result | - | - | - | - | - | ++ | +++ | +++ | - | - | +++ | ++ | - | - |

** 0.2 ml is removed from the last solution.*

*** 0.4 ml is removed from the final solution.*

Hence, when a 1% suspension of erythrocytes is added to each solution equal to the volume of the virus and the volume of the serum, the number of virions here is capable of 100% agglutination of erythrocytes (remember that the virus agglutinates 50% of erythrocytes in 1 GAB 1% suspension). If we take the virus less than 4 GAB, the absence of hemagglutination event is assumed to be a sudden decrease in the number of virions due to some technical error and deficiency, resulting in a 50% decrease in erythrocyte agglutination capacity (hence the two crosses) clear agglutination may also not occur).

To prevent this from happening, a 1% erythrocyte suspension is poured into the solution in the same volume as the virus (or half the volume of the liquid in the solution) or the titer of the virus is raised to 8 GAB. In both cases, the amount of virus in one test tube increases by a minimum of 4 times and is determined by hemagglutination. However, the antibody titer is 2 times lower.

This method is often used when it is insignificant to determine the exact titer of the antibody. Modifications to the GATR are shown in Table 9

Table 9. Scheme of halved erythrocyte count in GATR

| **Components of the reaction** | **Experience** | | | | | | | | **Control** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Dilute the whey** | | | | | | | | **Dice-dobs** | **Erythrocytes** | | | | |
| | 1:2 | 1:4 | 1:8 | 1:16 | 1:32 | 1:64 | 1:128 | 1:256 | | | 2 | 1 | 1/2 | 1/4 |
| Saline solution, ml | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 0.2 | 0.2 | 0.2 | 0.2 |
| Whey, ml | 0.2 | Consecutive transfer of 0.2 ml | | | | | | | 0.2 | - | - | - | - | - |
| Virus T = 4GAB, ml | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | - | - | 0.2 | Conductor of 0.2 ml | | |
| Adding a virus-infected dice (contact) | Leave for 40-60 minutes at room temperature | | | | | | | | | | | | | |
| 1% erythrocytes | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Save (exposition) | Leave for 30–40 minutes at room temperature | | | | | | | | | | | | | |
| the result | - | - | - | - | ++ | +++ | +++ | +++ | - | - | +++ | ++ | - | - |

The diluted level of serum also affects the correct determination of antibody titer. The smaller the dilution level, the more accurately the antibody titer is

determined, but double dilution is usually used because the preparation of very small dilution levels is inconvenient.

When the titer of the antibody in the serum needs to be determined very accurately, it is possible to change the titer of the antibody when the amount of virus obtained in the reaction is less than the control 4GAB titer. If the titer of the virus in test tube 3 was hemagglutination equal to 1/2 GAB 2-3 crosses and a negative result was 4, this indicates that 8 GAB viruses were obtained instead of 4 GAB in the reaction. Therefore, the actual titer of the antibody in the test serum is twice as high as when we obtained it. If the titer of the virus was 4 GABs (not 8 GABs), 2 times less antibodies were required to neutralize its hemagglutination activity, and the final dilution of the serum that stopped hemagglutination would be 2 times more.
Conversely, if hemagglutination does not occur in 1 GAB control of the virus (test tube 2), then the titer of the antibody in the serum is 2 times higher.

It should always be considered to rid GATR-tested serums of antiviral thermostable non-specific inhibitors, as they also have the property of stopping the virus's hemagglutination ability.

For this purpose, whey is treated with one of the following substances; carbon dioxide ($CO_2$), potassium periodate ($KlO_4$), rivanol, kaolin, activated carbon, cholera vibrio extract, and the like. The simplest way to release serum from non-thermostable non-specific inhibitors of the virus is to treat it with $CO_2$. To do this, the whey is initially diluted 1:10 with distilled water to form a gas bubble, and $CO_2$ gas is passed through for 3-5 minutes until the whey becomes cloudy (using a cylinder or Kipp apparatus) .

The serum is then centrifuged for 2000–2500 rpm for 10–20 min, and the surface liquid is precipitated (inhibitors are precipitated).

To restore the isotonicity of whey, 8.5% sodium chloride solution is poured in a volume equal to its dilution with 0.1 volume of water. It should be remembered that when using whey treated with $CO_2$, it is diluted to 1:11 degrees.

## Homework

Determination of antibody titer against Newcastle disease in rabbit serum using GATR.

## Material supply:

Newcastle disease virus with clear titer (from previous session); rabbit blood serum treated with $CO_2$ immunized against nyukasl disease ; saline NaCl solution; 1% suspension of washed rooster erythrocytes; plexiglass panels; 1 ml marked pipettes; rubber dots; Kipp apparatus.

## Approximate lesson plan (2 hours)

1. Independent work of students according to the schedule of GATR (from the previous lesson): a) Preparation of two carats of whey dilution (0.2 ml); b) adding 4 GAB titers to the virus (0.2 ml); c) add the serum with the virus for 40-60 minutes.
2. Teacher's control questions and explanation (at the time of addition)
3. To show ways to clean serum from non-specific inhibitors of viruses.
4. Continuation of independent work of students: a) infusion of erythrocyte suspension; b) Hold for 30-40 minutes (exposure)

5. Teacher's explanation during the exposition.
6. Calculate the results of GATR in antibody vibration.
7. Answer the questions.

**Control questions:**

1. What are antigens and antibodies?
2. What is a serological reaction and for what purpose is it used?
3. What are the basic rules for applying GATR?
4.Name a modification of GATR?

**Methodical instructions:**

Preparation of whey is the most complex and responsible. The main thing is that it should deal reliably with the virus. It is a Newcastle disease virus (most conveniently strain H) that is easy to find and can respond to a goal. In training, it is used to transmit the virus to fetuses, as well as to determine the titer of the virus.

It is also possible to use a dried virus vaccine against Newcastle disease. If a large amount of serum specific for Newcastle disease is needed, 1-2 rabbits are taken and given a diluted virus vaccine. The virus is injected 5 ml into the abdomen and intramuscularly (the titer of the virus should be as high as possible) and immunization is repeated after 12-14 days.

After 7–10 days, the rabbit is anesthetized and the blood is poured into a sterile container to obtain serum.

Activity is checked in GATR and titration (ranges from 1: 160–1: 1280).

It is then poured into ampoules of 1-2 ml and placed in the refrigerator compartment. The activity of whey is maintained for several years. For GATR, a dilution of whey (1:10) is used.

4 GAB of virus titer is pre-titrated for training. Methods of serum release from non-thermostable antiviral inhibitors should be demonstrated to all groups.

**"APPROVED"**
Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“____” _____–
2021.

**" Neutralization reaction and its application in virology ."**
**laboratory work (2 hours)**
**PASSPORTS**

***M ashg'ulotning goal:*** neutral essence of reaksiasining (NR), the same amount of serum added to the virus suspension with a solution, a mixture of active virus remaining after a certain time, or not.

***Required equipment, reagents and instrumentation:*** Alcohol-fixed SPT and normally grown cells should be obtained so that a neutralization reaction occurs; lighting microscopes and devices for observing solutions under a microscope.

***To put the neutralization reaction with a diluted virus:***

1. Two sets of double dilutions of the same volume of the virus are prepared (depending on the titer of the dilution level of the virus)
2. To all diluted in the first row add the same amount of test whey (slightly diluted)
3. The same amount of normal whey (NZ) is added to all dilute levels in the second row. has no antibodies against the resulting virus.
4. Serum and normal serum mixtures tested with the virus are kept at a certain temperature for a specified period of time: This figure is different for different viruses.
5. A virus-sensitive test taken in the same amount as each of the mixtures - infected in equal groups of objects (usually cultured cells, chicken embryos, or white mice).
6. Infection results are carried out on test objects in each group, a positive result is observed when the virus is affected, a negative result is observed when not affected.
7. The titer of the virus is considered separately when exposed to test serum ($T_{SA+SZ}$) and when the titer of the virus is exposed to normal serum ($T_{SA+NZ}$).
8. It is determined how much lower than $T_{SA+SZ}$, $T_{SA+NZ.}$ This number is called the **neutralization index** (NI).

***Books:***


1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

**Docent: Bazarov X.K.**

**Assistant: Nurgaliyeva J.S.**

## TOPIC: Neutralization reaction and its application in virology

The essence of the neutralization reaction (NR) is that a suspension of the virus with the same amount of serum is added to the solution to determine whether the active virus remains in the mixture after a certain time.

To determine this, the mixture is injected into sensitive living systems (biological experiments on test objects).

If the virus does not affect the test objects (negative biological experience), positive control indicates that the biological activity of the virus is neutralized by the antibody in the serum, or that the antibody is homologous in the serum with the antigen.

The higher the antibody content in the serum relative to the virus obtained, the more it is able to neutralize the exact (standard) amount of virus (usually 100 NM50) even at highly diluted levels. If a positive biological test occurs, then the serum does not contain antibodies to the virus.

Depending on the type of test objects, NR can be tested in laboratory animals, chicken embryos, or cultured cells.

Normally, the antibody interacts with its homologous antigen in a strictly defined ratio, but the amount of antibody in the serum is not always clear, so when the reaction is carried out, not one, but a series of test tubes are taken. the virus is infused with diluted levels of serum in different proportions. To do this, different dilutions of serum are poured into the same amount of virus in the solutions, or different diluted levels of virus into the same amount of serum: NR these two measures are not technically the same.

### Putting the neutralization reaction with diluted whey

1. In a series of test tubes, the test serum (sz) is diluted twice in the same volume. The number of dilution levels varies depending on the high antibody titer in the serum.

2. An equal volume of homologous virus (SA) titrated in the same volume is added to all diluted serum and in an amount equal to 100 NM50 for each test object.

3.Serum mixtures with the virus are stored at a certain temperature for a certain period of time. For different viruses, these indicators may vary.

4. Each mixture is infected in equal groups of sensitive animals (test objects) with the same volume.

5. The effect of the virus on the test objects in each group is calculated depending on the dilution of the serum.

6. Diluted levels of serum that protect 50% of test objects from 100 NM50 exposure to the virus are calculated using Kerber or Reed and Mench methods.

7. The calculation of the dilution of serum was taken as an indicator of the titer of antibodies that neutralize the virus in it.

Example: Blood serum was obtained from a rabbit vaccinated against Newcastle disease virus. It is necessary to determine the titer of the antibody in it.

Given that the Newcastle disease virus kills chicken embryos, NR can be placed in chicken embryos as a test object. For infection of chicken embryos, an amount of 0.1-0.2 ml of infectious material is injected into the allantois cavity, so that each fetus is given a mixture of 0.2 ml of virus and serum. The titer of the virus should be 1000 HO'M50 \ ml in order to send 0.1 ml of 100 HO'M50 of the virus to each fetus.

To put the NR, we prepare a series of 2 times diluted series of the same volume of test serum (SZ).

To each dilution of the test serum, an equal volume of 1000 HO'M 50 \ ml titre of Newcastle disease virus-containing material (SA) is added.

Table 10. The result of a neutralization reaction with diluted whey

| Components of the reaction | Special diluted whey SZ | | | | | | | | Control of SA virus |
|---|---|---|---|---|---|---|---|---|---|
| | 1: 2 | 1: 4 | 1: 8 | 1:16 | 1:32 | 1:64 | 1: 128 | 1: 256 | |
| SZ + SA | + | + | + | + | + | + | + | - | - |
| | + | + | + | + | + | - | - | - | - |
| | + | + | + | - | - | - | - | - | - |
| | + | + | - | - | - | - | - | - | - |
| SZ-serum control | + | | | | | | | | |
| | + | | | | | | | | |
| | + | | | | | | | | |
| | + | | | | | | | | |

The mixture is kept at room temperature for up to 60 minutes (such conditions are required by the Newcastle disease virus), after which each mixture is inoculated with 0.2 ml of four chicken embryos. The outcome of infection is calculated after 48-72 hours, depending on the death of the fetus. A positive NR result is determined by the survival of the fetuses and a negative result by their death (i.e., the viral serum in the mixture does not have the ability to neutralize). Assume that we obtained the results shown in Table 10: we compile Table 11 to calculate the titer of antibodies in the serum.

**Table 11. The result of a neutralization reaction with diluted whey**

| **Dilute the whey** | **Number of chicken embryos** | **Infectious amount, ml** | **Tirik (+)** | **Dead (-)** |
|---|---|---|---|---|
| 1: 2 = $10^{-0.3}$ | 4 | 0.2 | 4 | 0 |
| 1: 4 = $10^{-0.6}$ | 4 | 0.2 | 4 | 0 |
| 1: 8 = $10^{-0.9}$ | 4 | 0.2 | 3 | 1 |
| 1:16 = $10^{-1.2}$ | 4 | 0.2 | 2 | 2 |
| 1:32 = $10^{-1.5}$ | 4 | 0.2 | 2 | 2 |
| 1:64 = $10^{-1.8}$ | 4 | 0.2 | 1 | 3 |
| 1: 128 = $10^{-2.1}$ | 4 | 0.2 | 1 | 3 |
| 1: 256 = $10^{-2.4}$ | 4 | 0.2 | 0 | 4 |

Table 12. The result of a neutralization reaction with a diluted virus

| Components of the reaction | Dilution of the virus | | | | | | | control of serum |
|---|---|---|---|---|---|---|---|---|
| | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ | $10^{-4}$ | $10^{-5}$ | $10^{-6}$ | $10^{-7}$ | |
| SA + SZ | + | + | + | - | - | - | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | + | + | - | - | - | - | - | - |
| | + | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | - | - |
| SA + NZ | + | + | + | + | + | + | - | - |
| | + | + | + | + | + | - | - | - |
| | + | + | + | + | - | - | - | - |
| | + | + | + | - | - | - | - | - |
| Virus control | + | | | | | | | |
| | + | | | | | | | |
| | + | | | | | | | |
| | + | | | | | | | |

We use Kerber's (our modification) formula to calculate which dilute level of serum protects 50% of chicken embryos from the effects of the Newcastle disease virus 100 HO'M50:

where $NM_{50}$ is the desired, diluted level of serum. Putting the data in the table into the formula, we get the following.

This means that when serum is diluted at $10^{-1,425} = 1:10$ at $^{1.425,}$ it can protect 50% of chicken embryos from the effects of 100 $HO'M_{50\ of\ the}$ Newcastle virus . When we find the number obtained from the antilogarithmic table, 1:10 equals $^{1.425} = 1: 26.5$. Thus, the titer of antibodies in serum is T = 1: 26.5.

**Putting the neutralization reaction with the diluted virus**

1. Two sets of double dilutions of the same volume of the virus are prepared (depending on the titer of the dilution level of the virus)
2. To all diluted in the first row add the same amount of test whey (slightly diluted)
3. The same amount of normal whey (NZ) is added to all dilute levels in the second row. has no antibodies against the resulting virus.
4. Serum and normal serum mixtures tested with the virus are kept at a certain temperature for a specified period of time: This figure is different for different viruses.
5. A virus-sensitive test taken in the same amount as each of the mixtures - infected in equal groups of objects (usually cultured cells, chicken embryos, or white mice).
6. Infection results are carried out on test objects in each group, a positive result is observed when the virus is affected, a negative result is observed when not affected.
7. The titer of the virus is considered separately when exposed to test serum ($T_{SA + SZ}$) and when the titer of the virus is exposed to normal serum ($T_{SA + NZ}$).
8. It is determined how much lower than $T_{SA + SZ}$, $T_{SA + NZ.}$ This number is called the **neutralization index** (NI). The higher the concentration of antibody in the serum being tested, the higher the NI.

If NI <10 is used, it is considered that there is no antibody in the tested serum against the virus, if NI> 10 indicates the presence of antibody (suspicious result up to NI 10).

If we calculate the titer of the virus in the presence of test serum and normal serum, then we obtain the following numbers:

$T_{SA+SZ} = 10^{2} NM_{50}$/ ml $T_{SA+NZ} = 10^{5} NM_{50}$/ ml

From this

Thus, NR determines the titer of the antibody in the serum to be tested when we put it in different dilutions of serum, the value of which is expressed in the dilution of 50% of test objects in the protection of the virus against 100 $NM_{50}$. The antibody contained in the NR serum, which is applied by diluting the virus, can determine how many times it neutralizes the infectious titer of the virus. This abstract number, called the neutralization index, is an indicator of the concentration of antibodies in the serum. It is known that the higher the concentration of antielo in the serum, the higher the neutralization index.

The neutralization reaction solves the following problems:

1) determines the virus neutralizing titer, or neutralization index of the antibody in the serum;

2) test for an unknown virus using pre-determined serums;

3) detects antigen similarity between viruses.

The degree of antigenic similarity is calculated using the Archetti formula.

, where $r_1 = NI_1 / NI_2$; $r_2 = NI_3 / NI_4$,

NI - virus 1; serum neutralization index relative to virus 2; $NI_2$ is the neutralization index of serum for 1 virus ; $NI_3$ is the index of neutralization of serum 1 virus to 2 viruses; $NI_4$ is an index of serum neutralization of 2 viruses to 2 viruses.

The advantage of NR is its versatility and high specificity. Its shortcomings include; requiring great service, strict adherence to the arrow of material and tools is required. Live test objects are very expensive, mathematical calculations are complex, and biological testing takes a long time.

It should always be remembered that the serums used in NR are free from thermostable inhibitors of the virus (when they are twice diluted) this process is carried out for 30 minutes at 56 $^{0}$C to 63 $^{0}$C depending on the type of animal .

It requires heating the whey of horses and guinea pigs at 56 $^{0}$C, chicken whey at 58 $^{0}$C, and whey of rats and rabbits at 60 $^{0}$C.

## Homework

Determination of serum antibody titer due to NR placement in cultured cell

## Material supply

Alcohol-fixed SPTs and normally grown cells should be obtained so that a neutralization reaction occurs; lighting microscopes and devices for observing solutions under a microscope.

## Approximate lesson plan (2 hours)

1. Control questions.
2. Teacher's explanation.
3. Independent work of students: a) calculation and tabulation of NR-results in cultured cells; b) calculation of antibody titer in serum.
4. Completion of the lesson

5. Assignment for the next lesson.

## Control questions

1. What is the essence of the neutralization reaction?
2. What modifications of the neutralization reaction do you know?
3. Explain what problems the neutralization reaction can solve.
4. What are the advantages and disadvantages of the neutralization reaction?

## Methodical instructions

1. The training requires initial preparation. Since it is not possible to fully release NR in a session, it is advisable to show it only in the final phase.

NR is convenient to prepare in cultured fixed cells. To do this, the desired type of cells are grown in test tubes (at least 50).

Each test tube is initially a layer of cells with saline solution, after washing the monosloy their medium is replaced with 70 $^{\circ}$ ethyl alcohol.

Such fixed cells are stored in a horizontal (5% tilted) position at room temperature for several months. They are little different from living cells, so they are easy to observe.

The second part of the test tubes with a cell is infected with a virus called SPT. Once the SPT occurs, they are also fixed with alcohol.

The SPT and normal cell solutions are then numbered according to the table.

It is enough to put a few of these sets for each study group (one set for every 6-8 students) they can replace NR.

In addition to a practical introduction to NR, it is an additional exercise in assessing the potency of viruses in cells.

2.Antitelolarning subtitle of the calculation of diluted serum of two 10 karralikga o'tkaziladi.Shu liquefied levels for pieces with only 2 = $10^{0.3}$ should not forget that.

3.The difference between the 50% protective power of whey calculated by Reed and Mench or Kerber formulas is that here the positive result is the absence of viral effects (negative biological testing) i.e. nothing is changed in the formula.

**"APPROVED"**
Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“ ____ ” _____–
2021.

**" Indirect hemagglutination reaction and its application in virology ."**
**laboratory work (2 hours)**
**PASSPORTS**

***M ashg'ulotning goal:*** Reaction essence is that the surface of red blood cells pre-soaked antigene gomologik serum (antibody) of the invention, capable of agglutination.

***Required equipment, reagents and equipment:*** antigenic erythrocyte diagnosticum for the diagnosis of adenovirus and infectious rhinotracheitis in large horned animals; test serums of large horned animals; BGAR diluent; 1ml pipettes; test tubes; Takachi or Titertek apparatus; whey; NaCL isotonic solution; distilled water; filter papers; container filled with disinfectant solution. If there is no Takachi or Titertek apparatus, the recesses of plexiglass panels are used.

***To check BGAR:***

It is advisable to place the BGAR microsulin using Takachi or Titertek apparatus and use the diagnostics issued for BGAR as a component. In the absence of the above, the BGAR macrometer can be placed on plexiglass panels.

Imitation is used instead of the components of the reaction. For this, a vaccine strain of the Newcastle disease virus was obtained instead of the tested positive serum; instead of antigenic erythrocyte diagnosticum, rooster erythrocytes are obtained.

***Books:***


1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.



***Developers:***
**Docent:** **Bazarov X.K.**
**Assistant:** **Nurgaliyeva J.S.**

**TOPIC: Indirect hemagglutination reaction and its application in virology.**

Indirect hemagglutination test (BGAR) is widely used in virological examinations.

The essence of the reaction is that antigens pre-absorbed on the surface of erythrocytes have the ability to agglutinate when they encounter homologous serum (antibodies).

This phenomenon is based on the detection and titration of antibodies in this method. Erythrocytes here act as carriers of specific determinants, and their agglutination occurs as a result of an antigen-antibody reaction, which is evident in their deposition. Because of this, BGAR is a serological reaction that is specific (Fig. 58).

BGAR should be distinguished from GAR. In GAR, erythrocyte adhesion (agglutination) occurs as a result of the interaction of its receptors with viral receptors (Fig. 59).

In BGAR, agglutination is caused by an antigen + antibody complex.

In the late 1940s, BGAR was first recommended in the detection of bacterial diseases. BGAR with viral antigens was first described by Bernet and Andersen (1946).

Further development was continued by Boyden (1951) after the introduction of the tannin treatment method on erythrocytes used.

Another type of BGAR was proposed in 1956. In this case, antibodies are absorbed on the surface of erythrocytes, and they undergo hemagglutination under the influence of their homologous antigens, forming a specific precipitate. The use of antibody-sensitized erythrocytes allows rapid detection of antigens in various materials. Antigens firmly attached to the surface of erythrocytes are called erythrocyte antigen diagnostics or erythrocyte sensitized antibodies.

Modifications of BGAR based on these two important methods are widely used in virology.

It includes the following steps:

a) preparation of sensitized erythrocytes (preparation of erythrocytes, their fixation, recognition and sensitization).

b) Putting the basic experience of BGAR. Usually, only basic experiments are performed in a veterinary laboratory, and the preparation of sensitized erythrocytes is carried out in biological production plants.

The process of preparation of sensitized erythrocytes (erythrocyte diagnostics) includes:

Preparation of erythrocytes 1. Sheep and human erythrocytes are widely used for this purpose.

Currently, erythrocytes of poultry (chicken, turkey, duck) are widely used for this purpose, because the diagnostics prepared from them quickly precipitate, which shortens the inspection time without loss of sensitivity.

Blood is drawn from an animal of the appropriate species by the general method. Fibrin-free blood is washed three times with an isotonic solution of sodium chloride using a centrifuge.

2-fixation of erythrocytes. The feature of fixed erythrocytes is that they are stored in suspensions for a long time without hemolysis. Formaldehyde, glutaric or acrylic aldehydes are often used to fix erythrocytes.

The method of fixation is different. In one of them; A mixture of 50% washed erythrocytes is added with the same amount of 50% formalin and washed 3 times in 0.15 NaCL (pH 7.2) solution 3 times, stirring occasionally at 37 $^{0}$C 2 h contact.

3 Recognition of erythrocytes. The mechanism of action of tannin on erythrocytes is poorly understood. However, the main goal is achieved - the recognized erythrocytes have the ability to absorb large amounts of protein.

Identification of formalinized erythrocytes By adding the same volume of 3% erythrocytes to a solution of tannin (1: 20000) centrifuged after 10-15 minutes of contact at 37 $^{\circ}$C, the precipitate was tripled (pH 7.2). washed with phosphate buffer.

Sensitization of erythrocytes 4, erythrocytes are mixed with an equal volume of antiviral fluid at a concentration of 10% in 0.15 M phosphate buffer (pH 6.4) . The mixture is kept at 37 $^{\circ}$C for 60 minutes, shaken from time to time, then centrifuged and washed 2-3 times. Dilute the precipitate of sensitized erythrocytes to a concentration of 1% and stabilize in a phosphate buffer solution with a pH (7.2) that preserves 1% normal serum of the rabbit.

Erythrocytes sensitized in this way are used for BGAR. It should be noted that the process of sensitizing erythrocytes with each viral antigen is different; its optimal options will be known in test experiments.

Basic experience of BGAR

The reaction is placed in test tubes or in the grooves of plexiglass panels. Recently, the micro-method of BGAR is applied using Takachi (Fig. 60) or Titertek apparatus. The tested and controlled whey is heated to 56 $^{\circ}$C for 30 minutes. The test serum was diluted twice in a volume of 0.2 ml of saline solution containing 1% normal serum of rabbits (pH 7.2-7.4) , then to each dilution of serum was added 0.2 ml of antigen-sensitized erythrocytes. The mixture is shaken and stored at room temperature. The result is calculated after 2-3 hours, depending on the sedimentation of erythrocytes in the control.

The experiment is performed with the following controls:

1) control of unexpected hemagglutination of erythrocyte antigen (sensitized erythrocytes + saline solution with 1% rabbit serum);

2) to determine the activity of sensitized erythrocytes (sensitized erythrocytes + positive serum);

3) to determine the specificity of sensitized erythrocytes (sensitized erythrocytes + normal serum);

4) on the absence of non-specific hemagglutinins in serum (test serum + unsensitized erythrocytes).

The result of the reaction is evaluated on a four-point scale;

(+++) - the edges of agglutinated erythrocytes form an uneven "umbrella";

(++) - A thin ring of non-agglutinated erythrocytes is formed around the agglutinated erythrocytes.

(+) - A wide ring of agglutination-non-lying erythrocytes is formed around the agglutinated erythrocytes.

(-) - erythrocytes form a disc-like precipitate — the result is negative.

As a result of the positive reaction, the agglutinated erythrocytes spread evenly to the bottom of the test tube or pit, forming an umbrella-like precipitate.

In the absence of agglutination, a definite result is obtained: the test serum with unsensitized erythrocytes;

Currently, the veterinary and biological industry of the country produces a set of erythrocyte diagnostics for infectious rhinotracheitis, proteinuria and adenovirus diseases of large horned animals.

Each kit is provided with a manual for use in the laboratory.

Thus, BAGR can solve the following diagnostic problems:

a) finds the antibody in the serum and determines its titer.

To do this, virus-sensitized erythrocytes are used;

b) detects and differentiates viral antigen.

For this, erythrocytes sensitized by antibodies are used.

Feature of BGAR: very sensitive (DPR in terms of performance, ahead of CBR and close to the immunoenzyme method) technique is simple and the response is ready after 2-3 hours.

But it is not without its shortcomings. This is due to the difficulty in preparing stable erythrocyte diagnoses (components must be extremely clean and a separate sensitization procedure must be established for each virus.

Homework

The titer of antibodies in the serum of the calf should be determined on the example of adenovirus of large horned animals.

Table 13. Determination of serum antibody titers in BGAR.

| Components | Dilute the whey | | | | | | | | Components | Control | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1:10 | 1:20 | 1:40 | 1:80 | 1: 160 | 1: 320 | 1: 640 | 1: 1280 | | 1 | 2 | 3 | 4 |
| Saline solution, ml | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | Sensitized solute cells | 0.2 | 0.2 | 0.2 | |
| Test whey, ml | 0.2 | Transfer from 0.2 ml | | | | | | | Physiological solution | 0.2 | | | |
| Sensitized solute cells | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | Positive whey | | 0.2 | | |
| | Keep for 2–3 hours at room temperature | | | | | | | | Negative whey | | | 0.2 | |
| | | | | | | | | | Tested whey, ml | | | | 0.2 |
| | | | | | | | | | Sensitized solute cells | | | | 0.2 |
| Calculate the result | +++ | +++ | +++ | +++ | +++ | - | - | - | | - | +++ | - | - |

Conclusion: The titer of antibody in serum is 1: 160

Material supply:

Antigenic erythrocyte diagnosticum for the diagnosis of adenovirus and infectious rhinotracheitis in large horned animals; test serums of large horned animals; BGAR diluent; 1ml pipettes; test tubes; Takachi or Titertek apparatus; whey; NaCL isotonic solution; distilled water; filter papers; container filled with disinfectant solution. If there is no Takachi or Titertek apparatus, the recesses of plexiglass panels are used.

Approximate lesson plan (2 hours)

1. Control questions
2. Teacher's explanation
3. Demonstration: a) Diagnostic kits prepared by the biological industry for BGAR.

b) Placement of the microusulus of BGAR using Takachi or Titertek apparatus.

4. Independent work of students; a) Preparation of micropanels, loops and pipettes for BGAR;

b) BGAR to determine the titer of antibodies against infectious rhinotracheitis virus or adenovirus in the blood serum of the calf;

c) Calculate the result of the reaction.

5. Completion of the lesson.
6. Assignment for the next lesson.

Control questions

1. What is the difference between indirect hemagglutination reaction and hemagglutination reaction?
2. Explain the essence of BGAR.
3. How is BGAR applied in practice?

**"APPROVED"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“ ” _____
2021.

**"Gel diffusion precipitation reaction."**
**laboratory work (2 hours)**
**PASSPORTS**

***M ashg'ulotning goal:*** diffuziyali gel presipitatsiya to know the nature of the reaction; study of test Gelda diffusion precipitation reaction (GDPR) . To know and master the essence of diffuse precipitation reaction, methods of its application and application in practice.

***Required equipment, reagents and instrumentation:*** Degreased vials , test tubes, 1 and 5ml pipettes, Pasteur pipettes, tripods, DPR components (antigens and serums) bovine positive serum, bovine normal serum, saline solution, rubber bulb. antigen extracted in pipettes, special antigen, precipitating serum, normal serum, Ulengut solutions, tripod,

***To* put DPR on *a* Petri dish *:***

Technically it is no different than putting on glassware, only here if the thickness of the layer is 3mm, the area of the recesses and the distance between them will also be slightly larger. Therefore, the time to calculate the result is extended to 5-7 days

**Method of placing DPR in capillaries**

Since this method is not widely used in practice, we will not dwell on it. DPR preparations applied to glassware can be dried after 48-72 hours and stained with a black amide color. This allows the drug to be stored for a long time and photographed.

DPR's achievements include:

injection technique is simple; quick response; the purity of the components is not necessary; does not require work in sterile conditions; components are finally required in small quantities; can work with any soluble antigens; the results can be photographed.

***Books:***


1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.

5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

**Docent: Bazarov X.K.**

**Assistant: Nurgaliyeva J.S.**

## TOPIC: Gelda diffusion precipitation reaction and its application in virology

Gel diffusion precipitation reaction DPR (synonyms: gel-precipitation reaction, gel secondary diffusion reaction) is based on the gel diffusion property of antibodies and dissolved antigens, the antigen-antibody complex does not have such a property.

The antigen-antibody complex is formed by the diffuse meeting of homologous antigens and antibodies against each other. It sinks into the gel layer to form precipitation lines.

The entry of one substance into the molecules of another substance at a certain temperature is called a diffusion phenomenon. Diffusion can occur in gases, liquids, solids, and gel media.

A gel is a system of uniformly dispersed liquid phases in a solid.

Such compounds include starch, agar, gelatin, and others. Agar is often used in laboratory practice.

Serum antibodies are a collection of immunoglobulin molecules that, despite their size, can easily diffuse in the gel.

Viral antigens are viral proteins. They are present in the virion and represent the corpuscle of the antigen, the adult of which does not diffuse if the gel.

Soluble antigens of the virus are easily diffused in the gel.

The method of placing the DPR in the gel is as if several grooves are made in the gel layer and antigens and serums are placed in them so that the serums and antigens are close to each other. From the pits, the antigen and serum diffuse to the gel thickness. It begins to diffuse in all directions from each cavity.

Antigen and serum diffuse opposite to each other on the surface between the filled cavities (secondary diffusion in the gel). If they are homologous to each other, an antigen-antibody complex is formed; it is no longer diffused because it is large, but the sinking (precipitating) leak forms a precipitation line.

It is well known against the clear background of the gel surface (Fig. 52).

Hence, if the diffuse antigen and serum are not homologous to each other, a precipitation line will not form. This approach addresses a number of issues in practice, the most important of which are:

1) Using the DPR scheme shown in Figure 53, it detects antibodies in serum (Z) relative to its homologous SA antigen (e.g. virus).

If serum Z retains antibodies against SA-specific antigen in its composition, a precipitation line is formed between Z and SA infiltrated pores. Such a precipitation line does not occur between the controlled normal serum NZ and SA infusion cavities.

2) The detection of an unknown (SA) in a material that is homologous to a specific serum SZ antibody is performed using a scheme similar to DPR (Fig. 54).

If the test material contains a homologous antigen to the antibodies in the serum (SZ), a precipitation line is formed between the A and SZ infiltrated pits but does not appear between the other pits;

3) Differentiation of an unknown virus can be performed using the scheme of DPR described in Figure 55.Here SA is an unknown antigen; $SZ_1 . . . . SZ_5$- Serums that contain antibodies to unknown antigens.

If a precipitation line appears, for example, between SA and $SZ_3$ filled pits, then the antigen being tested indicates that $SZ_{3 is}$ homologous to serum antibodies.

4) The titer of the antibody in the serum can be determined.

Here, the formation of a line of precipitation of serum with a homologous antigen at its highest diluted level (1:16 in our example) determines the index of antibody titer in serum (SZ) (Fig. 56).

DPR can be placed on a petri dish, on a piece of glass and on tubes. DPR is widely used for placing on glassware. To do this, you need: degreased glass panes; 2-5 ml marked pipettes and pasteurized pipettes; 5 mm diameter tube or special mold with a sharp tip; humidified chamber; a training pen or special device that can remove the gel if the pit; 1.0–1.5% agar prepared in saline or pH 7.2-7.4 phosphate buffer solution; antigens; whey

The purity of agar is of great importance, so well-cleaned Difko agar is used

High-titer specific antigens and serums are obtained that can form a clear precipitation line for work and provide antigen + antibody complex formation.

**Put DPR**

The order of the reaction is as follows:

Degreased glassware is stored in a cool, flat place (on the table). Pipette 1.5-2 ml of agar heated to 60 $^0$C and in a zigzag motion first pour around the glass and then fill the middle, there should be no waves and bubbles during pouring. The thickness of the agar poured into the glass is 1, It should be 5 - 2 mm, then left for 5-10 minutes to allow the agar to harden.

In the layer of solidified agar is prepared pits. The number of pits depends on the purpose for which the DPR is placed, the diameter of the pits is 5mm, the distance between the pits is 3-4 mm. Most often, two types of honeycomb placement are used.

Sharp-tipped tubes are used to make the pits. If a ready-made mold is not available, the cartridge case of any tube or small-caliber rifle (5.6 caliber) whose area fits is used. In this case, first draw a picture of the relative position of the pits on the paper, and if it is placed under a cast-iron petri dish or a piece of glass, cut the pits according to it.

The agar left in the pit is removed with a needle, the tip of a pasteurized pipette, or a training pen. To ensure that the liquids poured into the trough do not leak, a drop of melted liquid agar is pipetted to the bottom of the trough using a paste pipette and then withdrawn again. The depiction of this condition is done in appearance as shown in Fig. 57. However, in some cases when melted on a well-degreased glass, if it adheres well, the liquid poured into the groove will not flow

even if no additional liquid is dripped into it, and a precipitation line will form in the norm.

DPR components (antigens and serums) are poured into the prepared pits. When pouring the components, the pits should be filled to prevent them from mixing with each other. To do this, the liquids are dripped using well-stretched pasteurized pipettes.

DPR components are placed in drip panes in humidified chambers to prevent them from drying out. Any lidded container (desiccator, petri dish, etc.) can be used as a moistened chamber, on which is placed a cotton ball or filter paper soaked in water.

The humidified chamber is heated to room temperature or placed in a thermostat (in a thermostat) where diffusion is less rapid.

The calculation of the initial result of DPR is carried out after 8-10 hours, the main after 24 hours and the last after 48 hours.

**Put the DPR on a Petri dish**

Technically it is no different than putting on glassware, only here if the thickness of the layer is 3mm, the area of the recesses and the distance between them will also be slightly larger. Therefore, the time to calculate the result is extended to 5-7 days.

**Method of placing DPR in capillaries**

Since this method is not widely used in practice, we will not dwell on it. DPR preparations applied to glassware can be dried after 48-72 hours and stained with a black amide color. This allows the drug to be stored for a long time and photographed.

DPR's achievements include:

injection technique is simple; quick response; the purity of the components is not necessary; does not require work in sterile conditions; components are finally required in small quantities; can work with any soluble antigens; the results can be photographed.

But these qualities are offset by his low sensitivity, which is his main shortcoming.

Nevertheless, DPR is widely used in laboratory diagnosis of viral diseases.

Detection of rabies in patmaterials, rhinotracheitis of large horned animals, African swine fever of pigs, plague of dogs and other diseases and differentiation of viruses of infectious anemia, adenoviruses, respiratory syncytial disease, diarrhea of large horned animals and blood serum of large horned animals RS is widely used in the detection of antibodies to the virus.DPR is placed with positive controls in order to increase sensitivity, and the result is calculated depending on where the precipitation lines are bent.

**Homework**

To determine the presence of antibodies against the Newcastle disease virus in rabbit serum.

**Material supply**

Degreased glass panes; 2 and 5 ml marked pipettes; pasteurized pipettes; 5.6 mm caliber cartridge cases; 18-24 cm cuvette lined with moistened filter paper and covered; Petri dish lined with moistened filter paper; pen mounted pen; 1.2% agar prepared in saline solution; blood serum of rabbits immunized with nyukasl virus; allantois fluid of a chicken embryo infected with the nyukasl virus; normal blood serum of rabbit; normal allantois fluid of the chicken fetus.

**Approximate lesson plan (2 hours)**

1. Control questions
2. Teacher's explanation.
3. Demonstration: a) pouring agar on the glass of the product; b) preparation of pits; c) Drip DPR components into the pits.
4. Independent work; pouring agar on glassware; preparation of pits in the agar layer; dripping DPR components; equipping the humidified chamber; Draw a picture of DPR in a notebook.
5. View the DPR result and enter it into the table in the next session.
6. Assignment for the next lesson.

**Control questions**

1. What is the essence of DPR?
2. What issues can DPR solve?
3. What are the features and disadvantages of DPR?

**Methodical instructions.**

1.It is best to use difco agar for DPR, in the absence of difco agar can be used after cleaning far eastern agar. The agar cleaning method is described in a number of practice manuals

2. Obtaining antigens and serum for DPR. The allantois fluid of a chicken embryo infected with the Newcastle disease virus is used as a specific antigen (SA). It is convenient to use vaccine strains ($B_1$, H, La-Sota, Boron) for infection, their lyophilization can be obtained from relevant organizations.

Allantois fluid of uninfected chicken embryos is used as the normal antigen (NA).

To obtain a specific serum, it is sufficient to inject 5-7 ml of allantois fluid of an infected chicken fetus into the abdomen of 2-3 rabbits, 1.0 ml intravenously. After 12–14 days, 15 ml and 5 ml intramuscularly are administered intravenously by the method of repeated Bezredka.

After two weeks, blood is drawn from the veins of rabbits or due to anemia. The serum of the rabbits is taken and the titer of the antibodies in it is determined using the hemagglutination cessation reaction. It should not be less than 1:64.

In addition to specific antibodies against Newcastle disease virus in rabbit serum, it should be noted that antibodies against allantois fluid proteins are formed, which also form precipitation lines, which should be taken into account when placing DPR. The dual-specific antigen + antibody used to inject DPR can also be used from diagnostic kits produced in biofactories (e.g., from a kit used to diagnose infectious anemia in horses).

**"APPROVED"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____ Z.J. Shapulatova
"____"_____2021.

**"** Immunoenzyme Analysis (IFT) **"**
**laboratory work (2 hours)**
**PASSPORTS**

***M Purpose of the lesson:*** Several dozen modifications of the IFA differ. The most common method of solid-phase heterogeneous immunoassay is ELISA (ensive linked immunosorbent assay). IFA is often used for two purposes: to detect antigens of different infectious agents: to determine the binding of antibodies (Lg A, Lg M, Lg G) to antigens of different pathogens.

***Required equipment, reagents and equipment:*** 96-cell polystyrene tablet , Antibody IgG serum fraction, Antigen bacterial or viral purified proteins, enzyme: horseradish peroxidase XP, substrate: tetramethylbenzidine TMB, orthophenyldiamine OFD.

***To put the IFA :***

For serodiagnostics, 96-ply polystyrene tablets are used, and its pits are pre-soaked in antigen. In this case, antibodies that are homologous to the antigen attach to it. Unbound antibodies are washed away. The cells are then infused with antibodies against the enzyme-labeled immunoglobulins. Interacts with established antibodies. The addition of a chromogenic substance after washing allows the calculation of the reaction result depending on the development of the dye in the cells. Its intensity depends on the amount of enzyme. When measuring the optical density of a liquid in a cell and comparing it with control samples, the concentration of antibodies per unit volume is calculated. It should be borne in mind that each test system has its own indicators of taking into account the results of the norm and pathology, which should be taken into account in the intervention of the results.

***Books:***


1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

Docent: Bazarov X.K.

**Assistant: Nurgaliyeva J.S.**

**Topic: IFA (Enzyme-linked immunosorbent assay)**

Immunoenzyme assays are laboratory tests based on the specificity and high selectivity of antigen reactions .

Several dozen modifications of the IFA differ. The most common method of solid-phase heterogeneous immunoassay is ELISA (ensive linked immunosorbent assay). IFA is often used for two purposes: to detect antigens of different infectious agents: to determine the binding of antibodies (Lg A, Lg M, Lg G) to antigens of different pathogens.

With the help of IFA it is possible to detect antibodies against infectious diseases of all genital organs.

IFA is based on the immune response of antigens and antibodies. The binding of the enzyme to the antibody allows to take into account the result of the antigen-antibody reaction, depending on the application of the enzymatic activity or increase in the rate of death . The mechanism of the reaction in a simplified form can be imagined below. The first reaction takes place between the detectable Lg (Av) and the antigen whose pathogens have been cleared and hardened on the surface of the immunological tablet. A second immunological reaction is performed to determine the immunocomplex formed. It is characterized by the enzyme peroxidase as an antibody against specific antigen-binding immunoglobulins . (Av) serves as a conjugate. An enzymatic reaction then occurs as a result of the catalysis of the enzyme portion of the molecule. The intensity of the color depends on the amount of immunoglobulins in the sample . At the end of the reaction, photometric measurements are made using special instruments. The higher the optical density, the greater the amount of specific antibodies in the sample.

***Putting IFA***

For serodiagnostics, 96-ply polystyrene tablets are used, and its pits are pre-soaked in antigen. In this case, antibodies that are homologous to the antigen attach to it. Unbound antibodies are washed away. Antibodies against the enzyme-labeled immunoglobulins are then injected into the cells. If antibodies are present in the samples to be tested, then they participate as antigens at this stage . Interacts with established antibodies. The addition of a chromogenic substance after washing allows the calculation of the reaction result depending on the development of the dye in the cells. Its intensity depends on the amount of enzyme. When measuring the optical density of a liquid in a cell and comparing it with control samples, the concentration of antibodies per unit volume is calculated. It should be borne in mind that each test system has its own indicators of taking into account the results of the norm and pathology, which should be taken into account in the intervention of the results.

There are methods of applying enzyme binding using biochemical immunobiological and genetic engineering.

ELISA (ensive linked immunosorbent assia) Detection of an enzyme bound to an immunosorbent.

Using special spectral instruments on polystyrene tablets, it can be detected in 96 cells in 96 cells for 1 minute. In general, it takes 3-4 hours to set a heterogeneous IFA.

Sensitivity of IFA is measured in micrograms and nanograms in 10-9-10-12 moles of protein at concentrations in 1 ml of substance.

One of the difficulties in setting IFA is related to the substrate specificity of the enzyme and the affinity of the antibodies against the background of the compounds under investigation. The presence of cofactors inhibitors and stimulants to be tested is also a disadvantage of IFA. The disadvantage of IFA is that it is not possible to distinguish native proteins that retain antigenic determinants and their biologically inactive fragments. Decreased catalytic properties of the enzyme may also interfere with conjugation with the antigen. The application of IFA only to all studied systems is also limited (which includes purified antigen and highly specific antibodies).

The high sensitivity and ability to test (from a few minutes to several hours), the ability to test many samples at once, and the need to pre-clean and concentrate the samples give IFA an advantage over other testing methods.

That is why IFA is widely used today in healthcare, agriculture, industrial biotechnology, nature conservation and scientific research. By identifying the pathogens of any disease in humans and animals, their individual antigenic components by antibodies to these components , or synthesized in its pathological processes that are not specific to a healthy organism (in tumors, cardiovascular, endocrine diseases) ) to identify and diagnose substances.

Dispancilization of the population, epidemiological control, contamination detection, to determine the composition of the drugs in the blood, tissues, drugs, animal and plant virus diseases, antibiotics, vitamins, biologically active compounds for industrial biotechnology medical drugs in AIDS and hepatitis C Lamb Checking and controlling for the absence of shooter viruses is a small list of areas of practical application of IFA.

Current fundamental research in the fields of biochemistry, cell physiology and immunology, microbiology, virology, oncology is inconceivable without IFA.

Control questions.

1. Types of IFA reaction?
2. What does the IFA test determine the composition of the serum?
3. How many days after the formation of antibodies in blood serum?

**"APPROVED"**
Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“____” _____–
2021.

**"Polymerase chain reaction (PCR)"**
**laboratory work (2 hours)**

**PASSPORTS**

***M ashg'ulotning goal:*** the basic principles of PCR, PCR conditions and factors affecting the types of PCR, PCR laboratory planning and contamination control, and the limitations of their earnings, opened in 1983 by Kary Mulligan, news, first published in 1985 , Was awarded the 1993 Nobel Prize in Chemistry.

***PCR treatment:*** equipment, Micropipets, Thermocycles, Electrophoresis equipment, Power supply, Equipment for photo documents, Stages of PCR analysis, Sampling, RNA and DNA separation, Detection of PCR products
Data analysis

***To separate RNA and DNA:***

1. Method of using phenol and chloroform,
2. Method of application of silicon sorbent,
3. Boiling method,
4. Method of using sorbents Chelec / Instagene

***Conditions and factors affecting PCR***

***Mixture:*** DNA matrices, Nucleotides, Magnesium chloride ($Mg^{2+}$), DNA polymerase ( *Taq* ), Composition of primers, PCR inhibitors

***PCR Inhibitors***

Hemoglobin, Heparin, Immunoglobulin, bile acids, mucopolysaccharides (sputum, mucus), Hormones, Enzymes (proteinase), Metal ions (Ca2 +, Fe3 +), Salts (bile fluid)

***Books:***

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.

4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**

## Topic: Polymerase chain reaction (PCR)

Basic Principles of PCR, Conditions and Factors Affecting PCR, Types of PCR, Planning and Contamination Control of PCR Laboratory, Achievements and Limitations, Discovered by Kary Mullis in 1983 , First published in 1985, Chemistry in 1993 He was awarded the Nobel Prize.

**What is PCR, why do you need this method?**

The PCR method amplifies a portion of DNA under laboratory conditions, spacing two strands in a specific sequence.

Producing an unlimited number of copies from a single DNA copy.

Quick and inexpensive copying from a DNA-specific fragment material that isn't much.

PCR treatment: equipment, Micropipets, Thermocycles, Equipment for electrophoresis, Energy source, Equipment for photo documents, Stages of PCR analysis, Sampling, RNA and DNA separation, Detection of PCR products

Data analysis

**Separation of RNA and DNA**

Phenol and chloroform application method, Silicon sorbent application method, Boiling method, Sorbent application method Chelec / Instagene

**Consisting of 3 stages, 30-40 cycles:**

Step 1 - Denaturation of the matrices (1 min. 95 $^{0}$C)

Step 2 - Burn the primers (45 seconds. 55-65 $^{0}$C)

Step 3 - Extend the primers (2 min. 72 $^{0}$C)

This 3-phase PCR forms a cycle of amplification

**Conditions and factors affecting PCR**

Mixture: DNA matrices, Nucleotides, Magnesium chloride ($Mg^{2+}$), DNA polymerase ( *Taq* ), Composition of primers, PCR inhibitors

**PCR Inhibitors**

Hemoglobin, Heparin, Immunoglobulin, bile acids, mucopolysaccharides (sputum, mucus), Hormones, Enzymes (proteinase), Metal ions (Ca2 +, Fe3 +), Salts (bile fluid)

**Types of PCR**

1. Reverse transcriptase PCR
2. Cellular PCR
3. Hot start PCR
4. Numerical PCR

5. Multiplex PCR
6. In Situ PCR
7. Real-time PCR

**The main stages of planning the rooms of the PCR laboratory**

Reagent preparation room

Sample processing room

The most polluted room is the entrance room to another room by taking off the robe

Detection and amplification room for PCR products

**Contamination control**

**Physical method:**

Separation of the preparation zone for the reaction (before amplification) and (after amplification), the appropriate use of laboratory equipment, the use of nozzles that always have an aerosol barrier. Autoclaving and alignment (use as), adding control samples

**Chemical method:**

UV irradiation, UTF (Ditr) (uracil - DNA, glycosylase (UNG **)**

**PCR - convenience**

Copying DNA-specific fragments from a small amount of material is quick, inexpensive, and simple. Radioisotope and toxic drugs are not used. PCR - exponential accumulation of products (there is a chance to encounter 1-2 copies of DNA in the sample). High specificity of encountering macro and microorganisms in genetic material.

**PCR limitation**

It takes a lot of work, the lack of automation is just not enough to differentiate production by size

The results are not shown in figures

Dyeing with brominated etidium is difficult to quantify

Low sensitivity, not always isolated by the presence of the number of DNA available.

After the PCR, of course, a revision is required.

Interpretation of results may be subjective.

**CONCLUSION**

It is a simple method that allows you to take multiple copies of specific DNA fragments

PCR consists of three main stages: denaturation, annealing, and transmission.

Successful completion of the work, perfect preparation of the reaction mixture and setting the conditions of the cycles.

**Control questions.**

1. What is the purpose and essence of the PCR reaction?
2. How many stages does the PCR reaction consist of?
3. What is the planning of PCR laboratory rooms?

**"APPROVED"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____ Z.J. Shapulatova
“ ____ ” _____–
2021.

**"Solving diagnostic problems."**
**laboratory work (2 hours)**
**PASSPORTS**

***THE purpose*** of the training: to increase the level of knowledge of students on the methods of diagnosis of viral diseases, to increase the formation of initial skills in diagnostic work and to provide insights into the practical application of general methods of working with viruses.

***Methods of*** examination ***:*** Depending on their type, cuts, marks, greases or suspensions are made of pathological material. Laboratory diagnosis of viral diseases can be divided into three groups.

Express methods, Virological methods, Serological methods of diagnosis

***<u>To find virions :</u>***

1. Virions in pathological materials can be detected using an electron microscope.
2. Only smallpox virions in mammals and birds can be detected using a light microscope because their size is 250 nm.

***<u>For biological testing:</u>***

1. Infection of biological test-laboratory animals and naturally susceptible animals for experiments with material obtained from sick animals (infection of all living objects is assumed).
2. Biological testing is performed to evoke specific clinical signs of the disease and similar pathological changes.

***<u>To</u>* <u>find viruses *:*</u>**

1. Infected laboratory objects with the prepared suspension (presumed to contain the virus) are often used for this purpose in laboratory animals, chicken embryos and cultured cells.
2. Methods and ways of infection are determined by the tropism of the virus.

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***Developers:***

**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**

## TOPIC: Solving diagnostic problems

The purpose of the training is to increase students' knowledge of methods of diagnosis of viral diseases, to increase the formation of initial skills in diagnostic work and to provide insights into the practical application of general methods of working with viruses.

The process of making a diagnosis is called diagnostics.

Diagnosis consists of the observation and examination of patmaterials obtained from the examination of a sick animal, the evaluation and analysis of the results of the examination. To draw conclusions about the cause of the disease and the form of the disease and the condition of the organism of the sick animal.

Until effective methods of treatment of infectious diseases are developed, their control is limited to diagnosing and carrying out preventive measures against them;

Therefore, the diagnosis of infectious diseases caused by viruses plays a crucial role in the system of measures to combat them.

Prompt and accurate diagnosis ensures the elimination of the origin of viral diseases, which allows a specific diagnosis of the epizootic situation and helps to carry out appropriate rehabilitation measures.

Misdiagnosis or delayed diagnosis can lead to the spread of the disease, making it difficult to take measures to eliminate it, causing a lot of economic damage, especially in rapidly spreading infectious viral diseases (protein or very white). The plague of pigs) is an example.

Therefore, the diagnosis of viral diseases should be made correctly and quickly. Unfortunately, these two requirements contradict each other, the sooner the diagnosis is made, the less accurate the result will be, and the later the diagnosis will be, the more accurate the result will be.

In most cases, a diagnosis requires multiple analyzes and the collection of a whole different set of data.

The diagnosis is therefore the result of long and deliberate labor. The most commonly studied data sets are: epizootiological data on the origin of the disease; symptoms of the disease; pathological changes in organs and tissues; results of laboratory examination of pathological material obtained from animals.

Diagnosis of viral diseases, as a rule, involves two stages: clinical-epizootiological (pre-laboratory) diagnosis is carried out on the farm and allows to make an initial diagnosis of the disease. Laboratory diagnosis is performed in specialized laboratories (or laboratory departments) and allows a final diagnosis to be made.

The data obtained are used in the first stage of diagnostics. These include clinical signs of the disease, epizootiological data and the results of dissection (pathological changes).

Epizootiological data include information on the cause of the disease in animals, the rate of spread to the regions, the species of infected animals, the course of the disease and the rate of development.

Symptoms of the disease are the symptoms of the disease observed during the clinical examination.

These changes (than normal) include body temperature, number and shape of breaths, number of pulses, appetite disturbances, behavioral changes, condition of skin and mucous membranes, activity of digestive and excretory organs, and so on.

Pathological changes are detected as a result of dissection of dead and compulsorily killed animals. They occur microscopically, ie in cells, tissues and are detected by histological methods, as well as changes that do not occur in the organs of a healthy animal (shape, size, color consistency, condition, the appearance of nodules, blood transfusions).

The data obtained will be sufficient to determine whether the disease is contagious or not. In an infectious disease, it is possible to tell which disease is present by carefully analyzing the collected data and comparing them.

Also, each of them (viruses and other pathogens) is characterized by a complex of distinctive clinical signs, accompanied by epizootiological conditions and pathological changes. In this case, the clinical and epizootiological diagnosis is reliable. But in most cases it is an initial and probable diagnosis; especially in a number of infectious diseases caused by viruses, epizootiological data, clinical signs and pathological changes in them are very similar, so it is not possible to diagnose the disease with complete confidence. the process of diagnosing etiological factors (e.g., when a disease is caused by two different viruses or by a virus and bacteria at the same time) is further complicated.

Sometimes a reliable diagnosis can be made by observing the clinical signs of the disease and studying the epizootiological and pathological data.

For example, if the disease infects large horned animals and pigs at the same time, is very acute, and spreads very quickly, infecting herds in a short period of time, and horses are not infected, aphthae can form in the mouths of infected animals. If saliva is present and lesions are observed between the hooves, it can be easily diagnosed as a protein disease. At this point, it is necessary to determine the type and variant of the protein pathogen.

The approximate nature of the initial diagnosis is of great importance because the diagnosis is made in a very short time and veterinarians suspect several diseases at once.

The final diagnosis of viral diseases is often based on the results of laboratory tests. Pathological materials obtained from sick animals are usually required for laboratory testing.

The task of the test is to find viral antigens in the pathological material and determine their type.

The active forms of the virus are found in susceptible laboratory animals by biological testing or, in rare cases, by hemagglutination reaction.

We know the presence of viruses in the animal's body from the presence of antiviral antibodies in the serum and the presence of viral antigens in the patmaterial derived from them. Their detection and differentiation is performed using serological tests. At the same time, the presence of the virus in the body is determined by finding the virus in the material.

All this is found by microscopic methods. Laboratory diagnosis of viral diseases can be divided into three groups.

**Express methods.** Based on the encounter of the virus in the patmaterial. These methods quickly detect the presence of a virus, but the accuracy of the data obtained is more questionable.

**Virological methods.** This method is based on isolating unknown viruses in the pathological material and distinguishing them using serological reactions. This method, in contrast to its labor-intensive, lengthy investigations, provides an accurate answer about the trigger, but the response is retrospective.

## Serological methods of diagnosis

The aim was to determine the titer of antibodies in a double serum obtained from sick animals. It is very reliable and gives the right answer, but it is also retrospective.

Such pathological material is obtained from sick animals, which is assumed to have a small concentration of the virus.

Pathological material obtained from dead or compulsorily slaughtered animals should be obtained no later than 1-2 hours after the clinical death or slaughter of the animal (if delayed, it will not be possible to obtain material due to bacterial contamination of the material).

As pathological material, fragments are often taken from injured organs (several cubic centimeters in size):

a) different from healthy organs (with the appearance of shape, size, color, softness or hardness and various changes);

b) which can be traumatic and contain the virus, it is considered in the presence of pre-mortem clinical signs.

c) most often the virus is stored in the liver, spleen, lungs, brain, lymph nodes, and kidneys.

The pathological material presented in the laboratory is cleaned of preservatives, weighed and divided into 2-3 parts.

An inspection plan is then developed based on the content of the dispatch letter, the quantity of material, its quality and appearance.

The plan envisages the study of pathological material in at least 2 ways, and it is necessary to obtain results as quickly as possible and to prove them using reliable methods as much as possible. Therefore, the material is divided into parts (one part is left unattended).

**Depending on the type of inspection methods, cuts, marks, greases or suspensions are prepared from the pathological material.**

**Express methods.** Using these methods, it is possible to quickly detect virus-antigens (viral proteins) and virions in pathological material. The methods of their rapid detection are combined into a group of express methods, and the diagnosis made using them is called express diagnosis.

**Detection of viral antigens.** Any serological reaction can be used to detect viral antigens in the pathogen material, and the antigen as a pathological material (directly or after appropriate treatment), as an antibody - a pre-known antibody, hyperimmune serum is prepared in advance ).

For this purpose, favorable immunofluorescence (IFR), complement binding reaction (CBR) or diffuse precipitation reaction (DPR), as well as immunoenzyme detection methods are used.

The IFR method can respond within 2–4 h to the presence or absence of any viral antigen in the pathological material.

The ease of the reaction is that the current response technique requires less of simple components, does not require the purity of the material being tested, is highly sensitive and universal. The disadvantage of this reaction is that non-specific irradiation is observed. Viral antigens in patmaterial can also be detected using CBR.

However, this reaction is less sensitive than IFR. To put it, you need a certain amount of patmaterial that maintains a sufficient concentration of viral antigen.

In addition, it is necessary to prepare a suspension of pathological material, it should be soaked and cleaned of anticomplementary substances (the choice of method of treatment depends on the condition of the pathological material and the capabilities of the laboratory). CBD is one of the most labor-intensive reactions and requires precise titration of the components used.

However, this reaction is widely used in veterinary practice, and the DPR sensitivity is also lower than that of the complement binding reaction. The above-mentioned serological reactions detect the viral antigen in the pathological material in a very short time (2-3 days) and determine which type it belongs to. The best of these is IFR.

**Find the input bodies.** The presence of some viruses in the body is determined by finding the inclusions in the pathological material. Inserted bodies are formed from adult virions (colonies) that accumulate in the cells during the multiplication of the virus in the cell and under its influence, and from the injured material of the cell.

Insects often consist of cell materials or combinations of virions.

The inclusions produced by different viruses are different from each other, indicating the presence of a specific disease virus when they are found.

It is known that about 100 viruses form cells in the process of reproduction in cells, but in practice a few of them are important.

The diagnostic value of the Babesh-Negri inclusions produced by the rabies virus in the cytoplasm of the nerve cells of mammals is enormous.

Influenza is caused by sheep pox virus (Borrel's carcass), avian pox (Bollinger's carcass) in dogs, plague (lentsa carcass), and chicken infectious laryngotracheitis (Zeyfred's carcass).

But because there are no special methods to determine their presence (general staining methods are used). Inserted corpuscles play an auxiliary role in diagnosis (other than Babesh-Negri corpuscles).

## Finding virions (elemental body of viruses)

Virions in pathological materials can be detected using an electron microscope. Only smallpox virions in mammals and birds can be detected using a light microscope because their size is 250 nm.

In this method, called viroroscopy, papules or vesicles of sick animals are cut and grease or stamps are made on the glass of the item.

The dried grease and marks are stained with ammonia silver by the Morozov method and examined using a drop of immersion oil under a microscope. The method of viroroscopy of smallpox is very simple, but it is necessary to have sufficient experience to identify elementary bodies.

A positive biological test result with a positive viroroscopy result is sufficient to diagnose smallpox.

## Biological testing and immunological sampling.

Biological testing is also added to express diagnostic methods, but conditionally added to express methods (immunological sample as well).

Infection of biological test-laboratory animals and naturally susceptible animals for experiments with material obtained from sick animals (infection of all living objects is assumed).

Biological testing is performed to evoke specific clinical signs of the disease and similar pathological changes.

Such diseases are very rare, including biologically tested in rabbits suspected of having Aueski disease, in rabies

-in some cases in mice, rabbits, proteinuria- in guinea pigs, large horned animals - in calves, vesicular stomatitis - in guinea pigs and white mice, in sheep contagious ecthyma and smallpox - in lambs; biologically tested in chickens with infectious laryngotracheitis and bronchitis.

Immunological sampling in immunized and non-immune animals, i.e., biological testing, allows the disease to be identified and differentiated.

In the plague of large horned animals, the immunological specimen is placed in calves, in the African plague of pigs — in piglets.

Biological testing, and especially immunological sampling in naturally inclined animals, is extremely expensive and rarely used due to its difficulty.

Biological testing is widely used in laboratory animals, but the answer is not always clear.

In general evaluation of express-diagnostic methods, the following can be said; they briefly answer the question of the type of virus in the pathological material obtained from the body of a sick animal and its presence. That is their main feature. However, the degree of accuracy of the answer obtained is usually not as high, so it is necessary to prove the results of express-diagnosis by other methods.

Therefore, if only a portion of the pathological material presented for examination is used for examination, the remainder is used for other virological examinations.

Typically, these two-way screening methods are started at the same time, but the response of the express-methods is obtained first, followed by those of the other methods, which prove the correctness of the express diagnosis.

**Virological methods.** These include methods that indicate the active form of the virus in the pathological material and then differentiate it. Indication of viruses is usually carried out by biological testing in sensitive, living laboratory objects, and their differentiation is carried out by means of serological reactions.

These methods can be conditionally called virological (or rather virological matter) because the function of other laboratory methods is also to detect viruses and distinguish them from their inactive form or their trace in the body.

When examining some pathological material by virological methods, the material should be obtained under sterile conditions and the virus in it should be well preserved. In laboratories, a mixture (suspension) is prepared from them, which is regularly cleaned of parts and fragments of material (centrifuged) and bacteria and fungi (with antibiotics or filtered).

**Finding viruses** . Infected laboratory objects with the prepared suspension (presumed to contain the virus) are often used for this purpose in laboratory animals, chicken embryos and cultured cells. Methods and ways of infection are determined by the tropism of the virus.

The selection of objects takes into account the origin of the pathological material and their sensitivity to viruses when selecting objects.

When laboratory objects are selected for the indication of viruses, the clinical and epizootiological data of the disease, the type of animal from which the pathological material was obtained and the type of pathological material are considered.

Often, this information allows you to select the appropriate laboratory systems and methods of infecting them. Therefore, methods of infection of chicken embryos are used to search for the virus in pathological material obtained from sick birds. Here, it is assumed that the virus developed in the body of adult chickens can easily develop in the chicken embryo.

If the pathological material is derived from mammals, it is advisable to infect the cultured cells to find the virus in the pathological material.

This is based on the fact that the virus in the pathological material adapts to the cells of certain animals and rapidly induces SPT.

The selection of laboratory animals to indicate the virus in pathological material is extremely complex. It is estimated only on the basis of the initial diagnosis, which is based on the ability to select the pathogen depending on the type and sensitivity of laboratory animals.

When laboratory animals are infected for experiments, the virus can enter any cell in the pathological material even after infection (infection of the brain with a suspension prepared from the brain, into the abdominal cavity with a liver suspension, lung suspension or high nasal infection with airway washing, etc.) tropism of the virus should also be taken into account.

Despite the above, in the first passage conducted to detect the virus in the pathological material, the laboratory systems did not react significantly to the virus. This often happens because the virus is not adapted to laboratory animals or when its amount is not enough to trigger a specific reaction. In this case, the first passage is considered a “blind passage,” followed by a second passage for the laboratory animals. If the second passage does not cause a reaction to the virus, it is also considered a "blind passage" and a third passage is performed.

Sometimes the virus can have a specific effect when it passes 10 times, because in the meantime the virus is sufficiently adapted to the organism of laboratory systems and accumulates enough to trigger a specific reaction. Usually there are 3-4 "blind" passages.

**Virus differentiation.** Thus, the active virus in the pathological material is found in one way or another.

The next task is to identify which virus it is and differentiate it.

In some cases, it is possible to distinguish which virus is which in the process of virus detection.

It helps to differentiate between taking into account the type of animal from which the pathological material was obtained, the type of sensitive laboratory systems, and the nature of the virus exposure to laboratory objects.

In addition, reliable identification of the type of virus can be achieved by studying the induction of hemagglutination and hemadorsorption, as well as its sensitivity to ether. However, definitive differentiation of the detected virus is performed using any appropriate serological test. The virus under study in this case acts as a viral antigen, and pre-prepared serums are used as specific serums. Fast-acting antiviral serums (conserved) are used.

It is necessary to study the properties of the isolated virus and obtain a suspension of the required volume for use as an antigen.

Therefore, before the isolated virus is identified, it is propagated by infecting the same laboratory systems from which animal it was isolated.

The choice of serological reactions for definitive identification of viruses is determined by the nature of the virus and the ability to carry out this or that serological reaction.

If the virus exhibits hemagglutination properties, it can be reliably identified using a hemagglutination inhibition reaction.

If the virus is isolated from cultured cells and exhibits hemadorsorption ability, it is advisable to identify it using a hemadorsorption stop reaction.

In the absence of the above features in the isolated virus, it is identified using a neutralization reaction at the same laboratory facilities.

However, it is taken into account that the neutralization reaction is labor-intensive, long-lasting, and ultimately expensive. Therefore, a diffusion precipitation reaction can be used in the gel.

This procedure is simple and easy, gives fast results, consumes few ingredients, but is characterized by low sensitivity, and therefore use when the titers of antigens and serums used in it are high enough (such serums are not always obtained). possible. CBR is also available.

However, it requires a lot of work, the need for components is great, it uses only soluble antigens, and antigens that are free (or exempt) from anticomplementary properties are used. Therefore, CBD is suitable for all viruses.

## PROOF OF THE ETIOLOGICAL ROLE OF THE VIRUS

Even if a serological test is selected and the isolated virus is identified, its etiological role in animal disease must still be proven.

If the titer of the antibody in the double serum obtained from animals from which the pathological material was obtained is higher than that of the isolated virus, then the disease is proven. This requires additional checks. In some cases, in order to prove the etiological role of the isolated virus in the disease of animals, it is carried out by infecting healthy animals of this species (usually young animals) and invoking the same disease in them. But this method, apart from its value, is not able to repeat the disease all the time.

A diagnosis based on the results of a virological examination can be considered reliable. But it is associated with lengthy labor-intensive inspections.

### Serological diagnostic methods

Serums of sick animals are examined by serological methods. Usually a pair of serums is used, and blood is taken from each sick animal twice every 2-3 weeks to obtain them.

Double sera should be taken at the beginning and end of the disease, and in practice this time is rarely determined.

To make the serum sterile, blood collection and separation of its serum is performed under aseptic conditions.

They are poured into capped test tubes and stored in the refrigerator or frozen (minus 25 $^{0}$C and below) until inspected .

The most important issue is to determine the titer of antibodies in the double serum against the virus, which is considered a probable, causative agent of sick animals.

The basis for the search for antibodies to the virus is the observation of epizootiological data, the initial diagnosis of organized clinical signs and pathological changes.

The presence of antibodies in serum and its titer are determined in serological reactions using presumed viral antibodies (these must be in the laboratory, they are prepared in advance).

Serological tests are selected to work with the virus, taking into account the capabilities of the laboratory and the qualifications of the staff.

It also takes into account the fact that it requires a quick response and a lot of work. If a known virus has the ability to hemagglutinate, the problem is easily solved. In this case, it is advisable to use a simple and fast-responsive hemagglutination stop reaction to detect the antibody and determine its titer.

The diffuse precipitation reaction is also simple, easy, and quick to perform, and requires a high serum titer, whereas the precipitation lines are not clearly known or appear at all. It is also very difficult to reliably titrate the antibody in this

reaction. Therefore, DPR is omitted when a rapid response to the presence of antibodies to a non-agglutinating virus is obtained and when an approximate initial response is required.

The indirect hemagglutination reaction is finally used to determine the titer of antibodies in the serum against various viruses, which is a sensitive and universal reaction.

He responds quickly. But to put it down, you need a supply of virus-sensitized and conserved erythrocytes, which is a problem for many labs. At the same time, this reaction requires purity of the components used and is distinguished by its "delicacy". Therefore, its use in practice is limited.

**The** binding phase of the **complement binding reaction** can be used to determine the titer of antibodies against most viruses when carried out under prolonged cold conditions.

However, CBR requires pre-compatible antigens with components that are characterized by their high labor intensity and exact quantities. However, practitioners know the procedure for placing CBR and it is widely used in diagnostic work.

It responds to many viruses (except rabies and swine fever) by neutralizing a reliable result on antibody titration, and it also finds virus-neutralizing antibodies that protect the body from the virus.

If animals are used as an indicator in it, it will take some time to put this reaction.

The time to set the reaction is reduced to 1-2 weeks, and if chicken embryos or cultured cells are used as an indicator, the time is further reduced.

However, even in this latter case, a lot of work is required to put the reaction .

Due to its good properties, the neutralization reaction is very necessary to determine the titer of the antibody in the serum.

After determining the titer of the antibody in the double serum, the result is interpreted as its titer increases. If the titer of the antibody in the serum is 4 times higher than the first serum titer, the time of the first blood sample from the animal indicates an active course of the infectious process.

It is also clear that the disease is caused by a virus that causes an increase in serum antibodies. The disadvantage of serological diagnosis is its retrospective, because by the time the diagnosis is made, the animal that received the double serum will have recovered or died.

However, the diagnosis made by serological methods gives a reliable picture of the disease and is also of great importance in the identification of measures to eliminate viral diseases and in the study of the epizootic situation.

(However, the diagnosis is irrelevant to an animal with double serum.)

The methods and scheme of diagnosis of all viral diseases can be shown as follows (Table 14).

**Homework**

Creating a schedule for the diagnosis of viral diseases based on their clinical manifestations and pathoanatomical changes.

**An approximate plan of the lesson. (2 hours).**

1. Control questions.
2. Giving diagnostic questions.
3. Independent work of students.

a) to read the auxiliary literature, which provides different information for the diagnosis, depending on the clinical course of the disease, pathological changes.

b) in this case it is determined which pathological material and how to send to the laboratory.

c) make a rough plan or scheme for laboratory testing of the obtained patmaterial.

4. Discuss the results of the work as a group.
5. Completion of the lesson.

## Control questions

1. How is the initial diagnosis of viral diseases?
2. What should be followed when obtaining pathological material?
3. What are the methods of laboratory examination of pathological material and its purpose?

## Methodical instructions

1. Diagnostic issues for each study group are prepared in advance by the teacher, where, as far as possible, using a set of clinical signs of the disease and pathological changes, the student should suspect more than one disease at a time, and as a result the need for differentiation arises.
2. Each diagnostic issue should be carefully developed by the teacher.
3. It is advisable to give one question to each study group, as in the process of checking the solved problem, several points of view may be opposed to the question in one issue. This ensures a creative approach to the issue at hand.
4. Open discussion of the results of students' work encourages the involvement of all students in the group. But the decisive point is made only by the teacher.
5. **Masala.** In the poultry farm, the chickens got sick.

Clinical signs: difficulty breathing, wheezing, coughing, runny nose.

When dissecting dead birds, swelling and redness are observed in the bronchial and pharyngeal mucosa of the larynx. Mortality has reached 20%. It is necessary to make an initial diagnosis of the disease, decide which pathological material should be taken and the way to take it to the laboratory, and make a tentative plan for the examination of pathological material.

**Problem solving.** The initial diagnosis is nyukasl disease (NK), or avian influenza (PG), or infectious laryngotracheitis (ULT), or infectious bronchitis in chickens (TYUB).

Pathological material: throat, laryngeal lavage, mucous membranes of the throat, bronchi and larynx from corpses.

**Table 14. General schedule of diagnosis of viral diseases**

| **Clinical and epizootiological diagnosis** | **Laboratory diagnosis** | | |
|---|---|---|---|
| **Inspection of farm animals** | **Examination of pathological material by express methods** | **Examination of pathological material by virological methods** | **Examination of double serum in the blood by serological methods** |
| Determination:<br>1) epizootiological data<br><br>2) clinical signs<br><br>3) pathological material of pathological animals is taken from sick animals and their carcasses, canned-naked is sent to the laboratory by means of transport, as well as a pair of serums. | 1. Detection of viral antigens using IFR, CBR or DPR.<br><br>2. Detection of elemental cells of viruses using viruoscopy or electron microscope.<br><br>3. Using a light microscope to detect the presence of viruses.<br><br>4. Biological testing to demonstrate immunological sampling or specificity. | Series:<br>Stage 1 is the separation of the active virus from susceptible cultured cells, chicken embryos, laboratory animals, or naturally inclined animals.<br>**Stage 2 - Identification of the isolated virus from serological tests: NR, GATR, GADTR, CBR or DPR.**<br>Stage 3 is to demonstrate the etiological significance of the isolated virus by increasing the antibody titer in the double serum relative to the isolated virus or by re-experimenting the disease in its natural host. | Determination of the growth of antibody titer dynamics in double serum relative to reference viruses from serological tests using NR, GATR, BGAR, CBR, or DPR. |
| Advantage | | | |
| Determining direction in places | Speed<br>. | Accuracy | |
| Disadvantage | | | |
| An initial diagnosis can be made | The results need to be proven in other ways | It takes a lot of work and a long time. | |

Approximate plan for examination of pathological material:

a) IFR examination (direct or indirect methods) using specific irradiated serums against suspected viruses NK, PG, YuLT, TyuB by preparing ointments and seals from the obtained pathological material;

b) preparation of a suspected viral suspension from pathological material and infection of one group of chicken embryos into the chorionic villus shell and the other group into the allantois cavity;

c) examination of the chorionic villus layer of the first group of chicken embryos. The white nodules formed in the layer indicate the presence of ULT virus in the pathological material;

d) fetuses in the second group are checked for death. Fetal death indicates the presence of NK or PG viruses in the pathological material.

e) Examination of the fetus and allantois fluid by rupturing the chicken embryos in the second group. Wrinkle-free growth, waxing, twisting indicate the presence of TYUB virus.

Testing of Allantois fluid using GAR chicken erythrocytes. A positive indicates the presence of GAR, NK, or GP viruses.

A positive result of GAR with allantois fluid treated with trypsin indicates the presence of TYUB virus;

f) If GATR with serum against NK and GP viruses is administered to allantois fluid (without trypsin) with a positive result in GAR, it is possible to determine which of these viruses is present in the pathological material.

**"APPROVED"**
Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“ ____ ” _____–
2021.

**" Diagnosis of rabies in the laboratory ."**
**laboratory work (2 hours)**
**PASSPORTS**

***M ashg'ulotning goal:*** Laboratory methods of mad cow disease diagnosis. Study of IFR implantation in rabies: a) preparation of a mark from the brain of white mice; b) treatment of the drug by the direct method of immunofluorescence reaction ; c) viewing a previously positive drug using luminescent microscopy.

***Required equipment, jet and instrumentation:*** Degreased glass, thin seal , brain , phosphate buffer solution , fluorescent gamma globulin .

***IFR put :***

On a degreased piece of glass, a thin stamp or grease is prepared from the left and right sides of different parts of the brain (ammonium horn, hemisphere cortex, and elongated brain).

At least two drugs are prepared from each part of the brain.

It is also possible to examine the spinal cord, submandibular salivary glands. Drugs are prepared from the brain of a healthy animal (white mouse) for control.

The drugs are air-dried and fixed in chilled (minus 15-20 ° C) acetone for 4 to 12 hours, air-dried, then instilled with fluorescent gamma globulin and placed in a humid chamber at 37 ° C for 25-30 minutes, then physiologically washed with a solution or phosphate buffer solution with a pH of 7.4, air-dried, instilled with fluorescent immersion oil, and examined under a fluorescent microscope. In the granules of the drug containing the rabies virus antigen, a yellowish-green fluorescent color of the vasculature of various sizes can often be found outside the cell.

In the absence of such light scattering in the control, the nerve cell is almost gray or pale green in color. The speed of light scattering is evaluated by crosses. The absence of a specific fluorescent light indicates that the result is negative.

Pathological material obtained from animals vaccinated against rabies cannot be tested by IFR for three months because the vaccine may also fluoresce the virus antigen. Tissues that have been preserved with glycerin, formalin, alcohol, etc., and have some signs of decay cannot be examined by IFR.

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***Developers:***


**Docent: Bazarov X.K.**

**Assistant: Nurgaliyeva J.S.**


**TOPIC : Laboratory diagnosis of rabies**

**Family, Rhabdoviridae Generation, Lussavirus.**

**Cryptogrammasi.R / 1: 4/2: U / E: V, I / 0, Di, Ac.**

Rabies is an acute infectious disease characterized by severe damage to the nervous system and ending in death. Humans and all mammals are prone to the disease.

Rabies is ubiquitous. The causative agent of the disease is spread by dogs, cats, wild rodents and predators, as well as blood-sucking bats (vampires).

The duration of the latent period depends on the location of the bite and the strength of the bite, the amount and virulence of the virus that fell, and the resistance of the bitten animal.

The latent period can range from 1-3 weeks to a year, or even longer.

The disease is acute. The clinical signs are almost the same in all animals. Rabies in dogs is characterized by aggression and calmness (paralysis).

Rabies occurs in large horned animals (loss of appetite, atony of the large abdomen, salivation is non-specific. There may be no stage of arousal. Pathological changes are not specific. Go. It is possible to come across inedible things in the stomachs of mammals (mainly dogs).

The rabies virus has a pronounced neuroprobase property. It descends from the periphery to the site of the bite, travels through the nerve fibers to the central nervous system, spreads through the peripheral nerves in the body, and enters various organs, including the salivary glands.

The virus belongs to the family Rhabdoviridae, genus Lussavirus. The virions have a rod-shaped shape, as if the second part had been cut off.

The virion of the virus has a spiral symmetry that retains RNA, has a lipoprotein shell.

At low temperatures, the virus is stored intact. A temperature of 60 ° C kills the virus in 5-10 minutes, sunlight in 5-7 days. Formalin , phenol, 5% hydrochloric acid increase the activity of the virus in 5-10 minutes. The virion of rabies virus stores glycoprotein (external) and nucleocapsid (internal) antigens. The glycoprotein antigen produces a virus-neutralizing antibody, while the nucleocapsid-complement binding and precipitating antibody.

Epizootic strains of rabies virus are similar in immunobiological properties, but differ in virulence.

In the body, the virus is stored mainly in the central nervous system, salivary glands and saliva. The virus is grown in mice, rabbits, guinea pigs and other animals, as well as in cells (VNK-21, KEM-1, etc.) growing in primary cultured cells (from the kidneys of Syrian hamsters, sheep embryos, calves, etc.). Reproduction of the virus in cultured cells does not always indicate CPT.

Pre-adapted chicken embryos are susceptible to rabies virus. The virus is able to form cytoplasmic inclusions.

These can often be found in ammonium horn cells, in the brain, in the cerebral cortex.

The source of the disease is a sick animal. They transmit the virus due to biting. Carnivores become infected with rabies when they eat the head and spinal cord of a dead animal.

It has been proven that rabies can be transmitted by aerogenous means where there are bats.

The main sources in the spread of rabies are dogs and cats, foxes, wolves and other species of wild animals.

Diagnosis of rabies is based on epizootiological, clinical data and laboratory tests.

Strict personal safety precautions should be taken when working with sick animals and infectious materials: Rubber gloves, rubber or polyethylene apron worn over the sleeves of gowns, rubber boots, goggles, face mask should be worn.

It is strictly forbidden to dissect the carcasses of animals suspected of having rabies in the field.

**Getting patmaterial**

For testing for rabies, a new carcass is sent to the laboratory, the head of small animals whole, large and medium-sized animals, along with the second and first cervical vertebrae.

The carcasses of small animals are treated with insecticides before being sent for examination.

The pathological material is placed in a plastic box. Then, a gasket treated with a moisture-absorbing disinfectant is placed inside the tightly closed box. Material and referral letter should be sent through a special person, indicating the sender and his address, type of animal, anamnesis evidence proving the suspicion of rabies, the signature and date of the veterinarian.

**Laboratory diagnostics.**

Antigen detection using IFR and DPR, imaging Babesh-Negri bodies, and placing a biological sample in mice.

IFR has produced a fluorescent antirabic gammaglobulin in our bio-industry for this reaction.

**How to put IFR.** Degreased, a thin mark on the mirror of the vessel or ointments are prepared from the left and right sides (ammonium horn, hemisphere cortex brain and elongated brain) from different parts of the brain.

At least two drugs are prepared from each part of the brain.

It is also possible to examine the spinal cord, submandibular salivary glands. Drugs are prepared from the brain of a healthy animal (white mouse) for control.

The drugs are air-dried and fixed in chilled (minus 15-20 ° C) acetone for 4 to 12 hours, air-dried, then instilled with fluorescent gamma globulin and placed in a humid chamber at 37 ° C for 25-30 minutes, then physiologically washed with a solution or phosphate buffer solution with a pH of 7.4, air-dried, instilled with fluorescent immersion oil, and examined under a fluorescent microscope. In the granules of the drug containing the rabies virus antigen, a yellowish-green fluorescent color of the vasculature of various sizes can often be found outside the cell. (See Figure 63).

In the absence of such light scattering in the control, the nerve cell is almost gray or pale green in color. The speed of light scattering is evaluated by crosses. The absence of a specific fluorescent light indicates that the result is negative.

Pathological material obtained from animals vaccinated against rabies cannot be tested by IFR for three months because the vaccine may also fluoresce the virus antigen. Tissues that have been preserved with glycerin, formalin, alcohol, etc., and have some signs of decay cannot be examined by IFR.

**DPR in a gel.**

This method is based on the properties of antigens and antibodies, and antigen and antibody meet after absorption and mixing in the gel (antigen complex + antibody) to form a visible precipitation line. It is used to find an antigen in the brain of an animal that has died from a street rabies virus or from an infection (biological sample) in an experiment.

When performing the reaction, the product is used glass and 2.5-3 ml of 1.5% molten agar is poured on it. If it hardens on the top of the window, holes are made in the stencil at a diameter of 4-5 mm. Columns are removed using a training pen. The pits in the agar are filled with components arranged according to the scheme (Fig. 65).

Positive view of -1: 4.1: 8.1: 16-PR diluted globulin on the right.

All parts of the brain (left and right sides) of large animals are examined, any three parts of the brain of medium size (rat, hamster, etc.) are examined, and in mice, all parts of the brain are examined.

Pinset preparing a mass of brain paste, poured to a depth considered. Negative and positive antigens are placed separately on the same stencil in the control window.

*A gel: if Difko agar-15g, sodium chloride-8.5g, 1% solution of methyl orange in 50% ethyl alcohol-10ml, merthiolate-0.01g, distilled water-1000ml.*

Once the pits are filled with components, the preparations are placed in a humid chamber, or placed in a thermostat at 37 ° C for 6 hours and then at room temperature for 18 hours. O'tkaziladi.Miya suspension after 48 hours to calculate the results and rabies gamma - globulin Pete around 2-3 trunks between the lines is indicative of a positive reaction.

Bacterial sterility or decay of the brain cannot be a barrier to putting DPR. Materials preserved with glycerin, formalin, or other means are unsuitable for DPR.

**Finding Babesh-Negri bodies.**

Thin grease or stamps (such as IFR) are prepared on at least two pieces of glass from each section of the brain and painted according to Sellers, Muromsev, Mann, Lens, and other methods.

For example, staining on Sellers: fresh, not yet hardened drug, held for 10-30s after coating with paint and washed with a solution of phosphate-buffer (pH 7.0-7.5) in a dark place at room temperature dried in a vertical position, then examined under a microscope using immersion oil.

The appearance of Babesh-Negri bodies, clearly drawn oval or elongated granular light red and located in or outside the cytoplasm of the cell, indicates that the result is positive. In this method, it is of diagnostic value to identify species-specific inserts.

**Biological sample.**

More effective than all the methods mentioned above.

This method is tested when a negative result is obtained and suspected in the above methods. White mice weighing 16–20g were selected for the biological sample. The brain is removed from all parts of the nerve tissue and crushed in a sterile sand mortar, then a saline solution is added to form a 10% mixture. After

soaking for 30-40 minutes, the liquid on the sediment is removed and the mice are infected.

If contaminated with a bacterial infection is suspected, 500 units of penicillin or streptomycin are added to 1 ml of suspension and kept at room temperature for 30-40 minutes. For a biological sample, 10–12 head of mice are infected: half to 0.03ml intracerebrally, and the remaining half to 0.1–2ml subcutaneously or on the upper lip.

Infected mice are placed in glass jars (preferably in an aquarium) and for 30 days they are monitored and the changes that occur are recorded.

The death of mice at the end of 48 hours is not considered disease-specific and is not taken into account in evaluating the outcome.

In the presence of rabies virus in the pathological material, the following symptoms appear within 7-10 days after infection in mice: hair loss, peculiar curvature of the shoulder, impaired coordination of movements, paralysis in the hind legs, then in the forelegs, and later death is observed.

The brains of dead mice were examined by placing IFR and DPR to meet Babesh-Negri carcasses (Fig. 65a).

Biological testing is a positive diagnosis if the antigen is found in drugs prepared from the brains of infected mice due to the presence of Babesh-Negri corpses or using the IFR, DPR method. If no death is observed in mice within 30 days, it is a negative diagnosis.

The morning diagnostic method for biological testing (which was when the test animal was bitten) used 20-30 mice instead of 10-12 mice for infection, and the brains of 1-2 mice were examined daily using IFR. This (in the positive case) shortens the inspection period to a few days.

In laboratory practice, a specific biological test method is put in place.

Its essence is that a suspension made from the brain tissue of an animal infected with rabies becomes infected when it infects mice. If the brain tissue is pre-treated with antirabic serum at 37 ° C -10 minutes, then the mice will not get sick.

Some investigators have suggested that an animal suspected of having rabies be diagnosed by immunofluorescence by making a mark on the cornea of the eye while it is alive.

But the effectiveness of this method is not high.

In almost all laboratories, testing is carried out in turn as follows:

A smear is prepared from the brain for IFR, a DPR is placed, and a biological sample is taken with a negative result.

When IFR is performed with high qualification, a result corresponding to 99-100% of the biological test is obtained. In rabies, Babesh-Negri corpuscles can be detected in 65–85%, and DPR in 45–70%.

**Homework.**

l. Study of methods of diagnosis of rabies in the laboratory.

2. To study the placement of IFR in rabies: a) preparation of a mark from the brain of white mice; b) treatment of the drug by the direct method of immunofluorescence reaction ; c) viewing a previously positive drug using luminescent microscopy.

Material supply: luminescent microscope; thermostat; fluorescent immersion oil; cuvettes; item windows; containers for saline and distilled water; Petri dish; filter paper; pen for writing on the mirror; tweezers; a set of tools for opening the skull of a white mouse and removing its brain; ether; rabies-positive drugs (IFR, DPR, Babesh-Negri bodies); white mice.

**Approximate lesson plan (2 hours)**

l. Control questions.

2. Teacher's explanation.

3. Independent work of students. a) making a mark from the brain of a mouse; b) Fixation and staining of drugs for IFR.

3. Demonstration: a) kits designed to diagnose rabies (IFR, DPR); b) Babesh-Negri tanachalaii drugs (histokesmas), IFR and DPR.

4. Independent work of students will continue: a) washing and drying of drugs; b) viewing under luminescent microscopy.

5. Conclude the session.

6. Assignment for the next lesson.

**Control questions.**

1. Describe the main features of the rabies virus.

2. Talk about the epizootiological features and symptoms of the disease caused by the rabies virus.

3. What methods do you know to diagnose rabies in the laboratory?

4. What material is obtained from animals suspected of having rabies and what are the rules of operation.

**Methodical instructions.**

Due to the lack of time for this session, the materials on display will be prepared in advance:

a) positive fix ointment prepared for viral fixation for IFR, ointment made from street rabies virus with good results, which can be obtained from a veterinary laboratory;

b) drugs with Babesh-Negri bodies (histocomes);

c) to put DPR using the components of the diagnostic kit or to use material that gives a positive result to DPR:

Not all students have to tear up white mice in class, as they have done on the topic of “lab animals”.

It is necessary to prepare and put an ointment from the brains of previously torn white mice.

During the staining of drugs, the teacher demonstrates all the methods of diagnosis in the laboratory.

In this exercise, healthy mice were taken to learn the IFR method. These drugs are then demonstrated under fluorescent microscopy in parallel for (negative) control, as the drugs obtained from sick mice gave positive results.

Alternatively, white mice infected with pre-infected virus fixation are dissected, and students prepare drugs from their brains.

**"APPROVED"**
Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“____” _____–
2021.

**" Diagnosis of smallpox in the laboratory ."**
**laboratory work (2 hours)**

## PASSPORTS

***M Purpose of the study:*** Biological sampling and viroscopy in smallpox.

***Required equipment, jet and instrumentation:*** Smallpox virus and susceptible living objects (rooster, pigeon, rabbit); sterilized toothbrush; sterile cotton swabs; degreased glassware; sharp blade; tweezers; 1,2,3 reagents; immersion oil; lighting microscopes; alcohol lamp; distilled water.

***For painting by MAMorozov method :***

The drug is treated with reagent 1 for 3-5 minutes, then washed with distilled water;

Immerse in reagent 2 and then heated for 1-2 minutes until steam is formed; Reagent 3 is heated for 1-2 minutes until dark brown, then washed thoroughly in distilled water; air-dried and viewed under a microscope immersion system. Result: On a yellow background, small dark brown, round oval-shaped, clustered, row or diffuse masses or non-individual bodies can be found. These bodies are virions of smallpox virus.

***Books:***


1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.



***Developers:***

**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**

**TOPIC** : **Laboratory diagnosis of smallpox Family.Poxviridae. Avlodi.Orthopoxvirus Cryptogram. D / 2: 160-200 / 5-7: X / *: V / 0, Di, Ac, Si.**

Smallpox affects 23 species of mammals, 5 species of birds and 16 species of insects. Some types of smallpox virus cause disease in certain types of animals, while others cause disease in several species.

In some animals, smallpox is caused by one pathogen, while in others it is caused by two or three other types of viruses in addition to their own (genuine).

Although the clinical picture of smallpox in animals does not pass in the same way, but they are very similar.

Damage can occur in the mucous membranes and skin, along with the process of generalization in more hairless, hairless areas of the body.

In the skin and mucous membranes, the appearance of roseolae specific to a particular species (redness), followed by the transition to papules and the formation of vesicles (blisters). They then turn into pustules, and as a result of their rupture, fluid leaks and a hard crust forms on the wounds.

Once the wounds have healed, the bark will fall off and scars will remain. In smallpox, due to the process of generalization, there is a rise in temperature, lethargy, loss of appetite, swelling of the subcutaneous tissue, and in birds, the formation of a diphtheria layer in the respiratory tract. Smallpox viruses produce virions, size 260x390 NM. They are the largest among other virions.

They can be seen not only under an electron microscope, but also under a light microscope. Smallpox is easily transmitted from sick animals to healthy animals and is easily transmitted to experimental animals.

Some viruses of smallpox multiply in the chorionic villus membrane of the chicken fetus and form smallpox (their shape is not the same in different viruses). Smallpox viruses multiply in the primary cultured cells of an animal specific to its species and show SPT.

As with other viruses, smallpox virus antigens in different materials can be detected using FAU and DPR.

It is not difficult to make a diagnosis based on clinical and epizootiological data. However, it is recommended to confirm the clinical epizootiological diagnosis based on laboratory test data.

Of the laboratory methods, viroroscopy is universal — the virion of smallpox virus can be detected using light microscopy on material obtained from a sick animal. To do this, a piece of skin or a mucous membrane damaged by a rash (preferably at the stage of papules or vesicles) is prepared ointments on the glass of the item. Greases are painted in different ways, the best of which is the silvering method of MAMorozov. When dyeing on MAMorozov, 3 reagents are prepared.

Nl Reagent (Ruge liquid): Pour into a container with 1ml of glacial acetic acid, 2ml of 40% formaldehyde solution (commercial formalin) and 100ml of distilled water.

N2 Reagent (chemical): After dissolving 5g of tannin in lOOml of distilled water, 1ml of liquid carbolic acid (phenol) is added. Carbolic acid in crystalline form is dissolved in a water bath at 56 ° C to liquefy. A good variety of tannin

should be used. To determine the purity of lg tannin, it is dissolved in 5ml of water and 10ml of 96 ° alcohol is added to it. Blurring should not occur for an hour (dextrin, camel). Then there should be no turbidity due to the addition of 5ml of ether (sugar, salt).

**3. Reagent (silver solution with ammonia):** 5 g of crystalline silver nitrate is dissolved in 1 ml of distilled water. A small amount (one-tenth) of the total solution is poured into another vessel. Ammonia solution is added dropwise (25%) to the remaining silver nitrate solution. Initially, a dense brown precipitate is formed, which then dissolves due to the addition of ammonia.

If the solution is completely shiny, pour the base solution before turbidity and add a drop of the obtained silver nitrate solution.

The drip is then added to the basic solution of ammonia until a slightly turbid solution is formed from the silver nitrate solution. The resulting turbid solution is diluted 1:10 in distilled water and used for dyeing drugs. The solution is very stable and should be stored in a tightly closed, glass container in a dark room.

**Painting by MAMorozov method.**

The drug is treated with reagent 1 for 3-5 minutes, then washed with distilled water;

An enameled cuvette (18x24) is convenient for painting, 2 1-2 ml pipettes are placed on the edges of the "bridge" and a rubber band is put on the edges.

There should be a separate pipette for each reagent. The disadvantages of this method are that it gives a clear result when examining the vesicular fluid, and the result of the reaction is significantly reduced when examining the pustules and hardened skin; each in the flower group

it is not possible to distinguish different viruses; it is not possible to clearly distinguish virions from cellular elements (in any case, the level of the examiner must be much higher).

**Biological sample.** It is the second most widely used method in the diagnosis of smallpox. Smallpox disease, the biological sample is naturally inclined to animals, animal primary cells in the o'stirilaan always grow.

Rabbits are susceptible to ospavaksina virus, cows and grasses are susceptible to smallpox virus, and chicken embryos are not only susceptible to smallpox virus in poultry, but also to smallpox, smallpox, and pigeon disease. All smallpox viruses are dermatropic for experimental infection due to intradermal, itchy skin, infection of the chicken embryo XAP (the method of infection in animals and chicken embryos is described in the relevant topics (Fig. 67).

The method of infecting the scratched skin of the rooster is easy, it is done using a needle or a broken pasteurized pipette, and the crown is scratched shallowly (no bleeding.

The smallpox virus can easily be transmitted to the feather follicles of a rooster. To do this, the feather on the thigh of the rooster is removed and immediately the virus suspension is applied to the open follicles using a tampon or brush.

If there is a smallpox virus in the test material, 5-7 days after the virus is infected, specific smallpox (Fig. 68) appears in the crown, and smallpox-specific folliculitis appears in the number (Fig. 69).

It is not difficult to encounter virions in smears by smear method in virulent lesions or follicles.

When rabbits are infected, the virus is spread to the scratched area after the skin has been cleaned of wool, which means that the scratching of the rooster is no different from infecting the virus.

The FAU and DPR methods in smallpox are almost identical to those written on other topics.

**Homework.**

Biological sampling and viroroscopy in smallpox.

**Material supply:**

Smallpox virus and susceptible living objects (rooster, pigeon, rabbit); sterilized toothbrush; sterile cotton swabs; degreased glassware; sharp blade; tweezers; 1,2,3 reagents; immersion oil; lighting microscopes; alcohol lamp; distilled water.

**Approximate lesson plan** (2 **hours)**

l. Infection of cockroaches and rabbits with rabies virus in the presence of all groups of students 5-7 days before the lesson.

2. Control questions.

3. Teacher's explanation.

4. Demonstration: a) the result of a biological sample; b) the method of preparation of ointments in smallpox.

5. Independent work of students: a) obtaining ointments for smallpox; b) painting of greases by the Morozov method; c) microscopic examination of greases; d) draw the results.

6. Concluding the session.

7. Assignment for the next lesson.

**Control questions.**

l.Describe smallpox viruses.

2. What are the epizootiological, clinical features of smallpox in different species of animals?

3. What methods do you know to diagnose smallpox?

**Methodical instructions**

The difficulty in preparing for this exercise is the selection of the smallpox virus and the living object that is sensitive to it.

A vaccine strain of smallpox virus in chickens NR-1 is used to infect roosters (scratched crown or feather follicles).

Flowers of chickens that are easy to find. is the N 'yu-D jersey strain of pigeon virus in pigeons used as a vaccine against the disease.

An effective biological sample with these viruses can be placed in pigeons.

Until recently, infecting the skin of rabbits with the smallpox virus, which was used to vaccinate humans, had shown good results.

When smallpox is not possible, many found chicken embryos are used for biological sampling. Infection with the above-mentioned viruses into the chorionic villus membrane of the chicken fetus causes swelling and the appearance of specific nodules (smallpox).

Preparation of reagents for painting greases by the Morozov method does not cause much difficulty. It is advisable to prepare kits for staining, which consist of reagents 1,2 and 3, immersion oil, gasoline, penicillin vials, pipettes used for the eye. All vials in one set can be placed on the lid of a Petri dish and given to two people in one set.

**"APPROVED"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“____” _____
2021.

**"Diagnosis of proteinuria in the laboratory."**
**laboratory work (2 hours)**
**PASSPORTS**

***M ashg'ulotning goal:*** protein disease diagnosis, disease information only pair of hoof damage and clinical symptoms of high kontagiozligi (the mucous membranes of the mouth, skin and vesicular lesions), glue (colon and pathological changes in the heart muscle injuries, young animal mortality) is based on the results of laboratory tests .

***Required equipment, reagents and equipment:*** Pathological material under investigation (a piece of skin from a flower in a vial with 50% glycerin solution); antigens of standard type (types A, 0, C); serums belonging to the standard (types A, 0, C); hemolysin; complement; 2% mixture of ram erythrocytes; isotonic solution - 0.85% NaCl solution; tripods; test tubes; 1.2 and 5 ml pipettes; water bath; thematic tables; container with disinfectant solution (2% - NaOH solution); a sterile mortar made of porcelain; crushed sterile glass; cuvettes; Petri dish; 10x10 filter paper; tweezers; scissors

***<u>To put the basic experience to determine the type of protein disease:</u>***

Specific protein antigens and serums are controlled according to the scheme.

l) for each serum titration of 0.2 ml of the working-specific serum - a number of vertical tubes;

2) 0.2 ml of the working trembling specific antigene, horizontally - seven series, in which a number of antigen;

3) 0.2 ml of test antigen in each dilution, a series of test tubes, horizontally;

4) 0.2 ml of saline solution, instead of the antigen on the last horizontal row (serum control) and the last row on the vertical ( control of antigens ) instead of serum ;

5) working dilute supplement from 0.2 ml - to all test tubes of the basic experiment.

The solutions are shaken gently and placed in a water bath at 37-38 °C for 20 minutes ;

6) 0.4 ml of hemolytic system is poured into all solutions. After the tubes are shaken again, they are placed in a water bath at 37-38 °C for 30 minutes .

***Books:***


1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.


***Developers:***


**Docent: Bazarov X.K.**

**Assistant: Nurgaliyeva J.S.**


**TOPIC: Diagnosis of proteinuria in the laboratory.**

**Family: Picornaviridae Generation: Aphtovirus**

**Cryptogram: R / 1: 2.3-2.8 / 30: S / S: V / O.**

Complement binding reaction (CBR) is one of the traditional serological reactions used in the diagnosis of many viral diseases. The name of the reaction consists of two separate stages, which to some extent indicate the nature of the work to be performed. In the first stage, antigen and antibody are involved (one of which is known in advance), and a certain amount of pre-titrated complement is required. Due to the compatibility of the antigen and antibody complex, it attaches to the complement, which is manifested in the second stage by an indicator function (a mixture of ram erythrocytes and their antisardob-hemolysin).

If complement is bound due to antigen and antibody binding, then erythrocytes do not lyse (positive CBR). In negative CBD, the unbound complement is involved in the hemolysis of erythrocytes. (Fig. 71).

Cessation of hemolysis is positive - CBD (+)

negative CBR - hemolysis (-)

CBD is often used in practice for diagnosis, detection and identification of the virus, detection and titration of antibodies in serum.

The main components of CBD are antigens (known and sought after), antibodies (known anticoagulants or test serum), complement, hemolytic serum, and

ram erythrocytes; instead of a diluent an isotonic solution of sodium chloride with a pH of 7.2-7.4 or various buffer solutions is used.

Antigens and serums are anticomplementary in nature, as well as complement adsorption, i.e., they can stop hemolysis and misrepresent the reaction result. To get rid of anticomplementation, antigens are purified in different ways, namely: acetone, freon, ether, chloroform and similar antigens and depending on the type of tissue used in place of the virus. Serums are purified from anticomplication by heating and other methods of complement processing.

Antigens for CBD are prepared from the organs of infected animals from the allantois or amniotic fluid of a virus-infected chicken fetus, as well as from the fluid medium of infected cell cultures . Antigen preparation for CBD in viral infections differs in many respects from that in bacterial infections. This is due to a number of specific features of the virus.

First , in order to isolate the viral antigen from the cell, it is often necessary to break down the infectious material and undergo additional processing when the antigen is isolated.

The second is the greater thermolability of viral antigens relative to bacteria. In most viruses, the complement-fixing antigen is associated with infectious fragments, the breakdown of which goes hand in hand with the disappearance of the infectious agent. In order to obtain the antigen, the material must be obtained within one to two hours after the death of the animal, if possible during life.

Preservation of the virus-preserving material with various disinfectants often results in the destruction of the viral antigen, without yielding positive results.

Third , complement fixation is not uniform due to the different proportions of antigen + antibody concentration. Antigen + antibody complex is formed only when they are numerically equal to each other; when the number of antibodies is high, the fixation of the complement suddenly decreases, the active complex of the antigen + antibody is associated with the antibody because the active surface of the complement is very small. This is also the case when the number of antigens is high. This is because the decrease in complement fixation is much faster. Pre-titration of the antigen and antibody is required for optimal binding of the complement.

Fourth , the virus fragment that enters the low-volume antigen + antibody complex has a very small size so the complement fixation area is small. As a result of increasing the volume of the antigen + antibody complex by prolonging the fixation period of the complement ( 18 hours at 4 °C), the sensitivity of the reaction increases but its specificity decreases; as well as the fixation of non-specific antigens due to prolonged fixation.

Fifth , high procomplementary activity of viral antigen. Complete purification of the viral antigen from tissue enzymes is necessary to prevent fixation of the non-specific complement. A major obstacle in the diagnosis of viral diseases in humans and animals using CBR is the uneven accumulation of viral antigen at different stages of the disease. CBD is used in the production of protein virus, strain testing, scientific research to determine the type and variants of the protein virus. It is a high,

contagious, acute disease of ungulates, accompanied by fever, vesicular inflammation of the mucous membranes of the oral cavity, the site of attachment to the skin of the hoof (ventricle) and the udder , occurs in young animals with myocardial and skeletal muscle injuries.

Protein disease is registered in most countries of the world. The incubation period is 1-3 days, in some cases up to 7-10 days. The most noticeable symptoms of this disease are vesicular inflammation of the oral mucosa, skin follicles.

In large horned animals and pigs, proteinuria is acute, while in older animals it is harmless (treatable). First of all, there is a worsening of appetite, increased salivation (Fig. 72), an increase in body temperature (40.5-41.5 °C). After 2–3 days on the inner surface of the lips, tongue, aphthous ulcers appear. (Fig. 73). In some animals, aphthae form between the hooves and on the hands (Fig. 74.75). After a day, the esophagus ruptures and erodes. (Fig. 76). After 2-3 weeks, the erosions are over and the animals recover. In pigs, sheep and goats, the lesion is most often observed on the feet and in some cases on the mucous membrane of the mouth. (Fig. 77). In most cases, the udder is injured. In young animals, proteinuria is worse (mortality 80% and higher), without aphthous ulcers, hemorrhagic inflammation of the intestine and degenerative changes in the heart muscle (tiger-like heart) and similar changes also found in skeletal muscle.

The virus belongs to the family Picornaviridae and the genus Aphtovirus, which stores RNA and has a supercapsid shell. The protein virus is resistant to environmental factors. It retains its virulence properties for 67 days in aphthae walls, 39 days in liquid feces and 103 days in running water. The best disinfectant is a hot solution of 2 or 3% sodium bicarbonate and 1% formaldehyde.

50% of recovered large horned animals carry the virus for 8 months, some even up to 2 years.

Under natural conditions, bipedal animals are sensitive to the protein virus. In sick animals, the virus can be isolated during the latent period of the disease (milk, semen, saliva). High amounts of the virus are stored in epithelial and vesicular fluid. Excretions and secretions of sick animals are contagious for more than 10 days. Prolonged viral transmission is observed after recovery from the disease

The virus is naturally inclined and is grown in laboratory animals: newborn mice and rabbits, guinea pigs in 60-day-old hamsters (Fig. 78-80).

**Determination of the type of protein disease is performed in the laboratory.**

Diagnosis of proteinuria is based on epizootiological data only lesions and high contagion of the ungulates, clinical signs (vesicular lesions on the mucous membranes of the mouth, skin of the feet and udder), pathological changes (injuries of the intestine and heart muscle, death of young animals) laboratory based on the results of inspections .

**Sampling: For** laboratory tests, 2-3 patients were examined from the wall and structure of the animal's aphthae, from the mucous membrane of the tongue

(from a large horned animal, from the snout of a pig, from the skin of a pig, and from between hooves, etc.). chqa and camel) is taken at least 5 g.

In the absence of aphthae, when the animal's temperature rises, blood is drawn from the carcasses of all kinds of small animals - the lymph nodes of the head, the pancreas, or the heart muscle. Esophageal mucosa is obtained using a special probe to check for virus transmission. It is important that the virus in unhealthy farm material does not spread to the environment and that workers working with infectious material are protected.

To do this: a) the farm veterinarian must have sufficient skills to obtain material from a sick animal; b) to obtain the material - tweezers, scissors, napkins, thick-walled phlocons, adhesive tape, rubber stopper, sterile mixture of 50% glycerin in isotonic sodium chloride solution, thermos with cooling mixture, 2% - NaOH or 1% vinegar or lactic acid solution, special furry -xalatlar, kombinzonlar, created or -'quite, rubber boots, gloves and others .

Once all the necessary items have been placed in a container and taken to the unhealthy farm, the sick animals are dressed before entering the room where they are standing;

c) After removing the material from the sick animal, instruments, face masks, gloves are immersed in the disinfectant solution, and the outside of the vial and thermos is treated with the disinfectant solution .

At the sanitary inspection of people and things (sanpropusknik), all clothes are taken off and taken to the shower. The protein virus lives in the human nasal cavity for up to 7 days. This means avoiding as much contact with healthy ungulates as possible for up to 7 days after visiting an unhealthy farm. A sample of non-degradable material is frozen after the stopper is placed in tightly closed or tightly closed vials, and if there are no conditions for freezing, a preservative solution is added (50% sterile glycerin solution in NaCl isotonic solution). A label is affixed to the vial, indicating the type of animal, the name of the material, its quantity, time of receipt and the address of the sender. The vials are placed in a metal and impermeable container, sealed, and placed in an ice thermos and sealed again. A letter of recommendation is attached to the material and states the following: the time of receipt of the material, notification of the epizootic situation on the farm due to proteinuria, and signed by a veterinarian. The material is delivered through a special veterinarian. The laboratory has a separate room for working with the protein virus (with boxing and pre-boxing room), where there is the necessary equipment for diagnostic work (preparation of material, CBD placement, biological experiments, etc.). condition When working in boxing, special clothing and footwear are completely replaced, rubber gloves and a face mask are worn. Dishes and utensils are boiled, special clothing is placed in a container and autoclaved, tables, floors, walls are treated with a disinfectant solution, then irradiated with UBN.

The material brought to the laboratory and its consumption are taken into account to the nearest 0.1 mg. The material brought to the laboratory is stored in a sealed refrigerator, which is closed with a key, both before the inspection and during operation.

**Laboratory testing for** proteinuria **includes:** finding and identifying a protein virus antigen (determining which type and variant it belongs to);

FMD (rekonvalessentlar) to fix the radial reaction immunodiffuziya antibodies against the virus in the blood (RIDR and indirect immunofluoressensiya reactions (BIFR) and using titration.

**Detection and identification of protein virus antigen using CBR.**

The components of the reaction are: a) an epizootic strain of the test virus antigen obtained from an infected animal ;

b) protein on the options and types of the virus strains of the virus giperimmunlangan sea pigs serum (biofabrikada removed);

c) under the supervision antigene protein and options specific virus strain (biofabrikada removed);

d) compliment - fresh normal dried whey of guinea pig ;

e) biofabrikada developed hemolysis;

f) 0.85% solution of pure salt in distilled water of a mixture of 2% erythrocytes of ram in saline;

g) other viruses that cause vesicular injury, specific serums and antigens.

**CBR can be set in different sizes:**

if the total volume is 1 ml - 0.2 ml is taken from each component; If any component is 0.1 ml or 0.5 ml micro level - the total volume 0,125 ml of each component volume of 0,025 ml taken.

**Preparation of protein antigen. The** wall of the aphtha obtained from a small animal is cleaned from the preservative liquid using a saline solution with a pH of 7.4-7.6, dried with filter paper, weighed, after crushing in a porcelain mortar with a small sterile bottle. mix well until a homogeneous mass is formed. Twice the mass of aphthae is added to 1 g of aphtha with a pH of 7.4-7.6 2 ml of saline. The resulting 33% suspension is left (extracted) at room temperature for 2 hours, frozen at -10, -20 $^{0}$C for 5-18 hours. 3-5 thousand ail / min after melting. Centrifuge for 30-15 minutes. The liquid on the precipitate loses its activity at 58 $^{0}$C for 40 minutes, if the liquid is in a state of sedimentation , it is reabsorbed for 10-15 minutes. It is centrifuged at 3,000 rpm and then used as an antigen for CBD .

**Preparation of hemolysis.** Vibrates when a new batch of hemolysin is obtained. The titration is performed according to the commonly used method. Hemolysin produced by biofactories is sometimes preserved 1: 1 with glycerin, so in the preparation of the basic (1: 1000) dilution of hemolysin, 0.2 ml of hemolysin and 9.8 ml of saline (1: 100), then **this** is prepared by diluting 1: 1000: 9 ml of saline is added to 1 ml (1:10) of hemolysis. From the basic (1: 1000) solution, the following are prepared according to the scheme shown (Table 18). After receiving the required dilution of hemolysin, titration is carried out according to the table in the scheme N19. To titrate hemolysin is necessary: l) control to exclude spontaneous hemolysis of erythrocytes (0.5 ml of 2% - erythrocyte suspension + 2 ml of saline); 2) control of hemolysin to exclude hemolysis of erythrocytes without additives (0.5 ml 1: 1000 diluted hemolysin + 0.5 ml 2% suspension of erythrocytes + 1.5 ml of saline); 3) complement control without the presence of hemolysis to exclude hemolysis of erythrocytes (0.5 ml of 1:20 diluted complement + 0.5 ml of

2% erythrocyte suspension + 1.5 ml of saline); 4) control of the hemolytic system (0.5 ml of 1: 1000 diluted hemolysin + 0.5 ml of 2% - erythrocyte suspension + 0.5 ml of 1:20 diluted complement + 1.0 ml of saline). The titration determines the most recent titer of hemolysin. Hence the ability to induce minimal hemolysis in erythrocytes in the presence of complement .

In the given scheme, the dilution number of hemolysin was 1: 3000.

**18-iadval. Scheme of preparation of liquefied hemolysis**

| **Components, ml** | **Dilution of hemolysis** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1: 1500** | **1: 2000** | **1: 3000** | **1: 4000** | **1: 5000** | **1: 6000** | **1: 7000** | **1: 8000** |
| Hemolysis 1: 1000 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Physiological solution | 0.5 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 |

**Table 19I. Hemolysis titration scheme.**

| **Components, ml** | **Dilution of hemolysis** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1: 1000** | **1: 1500** | **1: 2000** | **1: 3000** | **1: 4000** | **1: 5000** | **1: 6000** | **1: 7000** |
| Hemolysin | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Saline instead of antigen (zardobolar) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1:20 diluted complement | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 2% erythrocyte suspension | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 37 °C | Keep in a water bath for 10 minutes | | | | | | | |
| The result of the titration | | - | - | - | ++ | +++ | ++++ | ++++ |

In the first three controls, hemolysis should be completely stopped, and in the fourth control, hemolysis should be completely stopped .

For example, the most recent titer of hemolysin is 1: 3000, and its working dilution is 1: 750.

If it is preserved with glycerin (1: 1), then 2: 750 is taken to prepare the working dilution, or 0.2 ml of solid hemolysin and 74.8 ml of saline .

**Preparation of the hemolytic system (hemo system).**

The working dilution of hemolysin is mixed with an equal amount of 2% ram erythrocytes. Before using the hemosystem, hold the thermostat for 30 minutes to sensitize the erythrocytes .

**Preparation of 2% suspension of ram erythrocytes.**

To 2 ml of washed erythrocyte sediment is added 98 ml of saline .

**Complement titration**

The day of the main experiment is titrated according to the scheme shown in the complement in the hemolytic system (Table 20).

The titer of complement is the induction of complete hemolysis in erythrocytes of the minimum number of complement. Combinations with a titer of not less than 2.5% are used to determine the type of protein disease .

**Table 20. Complement titration scheme**

| **Components, ml** | **Good complement retention,%** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **0.5** | **1.0** | **1.5** | **2.0** | **2.5** | **3.0** | **3.5** | **4.0** | **4.5** |
| 1:20 diluted complement | 0.05 | 0.1 | 0.15 | 0.2 | 0.25 | 0.3 | 0.35 | 0.4 | 0.45 |
| Saline solution up to 0.5 ml | 0.45 | 0.4 | 0.35 | 0.3 | 0.25 | 0.2 | 0.15 | 0.1 | 0.05 |
| Hemolytic system | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Saline solution (instead of antigen and serum) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 37-38 °C | kept in a water bath for 15 minutes | | | | | | | | |
| The result of the titration | ++++ | +++ | ++ | + | - | - | - | | |

To put the basic experience of CBR, a 1% excess complement, or 2 conditional units, is obtained from its titer in the hemosystem.

For example, gemosistemada complementary experience in a titer of 2%, 3% of the amount taken, working for the preparation of 3 ml of whole complement of 97 ml physiological saline solution is added.

The preparation of liquefied natural complement to calculate the amount of its net assets and working to prepare KBRga great attention .

The working quantity of a properly selected complement is calculated from the normal course of the reaction to ensure the accuracy of the result.

Excess of complement can lead to partial detection or complete loss of a specific antigen or antibody. In the absence of complement, hemolysis of the reaction also ceases due to the absence of a specific antigen and antibody.

**Zardobar.** When determining the type of protein virus, the working titer of the positive type specific protein serum is used. Thus, the serum was shown to be equal to the last tab on the titer of 1:40, while working titer of 1:20 .

**Antigens.** Double titers of type-specific protein antigens (similar to those produced by specific serums in biofactories) are used.

If the label shows a 1: 6 titer, its secondary titer is 1: 3 .

As a test antigen ( composition and wall of aphthae of infected animals with protein, carcasses of dead mice and rabbits after pathological experiments , pathological material); The virus-

protective culture fluid is used. (Antigen preparation method: see page ).

The compound tested a unified antigen reactions (33%) 1: 2, 1: 4, 1: 8 liquefied used.

If there is a risk of entry of other types of protein disease in the border areas of our country (Sat-1, Sat-2, Sat-3 and Asia-1) in the main experiment, serum and antigens of the protein virus occurring in another country are added to identify and control the type.

**To put the basic experiment to determine the type of protein disease**

Along with basic experience, specific protein antigens and serums are monitored according to the scheme. The components are placed in the following order (see the basic experimental scheme in Table 21):

l) for each serum titration of 0.2 ml of the working-specific serum - a number of vertical tubes;

2) 0.2 ml of the working trembling specific antigene, horizontally - seven series, in which a number of antigen;

3) 0.2 ml of test antigen in each dilution, a series of test tubes, horizontally;

4) 0.2 ml of saline solution, instead of the antigen on the last horizontal row (serum control) and the last row on the vertical ( control of antigens ) instead of serum ;

5) working dilute supplement from 0.2 ml - to all test tubes of the basic experiment.

The solutions are shaken gently and placed in a water bath at 37-38 °C for 20 minutes ;

6) 0.4 ml of hemolytic system is poured into all solutions. After the tubes are shaken again, they are placed in a water bath at 37-38 °C for 30 minutes .

The reaction results are calculated after 5-10 minutes in a water bath and the final result is obtained after 10-12 hours.

The degree of cessation of hemolysis is assessed by crosses:

(++++) - 100% cessation of hemolysis; (+++) - 75% cessation of hemolysis; (++) - 50% cessation of hemolysis; (+) - 25% cessation of hemolysis; (-) - complete hemolysis.

If the test antigen is homologous to a specific antibody, then hemolysis stops and the reaction is considered positive; if there is no hemolytic antigen, complete hemolysis is observed and the reaction is negative.

**Table 21. Scheme of basic experiments in determining the type of protein virus**

| Antigens | Working titers of antigens | Whey | | | | | | | Antigen control |
|---|---|---|---|---|---|---|---|---|---|
| | | Atitr 1:30 | 0 Titus 1:40 | C Titus 1:20 | Asia-1 Title 1:30 | Sat-1 Title 1:30 | Sat-2 Titus 1:20 | Sat-3 Title 1:30 | |
| | | Titer of serum worker | | | | | | | |
| | | 1:15 | 1:20 | 1:10 | 1:15 | 1:15 | 1:10 | 1:15 | |
| A, titer 1: 4 | 1: 2 | ++++ | - | - | - | - | - | - | - |
| 0, titer 1: 6 | 1: 3 | - | ++++ | - | - | - | - | - | - |
| C, titer 1: 8 | 1: 4 | - | - | ++++ | - | - | - | - | |
| Asia-1, titer 1: 8 | 1: 4 | - | - | - | ++++ | - | - | - | - |
| Sat-1, titer 1: 8 | 1: 4 | - | - | - | - | ++++ | - | - | - |
| Sat-2, titer 1: 6 | 1: 3 | - | - | - | - | - | ++++ - | - | - |
| Sat-3, titer 1: 4 | 1: 2 | - | - | - | - | - | - | ++++ | - |
| | S | ++++ | - | - | - | - | - | - | - |
| Sinalayot-gan antigen | 1: 2 | +++ | - | - | - | - | - | - | |
| | 1: 4 | ++ | - | - | - | - | - | - | - |
| | 1: 8 | - | - | - | - | - | - | - | - |
| Whey-ni control to do | | - | - | - | - | - | - | - | - |

**Note: According to the** results, all antigens and serums are active and type specific. The antigen being tested is type A. When necessary, the type of protein virus in production is determined, and then the variant is determined. To do this, CBR is placed in a similar manner and serum and antigens of the appropriate identified variant are used.

But the last titer of the variant serum, the double titer of the antigen, is used.

If the test antigen reacts positively with the serum even at high dilution, it indicates that it belongs to the same variant (Table 22).

**Table 22. An approximate result of determining which variant the epizootic strain of the protein virus in CBD belongs to.**

| *Variant antigens* | *Dilution of antigens* | *Whey in the latest titer of the variant* | | | | *Antigen-control* |
|---|---|---|---|---|---|---|
| | | $A_{ST}$ | $A_{7}$ | $A_{20}$ | $A_{22}$ | |
| *$A_{ST}$, titer 1: 4* | *1: 2* | ++++ | - | - | - | - |
| *A7, titer 1: 8* | *1: 4* | - | ++++ | - | - | - |
| *$A_{2}$o, titer 1: 6* | *1: 3* | - | - | ++++ | - | - |
| *A22, titer 1: 8* | *1: 4* | - | - | - | ++++ | - |
| *Test antigen (epizootic)* | *S* | ++++ | ++++ | ++++ | ++++ | - |
| | *1: 2* | ++++ | ++++ | ++++ | ++++ | – |
| | *1: 4* | +++ | ++++ | ++++ | ++++ | – |
| | *1: 8* | ++ | + | + | ++++ | – |
| | *1:16* | + | ± | ± | +++++ | – |
| | *1:32* | - | - | - | +++ | – |
| *Whey control* | | - | - | - | - | – |

Conclusion. The strain being tested belongs to variant $A_{22}$.

If the amount of viral material sent from the farm is not sufficient for CBD, then it is multiplied in cultured cells or in 3–6-day-old mammals or older guinea pigs. The test suspension is injected under the skin of mice, 0.1-0.2 ml into the shoulder area, into the skin of guinea pigs and 0.2-0.5 ml into the pads of the next two legs. Animals are observed for 5–7 days .

When mice die, antigen for CBD is prepared from their body. In the legs of guinea pigs, aphthae appear as a positive result; the walls of that week and its composition are used for KBR. If necessary, 2-3 "blind" passages are held.

In the third passage, if there is no degeneration in the cells or if the mice do not die, the protein virus antigen in the suspensions obtained from them is not found in the CBR, and the sample of the suspension being examined is negative .

**Retrospective diagnosis of proteinuria**

Blood serum from animals infected with proteinuria or suspected of other vesicular diseases will be needed as a test material to find antibodies to the protein virus. In animals, blood serum is taken 7 days after the onset of symptoms of vesicular disease. 5-10 samples from adult animals in each group will be sent for testing. In case of uncertain results in the first examination, blood is taken again from the same animals after 7-10 days. Whey is preserved by the general method (penicillin and streptomycin 500 units / ml) or frozen at -20 °C. Each animal control for at least 5 ml of serum taken from the ice laid unit will be sent.

In laboratories, serum is tested using the radial immunodiffusion reaction (RIDR) and indirect immunofluorescence (BIFR) reactions .

RIDR. The essence of the reaction is that if the gel contains viral antigens, combined with antibodies, it forms a specific precipitation line. RIDR is type specific .

To perform the reaction, dilute 1: 5, 1:10, 1:20 tsp, diluted 1: 320 (to 50-55 °C ) with melted agar (2%), mix equal volumes of test whey and transfer from 4 ml to the beaker. poured.

In the solid agar, a pit with a diameter of 4-7.7 mm is cut, the pits are filled with reference antigens of the type. The instrument window is then placed in a humid chamber with a temperature of 37 °C. The results of the reaction are taken into account after 6–7 h and 18 h.

In a positive reaction, an opalescent precipitation ring is formed around the antigen infiltration pit relative to the disease-causing homologous pathogen .

When the animals become ill and recover, the titer of the antibody is more than 1: 160 .

BIFR. This reaction is based on the antibody-specific irradiation (antigen + antibody complex) present in the serum of infected animals, and no irradiation is observed in the serum complex of vaccinated animals.

The procedure for setting the reaction is as follows.

VNK-21, SHB, CHHB infected cell infected with any type of protein virus is infused 1:10 and 1:20 diluted test serum, incubated in a humid chamber at 37 °C for 30 minutes , the unbound antibody is washed, air-dried marked with rhodamine dyed with a working dilute mixture of serum against the fluorescent type. It is then incubated in a humid chamber at 37 °C for 30 min, dried, and observed under a luminescent microscope (objective x 40, ocular x 4 or 5).

In a positive reaction, the cell cytoplasm emits a green or light green light. The reaction is monitored with appropriate control. If even one specific irradiation is found in 5-10 serums sent from the farm, the diagnosis is positive. The test serum is thus titrated to determine the level of antibody found. To do this, the test serum is diluted 1:40 to 1: 1280. As shown above, the pre-infected drug was treated with each of the diluted ones .

To determine the titer of the antibody formed after infection, the final dilution, which gave a positive result in BIFR, is considered.

1:10, 1:20, 1:40 Diluted serum preparations were obtained during the acute phase of the disease, ie 7 days after the disease, diluted 1:80 and above, and serum from a convalescent animal indicates that

In proteinuria, a protocol is drawn up based on the results of the examination, which describes the date of the examination, the name of the farm, the type of material, a brief epizootiological information and the name of the components used in the examination, the method of control .

**Homework**

1. To acquaint students with the methods of diagnosis of proteinuria in the laboratory .

2. Preparation of antigen for CBD from pathological material (a piece of goulash skin) obtained from an animal suspected of having proteinuria.

3. To put the basic experience of CBD to determine which type of protein virus it belongs to.

4. Calculation and completion of reaction results .

**Material supply:**

Examined pathological material (a piece of skin from a flower in a vial containing 50% glycerin solution); antigens of standard type (types A, 0, C); serums belonging to the standard (types A, 0, C); hemolysin; complement; 2% mixture of ram erythrocytes; isotonic solution - 0.85% NaCl solution; tripods; test tubes; 1.2 and 5 ml pipettes; water bath; thematic tables; container with disinfectant solution (2% - NaOH solution); a sterile mortar made of porcelain; crushed sterile glass; cuvettes; Petri dish; 10x10 filter paper; tweezers; scissors.

**Lesson plan (6 hours) Lesson I.**

l.Questions for control .

2. Teacher's explanation.

3. Demonstration of a diagnostic kit developed by the biological industry for the diagnosis of proteinuria.

4. Independent work of students. Preparation of antigen from pathological material for CBD .

**Lessons II and III.**

1. Teacher's explanation: a) the essence of CBD and its role in the diagnosis of viral diseases; b) a method of placing CBD in determining the type of protein virus .

2. Demonstration and calculation of complement and titration of the hemolytic system .

3. Independent work of students: Putting the basic experience of CBD.

4. Teacher's explanation (the period between the stages of CBD): a) a method of determining which variant the protein virus belongs to; b) retrospective diagnosis of proteinuria.

5. Independent work of students with the help of the teacher: calculation of CBR results .

6. Completion of the lesson.

7. Assignment for the next lesson.

**Control questions.**

l.What are the main features of protein virus?

2. Describe the rules of working with protein virus-containing material .

3. What are the epizootiological features and symptoms of the disease caused by the protein virus ?

4. What methods do you know to diagnose proteinuria in the laboratory ?

**Methodical instructions.**

This session is designed for 6 hours. The time can be distributed as follows. In the first 2 hours, the teacher explains, demonstrates (see plan), and the students work independently - preparing the antigen for the CBD. A piece of skin taken from a dead animal instead of pathological material or a cow embryo taken from a cultured cell section.

The tissue is placed in vials of 2-3 g of penicillin, 50% glycerin solution is poured over it and placed in a thermos with the cooling mixture .

In the next 4 hours - teacher explanation, demonstration (see plan) and independent work of students - to put the basic experience of CBD .

At this time, it is advisable to divide the study group into small groups of 4-5 people, and each small group should also put CBR .

In addition to teachers, students tested the antigen KBR in all components of the working liquid state and at KBR check it.

Using a set of diagnostics produced by the biological industry for CBR, the liquefaction work on all components is pre-performed by the instructor and checked by CBR.

CBR results are calculated with students and discussed in each subgroup .

In order to save components, standard serum and non-double dilutions of antigens are prepared for students.

In addition, testing of the tested material with serums of types A, O and C is considered sufficient.

**"APPROVED"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____ Z.J. Shapulatova
“ ____ ” _____–
2021.

**Laboratory work on "Differentiation of avian influenza virus from Newcastle disease virus using hemagglutination inhibition reaction" (2 hours)**

## PASSPORTS

***M Purpose of the study:*** To differentiate between unknown hemagglutinating Newcastle and influenza viruses using GATR.

***Necessary equipment, reagents and equipment:*** Newcastle disease virus; special serum for this virus; saline solution; l-2ml pipettes; plexiglass panels; 1% - chicken erythrocytes; a glass filled with disinfectant solution; rubber nokcha; pen to write on the mirror.

***To differentiate the virus of avian influenza and Newcastle disease in the laboratory:***

Execution will be based on the following plan:

isolation of the virus in chicken embryos; Distinguish the influenza virus from the virus that causes Newcastle disease using GATR. We test the droplet hemagglutination reaction to detect the virus in suspected bird flu and Newcastle disease.

To do this, one drop of 5% chicken erythrocytes is added to a drop of suspension prepared from pathological material. A positive reaction indicates the presence of a hemagglutination virus in the material.

***Books:***


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3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.


***Developers:***


**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**

**TOPIC: Differentiation of avian influenza virus from Newcastle disease virus using GATR**

**Family: Myxsoviridae Generation: Orthomyxovirus and Paramyxovirus**

**Cryptogram: R / I: S5 / 1: S / E: V / O and R / I: 6-8 / I: S / EV / O.**

Newcastle disease is a common disease of birds that causes great economic damage. Recently, there has been an outbreak of bird flu, which is similar to this disease. We need to differentiate between these diseases and specific preventive measures.

Newcastle disease is a highly contagious disease of chickens and turkeys. The disease can be acute, asymptomatic, and latent, depending on the virulence of the epizootic strain, immunological status, age of the chickens, and additional infection. The symptoms of Newcastle disease vary. Symptoms of weakness are accompanied by damage to the respiratory tract, runny nose, runny nose, cough, suffocation.

Bloody discharge of a bluish-brown liquid indicates inflammation of the digestive tract.

Catarrhal inflammation, hyperemia and bleeding in the respiratory system, esophagus, stomach, intestines are observed when dead chickens are torn. The brain becomes red and swollen.

The virus that causes Newcastle disease belongs to the family Paramyxoviridae (Fig. 70). The uniformity of the viral antigen greatly facilitates laboratory testing and diagnosis.

The virus agglutinates erythrocytes in chickens, guinea pigs, mice, and humans. Some strains of the virus also agglutinate sheep and horse erythrocytes.

Avian influenza is an acute highly contagious disease of domestic and wild birds. Chickens, ducks, turkeys, geese are susceptible to influenza.

In avian influenza, fatigue, loss of appetite, difficulty breathing, fluid leakage from the mouth and nasal cavity, impaired coordination of movements, paralysis and paralysis of the legs, crown swelling, and in some cases, smallpox are observed.

Swelling of the head, neck, diarrhea, damage to the nervous system.

In the Al serological variant of influenza in chickens, 70-80% of sick chickens die. But it also depends on the virulence of the virus strain, the age of the chicken, the storage conditions, and the intervention of additional infection. When we examine chickens that have died of influenza, we can see catarrhal conjunctivitis, rhinitis, sinusitis, tracheitis, catarrhal hemorrhagic inflammation, bleeding in the gastric mucosa, intestines. In some cases, inflammation of the oviduct and ovaries is observed.

Avian influenza virus belongs to the family Orthomyxoviridae, 13 serological variants, which have different levels of pathogenicity and different clinical signs of the disease in different species of birds. Therefore, the bird flu virus was formerly called the bird flu virus. Influenza virus is an A, S-antigen belonging to all generations, which can be detected by placing CBR and B-antigen (hemagglutinin and neuraminidase) using GATR and NR. The avian influenza virus agglutinates the erythrocytes of chickens, guinea pigs, rabbits, horses, sheep, and other animals. Judging by the above, the clinical symptoms, pathological changes of

Newcastle disease are very similar to avian influenza, and we can distinguish them only by laboratory methods.

The brain, lungs and spleen are sent to the laboratory to do this work.

The virus should be isolated from dead birds at the peak of the disease.

Therefore, patmaterial should be taken within 3-5 days after the onset of the disease.

Blood serum is taken from 25 chickens in one henhouse to test for antibodies to the virus being tested and sent for sampling. After 2-3 weeks, blood serum is sent from 25 chickens of the same number for testing.

When blood is taken from the chicken, following the rules of asepsis, after taking the serum, it is preserved by adding to it a ratio of 1: 20000 merthiolate.

**Differential diagnosis of avian influenza and Newcastle disease virus in the laboratory.**

Execution will be based on the following plan:

isolation of the virus in chicken embryos; Distinguish the influenza virus from the virus that causes Newcastle disease using GATR. We test the droplet hemagglutination reaction to detect the virus in suspected bird flu and Newcastle disease.

To do this, one drop of 5% chicken erythrocytes is added to a drop of suspension prepared from pathological material. A positive reaction indicates the presence of a hemagglutination virus in the material.

**Isolation of the virus.** In order to detect and isolate the virus by biological sampling, a suspension made of patmaterial is injected into the allantois cavity of a 9–11-day-old chicken fetus.

If the strain of the virus is virulent within 20-76 hours as a result of the proliferation of Newcastle and influenza viruses, the chicken embryo will die. When we open a dead chicken embryo, we see that there is a lot of blood on the neck, legs and body of the fetus. The allantois fluid of a dead chicken embryo is taken and the presence of the virus is determined using a droplet reaction, which we use as a material in the next test, i.e. in place of the isolated virus.

If we cannot isolate the virus at the first infection, then it is considered a “blind” passage 3 times.

For infection, allantois fluid, which reacted positively in a previous examination of the fetus, is used.

The virus isolated on the basis of tests is Newcastle virus, in which we need to determine whether it is vaccinated or epizootic.

To determine the pathogenicity of the field strain, we use vaccinated 30-day-old chicks.

Chickens are infected with a suspension of 0.2 ml of allantois fluid (1: 100) or obtained from dead chickens. If there is a field strain, the chicks die in 4–6 days.

**Distinguish influenza virus from Newcastle virus using GATR.**

The encounter and isolation of the virus in the chicken embryo has nothing to do with virus differentiation. Both viruses cause the same pathological changes due to their development in the chicken fetus.

The specific effects of viruses are evident as a result of serological reactions.

For the differentiation of GATR viruses, the use of chicken erythrocytes is very convenient.

The purpose of selecting this reaction is that both viruses have the ability to hemagglutinate erythrocytes, but as a result of their combination with specific serums we can distinguish them from each other.

The reaction is quick and easy, requires little sterility, and we can get a quick response. Serums containing specific antibodies are prepared in biofactories and sent to laboratories as diagnostics.

Two such kits have been developed in the country for laboratory diagnosis of Newcastle and influenza viruses.

To differentiate Newcastle disease from influenza, GATR is applied and two special serums are used.

The first contains antibodies against Newcastle virus, and the second contains antibodies to influenza virus.

The goal of determining the serological variant of influenza virus is that birds infected with one variant do not produce antibodies against the virus of the second variant.

To set the reaction, the isolated virus is titrated and a working diluted level of 4 GAB titers is formed.

Two types of serum prepared in a biofactory are then obtained and the titer of antibodies in the serum is determined in the presence of the isolated virus.

In the following example, the hemagglutination activity of an unknown virus was stopped using a specific serum-containing antibody.

**Table 15. Scheme of differentiation of Newcastle and influenza virus by dilution of serum using GATR.**

| An integral part of the reaction | Dilute the whey | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1: 2 | 1: 4 | 1: 8 | 1:16 | 1:32 | 1:64 | 1: 128 | 1: 256 | 1: 512 |
| Serum for VirusX + Newcastle virus | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ |
| Serum for VirusX + Influenza virus | - | - | - | - | - | + | ++ | +++ | +++ |

Formation of antigen + antibody complex (isolated virus + antibody of specific serum). The addition of serum containing antibodies against Newcastle virus to the virus.

**Table 16. Scheme of differentiation of Newcastle disease from influenza by diluting the virus using GATR.**

| Rows№ | The composition of the reaction, ml | Dilute the virus | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1: 2 | 1: 4 | 1: 8 | 1:16 | 1:32 | 1:64 | 11: 128 | 1: 256 |
| | Physiological | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | solution | | | | | | | | |
| | Virus X | 0.2 | Transfer to 0.2 ml in turn | | | | | | |
| 1 | Serum for Newcastle virus | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| | Physiological solution | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| | Virus X | 0.2 | Transfer to 0.2 ml in turn | | | | | | |
| 2 | Serum for influenza virus | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| 3 | Physiological solution | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| | Virus X | 0.2 | Transfer to 0.2 ml in turn | | | | | | |
| | Physiological solution | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

**Table 17. Results of differentiation of serous variant of Newcastle and influenza 1 virus in birds by diluting the virus using GATR.**

| The composition of the reaction | Dilute the virus | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1: 2 | 1: 4 | 1: 8 | 1:16 | 1:32 | 1:64 | 1: 128 | 1: 256 | 1: 512 |
| Serum for virus X + Newcastle virus | +++ | +++ | ++ | + | - | - | - | - | - |
| Serum for virus X + influenza virus | +++ | +++ | +++ | +++ | +++ | +++ | ++ | + | - |
| Virus X + saline solution | +++ | +++ | +++ | +++ | +++ | +++ | ++ | + | - |

Thus, Newcastle and influenza virus cause the same changes in chicken embryos.

By placing the GATR, the virus can be differentiated, and if a reaction is suspected, a neutralization reaction is considered.

**Homework**

Distinguish between unknown hemagglutinating Newcastle and influenza viruses using GATR.

**Material supply:**

Newcastle disease virus; special serum for this virus; saline solution; l-2ml pipettes; plexiglass panels; 1% - chicken erythrocytes; a glass filled with disinfectant solution; rubber nokcha; pen to write on the mirror.

**Lesson plan (2 hours)**

1. Teacher's explanation.
2. Independent work of students:

a) double dilution of the virus;

b) pouring whey.

3. Control questions.

4.Students shed erythrocytes independently.

5. Teacher's explanation.

6. To show students the diagnostic kit, to distinguish Newcastle virus from influenza virus . To study the use of antigens and serums. Distinguish one virus from another by GATR.

7. View the results of GATR performed independently.

8. Concluding the session. 9. Assignment to the next lesson.

**Control questions**

l.N'yukasl and calls on the influenza virus disease What are the similarities?

2. What methods do you know to isolate and detect the virus from sick and dead chickens?

3. How to distinguish Newcastle disease virus from influenza virus?

**"APPROVED"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____ Z.J. Shapulatova
“____” _____–
2021.

**"Differentiation of pneumoenteritis in calves using diagnostic kits produced in biofactories"**
**laboratory work (2 hours)**
**PASSPORTS**

***THE purpose of the*** lesson: to teach students how to make a practical diagnosis of viral diseases of animals. To do this, the following task is set: to detect and differentiate the virus that causes pneumoenteritis in calves in pathological material

***Required equipment, reagents and instruments:*** Diagnostic kits for the diagnosis of large horned animals YURT, pg-3, DV, RS and adenovirus infection; mucous membranes of the trachea and bronchi taken from sick calves; fluorescent microscopes; thermostat; cuvettes; pipettes; acetone; saline solution.

The composition of the diagnostic kit used in the diagnosis of YURT disease of large horned animals:

a) horse- specific serum for NR and DPR ;
b) horse (negative) control serum for NR and DPR ;
c) the specified specific serum of the horse ;
d) marked (negative) control globulin of the horse .

2. The composition of diagnostic kits used in the diagnosis of VD in large horned animals:

a) NR diarrhea vaccine for the virus;
b) a specific antigen of the diarrhea virus for CBD and DPR;
c) control (negative) antigen;
d) serum specific for diarrhea virus for CBD and DPR;
e) serum specific for diarrhea virus for NR ;
f) control (negative) serum;
g) fluorescent serum for diarrhea virus .

***Books:***

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.

5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

**Docent: Bazarov X.K.**

**Assistant: Nurgaliyeva J.S.**

## TOPIC: Differentiation of pneumoenteritis in calves using diagnostic kits developed in biofactories.

The purpose of the course is to teach students how to make a practical diagnosis of viral diseases of animals. To do this, the following task is set: to detect and differentiate the virus that causes pneumoenteritis in calves in pathological material .

A group of similar diseases with a viral etiology in which the pathogen has no reciprocal side is artificially referred to as pneumoenteritis. This group includes infectious rhinotracheitis (YURT), viral diarrhea (VD), parainfluenza type 3 (pg-3), adenovirus, and respiratory syncytial (RS) infections in large horned animals .

There are many similarities between the infections mentioned above:

1) epizootology - mainly sick young calves of 5–6 months of age in the autumn-winter period. The disease is often fatal in the enzootic state, the virus carrier lasts longer ;

2) symptoms - fever, rhinitis, cough, runny nose, diarrhea ;

3) pathological changes - redness, swelling of the mucous membranes of the respiratory tract, chest space between the bronchi and spine, redness of the lymph nodes ;

4) Mucus from the nose and larynx, mucous membranes of the nose, trachea, bronchi, feces are sent to the laboratory as pathological material ;

5) The virus of pneumoenteritis multiplies by showing SPT in cultured cells prepared from the kidneys or testicles of the fetus of large horned animals. Their antigens can be detected using DPR and IFR ;

6) pg-3 virus agglutinates guinea pig erythrocytes. The choice of the same infection as a learning task is based on the consideration that: l) infection belonging to the group of pneumoenteritis is common and causes great economic damage to livestock. However, the diagnosis of this infection is rarely made because it is neglected due to the fact that the disease is highly lethal and progresses slowly. These diseases are often referred to by a different diagnosis and may even go unnoticed as the disease progresses .

Solving the task set before us will allow future veterinary specialists to solve the problem of pneumoenteritis;

2) special diagnostic kits are developed by the biological industry and can be performed by a qualified veterinarian not only to differentiate pneumoenteritis in the laboratory, but also on the farm using a simple device (fluorescent microscope).

Getting acquainted with these collections and using them in practice is one of the tasks of this topic.

The importance of familiarity with diagnostic kits is that such kits are being developed to diagnose not only pneumoenteritis but also other infections ;

3) pnevmoenterit heifers differensiatsiyalashda diseases biological drugs widely used in industrial and developed by a separate group of disease prevention is critical .

4) Due to the similarity of pneumoenteritis infection, it is convenient to differentiate the viruses that cause them. To diagnose pneumoenteritis in calves, we present the composition of diagnostic kits produced at the Privolzh biofactory .

l. The composition of the diagnostic kit used in the diagnosis of YURT disease of large horned animals:

a) horse- specific serum for NR and DPR ;

b) horse (negative) control serum for NR and DPR ;

c) the specified specific serum of the horse ;

d) marked (negative) control globulin of the horse .

2. The composition of diagnostic kits used in the diagnosis of VD in large horned animals:

a) NR diarrhea vaccine for the virus;

b) a specific antigen of the diarrhea virus for CBD and DPR;

c) control (negative) antigen;

d) serum specific for diarrhea virus for CBD and DPR;

e) serum specific for diarrhea virus for NR ;

f) control (negative) serum;

g) fluorescent serum for diarrhea virus .

3. The composition of diagnostic kits used in the diagnosis of pg-3 disease in large horned animals:

a) agglutination antigen;

b) specific whey;

c) negative serum;

d) fluorescent serum.

4. The composition of diagnostic kits used in the diagnosis of adenovirus infection in large horned animals:

a) 1 small group specific antigen;

b) DPR 1 to a small group of specific serum;

c) specific serum of subgroup 1 for CBD ;

d) fluorescent serum for subgroup 1;

e) 2- subgroup - specific antigen;

f) the DPR for 2 small- group -specific serum; g) for KBR 2 small- group - specific serum; h) fluorescent serum for subgroup 2; i)
negative antigen; f) negative serum for DPR ; k) Negative serum for CBD .

5. The composition of diagnostic kits used in the diagnosis of RS-infection of large horned animals: a) specific antigen of RS-virus ; b)

control (negative) antigen; c) specific serum for CBD and DPR ; d)
control (negative) serum;

e) fluorescent specific serum.

**Homework**

Pnevmoenterit signs of pathological samples calves in which the presence of virus detection.

**Material supply**

Diagnostic kits used to diagnose YURT, pg-3, DV, RS and adenovirus infection of large horned animals prepared in a biofactory ; mucous membranes of the trachea and bronchi taken from sick calves; fluorescent microscopes; thermostat; cuvettes; pipettes; acetone; saline solution.

**Approximate lesson plan (4 hours)**

Session 1 (2 hours):

l.questions for control .

2. Issue the details of the IFR method.

3. Demonstration of diagnostic kits .

4. Independent work of students :

marking a) pathological material ;

b) fixation of the mark in acetone ;

c) drying.

Lesson 2 (2 hours):

1. Stamping with fluorescent whey.

2.Nazorat questions.

3. Washing the preparation .

4. Drying of the drug .

5. Viewing the drug under a microscope .

6. Discuss the results of the IFR .

**Control questions**

1. What are the clinical and pathological signs of pneumoenteritis in calves?

2. Describe how the laboratory diagnosis and differentiation of calf pneumoenteritis.

What is 3.IFR ?

**Methodical instructions.**

It is practically impossible to fully differentiate pneumoenteritis from real pathological material by students in the laboratory .

In meat establishments, a piece of the mucous membranes of the larynx or bronchi as a pathological material is limited to the identification of the virus using IFR.

It is important to take into account the difficulty and cost of obtaining sufficient quantities of diagnostic kits for educational purposes. Therefore, given the complexity of providing the training process with diagnostic kits, it is necessary to simplify the training without reducing the effectiveness of the study .

It is recommended to use one antigen and one serum during training .

Serum can be obtained from the appropriate kit for IFR. As an antigen, a corresponding tissue (for stamping) derived from large horned animals can be used.

Instead of specific serum - fluorescent serum (subgroup of choice) is taken from the adenovirus collection and used only in high concentrations .

Fluorescent serums containing DV and pg-3 kits can be used, but their activity (not specificity) has been tested in the tissues of large horned animals .

Antigen is used in rabbit laryngeal tissue and fluorescent serum against specific rabbit serum.

In any case, because fluorescence is not specific, the study of a fluorescent antigen may not be natural .

For this simple method, each set of 5 sets of whey according to the scheme (+) -positive, (-) - negative whey is prepared for each study group .

The training can be organized as follows. The study group is divided into 5 brigades of 25 students. Each brigade is given 5 whey from a different numbered set .

Each brigade from the serum using IFR pathological material using a structure in which to determine the presence of the virus to do it.

Naturally, the results will be different in each brigade, which means that whichever serum in their set is positive is associated with the same virus.

| **Serum package number** | | | | | **Whey to be called** | |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | | |
| **+** | **0** | **0** | **0** | **0** | | YURT |
| **0** | **+** | **0** | **0** | **0** | | DV |
| **0** | **0** | **+** | **0** | **0** | | Pg-3 |
| **0** | **0** | **0** | **+** | **0** | | RS |
| **0** | **0** | **0** | **0** | **+** | | Adeno |

Such execution of the imitation does not reduce the students' interest in the examination, but it remains unknown which virus was found in the pathological material obtained. The transition process is more important here than getting the actual test results .

**"APPROVED**

**"**

Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“ ” _____–
____
2021.

**" Disease-causing viruses in fish ."**
**laboratory work (2 hours)**
**PASSPORTS**

***M Purpose of the study:*** Viral diseases of fish are spread through contact or through the habitat. In some diseases, they are spread by carriers, such as invertebrates (leeches, crabs).

***Required equipment, reagents and equipment:*** Pathological material under investigation (a piece of skin from a flower in a vial with 50% glycerin solution); NaCl solution; tripods; test tubes; 1.2 and 5 ml pipettes; water bath; thematic tables; container with disinfectant solution (2% - NaOH solution); crushed sterile glass; cuvettes; Petri dish; 10x10 filter paper; tweezers; scissors, luminescent microscopes; thermostat; cuvettes; pipettes; acetone; saline solution.

***For a complex method of diagnosis:***

The most reliable diagnosis is to isolate the VGS virus and grow it in a tissue culture, identify it by serological tests, and place a bioprobe on susceptible fish.

***Books:***


1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3. M.Jackson. Veterinary clinical pathology. America 2010 year.
4. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Agropromizdat 1998 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.



***Developers:***

**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**


## Disease-causing viruses in fish

**Viral diseases** . The causative agents of this disease are very small organisms, the size of which is millimicrons (10-300). These organisms parasitize inside the cells of the fish body, both in the cytoplasm and in the nucleus. They come in a variety of shapes: rod-shaped, thread-like, spider-like, and so on. The mature part of viruses - varions - consists of two components, namely a protein and a single nucleic acid (either DNA and or RNA), which differs sharply from other microorganisms by these properties. Reproduction of viruses also differs from

other microorganisms in that each component in the virus is synthesized separately in different parts of the host organism, and then they combine with each other and form a mature virus.

It is necessary to isolate the causative agent of the virus in order to make an accurate and correct diagnosis in viral diseases. There are several ways to do this. The most important of these is the cultivation of these viruses in tissue culture and their detection under an electron microscope. Isolation of tissue culture in virological examination is a very difficult task and can only be performed under specially equipped laboratory conditions. Different tissue cultures will be required for different virus types. For example, while some viruses develop in a specific tissue culture derived from fish, others do not feel the need for it, i.e. it does not make much difference whether it is derived from infected fish or from healthy fish.

All the material collected about the viruses of fish allows them to distinguish them from viruses in warm-blooded animals and to classify them. The main difference between fish viruses and warm-blooded animal viruses is that fish viruses have the ability to live and reproduce at different, extensive temperature ranges. In this case, the lower temperature limit is much lower than in warm-blooded animals and is equal to the temperature required for fish to survive.

Viral diseases of fish are spread through contact or through the habitat. In some diseases, they are spread by carriers, such as invertebrates (leeches, crabs).

**Viral hemorrhagic septicemia (in large fish).** This contagious disease is an infectious disease characterized by viral (viral) processes, darkening of the skin, swelling of the abdomen, dysfunction of the swimming apparatus, dysfunction of the nervous system, hemorrhage in the abdomen and connective tissue of the eye. , characterized by hemorrhage in the skeletal muscle, perivisseral adipose tissue, and the bladder (pucheglazie). The functions of individual organs as well as the whole organism are completely disrupted.

**Etiology.** The causative agents of the disease are RNA viral pathogens. Jensen (1965) first isolated the virus and managed to grow it in artificial culture tissue (nutrient medium) and named the virus egtved-virus in honor of the Danish city of egtved .

Near this town there is a farm that breeds trout species, which is considered unhealthy for viral hemorrhagic septicemia. Viral hemorrhagic septicemia virus is finger-shaped, 180-240 millimicrons long and 60-75 nm wide. Its apical part is round and the distal part is flat and armed with a caudal tumor. Inside the virus, the nucleus is 2nm in size, surrounded by a very complex shell-like shell (membrane) and covered with a smooth membrane. The virus grows well in digestive tissue cultures (RTQ-2), and the virus derived from fibroblasts in the ovaries of trout species is more sensitive to ether, chloroform, glycerin, and pH-3.5. The virus inactivates the entire layer at 44 degrees, within 15 minutes, at 30 degrees it loses its pathogenicity by 50%. In 50% glycerin, if the temperature is 14 degrees, the virus loses its infectious properties after about 6 days. The virus loses 50% of its activity when stored in a bottle of distilled water at 14 degrees, and about 90% when stored in water bodies. Ultraviolet rays have a lethal effect on the virus for

10 minutes. Of the disinfectants, 2% sodium hydroxide and 3% formalin kill the virus in 5-10 minutes. Active chlorine, which is widely used in ichthyopathology, has the ability to kill the virus in 2-20 minutes, depending on its concentration.

In the death of trout, which died of VGS, if the body is stored on ice, the virus can maintain its viability for 24 hours - at temperatures of 20 degrees and below, the virus retains its infectious ability for 2 years but the titer is reduced by a factor of 2.

Several types of VGS virus have been identified. For example, N (liver), R (kidney), V visceral and P (general affective), and N (neurotropic).

**Epizootiological data.** The disease has been reported in most European countries. In 1968, the virus was introduced from Denmark through caviar bred in the Czech Republic. In the former Soviet Union, it was found that the disease was transmitted through caviar.

VGS mainly affects trout. In the wild, trout, whales, hares and pali are infected. Mortality is 9-78% when the disease is epizootic. In hot weather, the disease is latent, but if the nutrition and storage conditions of fish do not meet the zoohygienic requirements, the disease develops in the summer with clinical signs. VGS affects trout with a size of 5-7 cm up to one year of age. Malki and segoletkas as well as adult fish are more resistant to the disease.

The source of the disease is sick fish, its waste and dead. Healthy fish can also get sick through the waters and muds of water bodies. The latent period of the disease depends on the ambient temperature, the virulence of the virus and the resistance of the fish organism. Under natural conditions, the incubation period is 7-15 days when the water temperature is 15-16 degrees, sometimes this period can be slightly extended to 25 days. Under experimental conditions, the latent period of the disease may be 2 weeks, 4 days when the pathogen is inoculated, and this period may be further reduced in contact with healthy fish and sick fish. When the virus is grown in vitro, it can cause disease in 10-15 days. Trout infected with VGS develop strong immunity.

**Clinical signs of the disease.** The disease is acute and chronic, as well as in the form of disorders of the nervous system. Sometimes it is very acute (sverx ostroe) and subclinical (latent).

When the disease is acute, the pathological process develops rapidly and the mortality rate is high. Dark brown spots appear on the body of sick fish, unilateral or bilateral blindness (pucheglazie), anemia and hemorrhagic streaks in the jaw, periocular membrane of the eye. The base of the filter apparatus (osnovanie) is red.

In the chronic course of the disease, the clinical signs develop slowly and the mortality rate is much lower. The body is completely darkened, a state of severe exophthalmos, as well as anemia. In this case, the jaw is light red or white-gray, and sometimes completely white. Sometimes water accumulates in the abdominal cavity.

In the nervous form of the disease we can see specific changes in the movement of fish. Sick fish move in a spiral (under water basins or against the flow of water),

sometimes floating sideways for some time. They have tremors and spasms. Death will be much lower.

The duration of the disease depends on the external environmental conditions, the sanitary condition of water bodies, technological processes. The appearance of the disease enzootia ends in 1–2 months.

**Pathoanatomical changes.** The main pathologic changes were observed in the periocular membrane of the eye, muscles, perivisceral fat layer, bladder (sac), abdominal wall, heart, where blood was transfused. Hemorrhage is often observed in the acute course of the disease, and disappears in the chronic course. In the acute course the liver is hyperemic, the color is dark red, and in the chronic course it is white-gray. On histological examination, necrotic lesions of hepatocytes, vacuolation of the cytoplasm, cariolysis and picnic state, spread in the liver parenchyma or in groups. Kidney disease is reddish in the acute course, thin, the surface is gray and bumpy in the chronic course of smooth. On histological examination we can see necrotic lesions, cytoplasmic vacuolation of the protoplasm, pycnosis, karyolysis, separation of the epithelium, general swelling. There are also changes in blood composition, decreased hemoglobin levels and erythrocyte counts.

**Pathogenesis** . The virus enters the fish's body through its jaws. It develops and multiplies in the endothelial cell of the spleen and the whole blood vessel, then spreads to all internal organs and tissues and causes a deep pathological process. Nerve form of the disease is manifested as a result of damage to the nervous system. When the epithelium of the blood vessels is damaged, their permeability increases, blood clots are observed, the wall is damaged, and a hemorrhagic condition occurs. In chronic flow, tumors are formed as a result of toxicosis, the process of osmoregulation is disrupted. When the nervous system is damaged, motor coordination is impaired. Hyperglycemia, decreased lipid levels, variable electrolyte concentrations, decreased serum protein levels, especially albumins, but increased alpha and betta globulins.

**Diagnosis** . Diagnosis of the disease is based on a complex method: epizootiological data, depending on clinical signs and pathological changes. The most reliable diagnosis is to isolate the VGS virus and grow it in a tissue culture, identify it by serological tests, and place a bioprobe on susceptible fish.

**Treatment, prevention and control measures.** No treatment for VGS has been developed. Foreign scientists recommend the use of antibiotics (oxytetracycline) and antiseptics (methylene blue). Although they do not kill the virus, they do prevent the development of a secondary infection and make the course of the disease a little easier.

Disease prevention and control measures include a set of comprehensive general veterinary-sanitary, fishery-reclamation and biotechnological measures, which should be aimed at:

-epizootology chain breakage (parasite-host);

-increasing the natural resistance of fish;

-reduction of the total amount of the pathogen in the external environment;

-improvement of veterinary and fishing culture.

**Vet san expertise** . The VGS pathogen is not dangerous to humans and and animals. If the fish caught from unhealthy farms meets the demand for the appearance and quality of the product, it will be released without any restrictions. If it does not meet the requirements, it can be fed to farm animals after boiling on the advice of a veterinarian-ichthyopathologist.

**2** . **Measles (krasnukha)** is a very dangerous, common infectious disease . The disease is widespread mainly in Ukraine, the North Caucasus, the Central Asian republics, and Western European countries. Carp and its wild species - carp are prone to the disease. The disease is less common in fish such as carp, fin, grass carp, forehead fish.

**Etiology.** It has long been known that Krasnukha is a contagious disease. For a long time there was no clear idea about its cause. In the 1930s, W. Sheperklaus hypothesized that it was caused by bacteria. According to him, the causative agent of krasnukha is a virulent form of the saprophyte Aeromonas punstata bacterium in water, which can be found at the bottom of water bodies. This bacterium can be isolated from the intestines and tissues of healthy fish. When unfavorable conditions for fish occur, they can become virulent and cause disease. According to Sheperklaus, the disease is observed in late winter. Sheperklaus' hypothesis is still supported by many MDX and foreign scientists. When a strong culture of Aeromonas was sent to a healthy fish, a fatal disease reminiscent of Krasnukha disease occurred. However, in the course of studying the disease, opinions contradicting this hypothesis emerged. For example, it is not always possible to find Aeromonas bacteria in the body of fish infected with Krasnukha. Bacteria isolated from diseased fish were no different from bacteria isolated from healthy fish. In the 30s of the XX century GVEpshtein, MAPeshkov, GDGoncharov and others expressed their views on the viral nature of Krasnukha. Their views were later endorsed by several foreign scholars. Einstein found that there were eosinophilic bodies in the cells in the brains of sick fish, but that there were no such bodies in fish that had been sent a culture of bacteria and bacteria. Together with Fiyan staff and Svillenberg, they examined the virus under an electron microscope. Its length is 70-180 nm and its shape is elongated, axial. One side of the varions is round and the other side is flat. The virus of Krasnukha disease was included in the group of rabdoviruses, which was called Rabdovirus carpio.

**Epizootiological data.** Carp species, carp and their hybrids are prone to the disease. The disease peaks in late summer, peaks in summer, and decreases in autumn. Often 2-3 year old fish get sick. The source of the disease is sick fish, the waste they excrete, dead fish, healthy fish that carry the infection. In ponds, the pathogen is introduced through water, through diseased fish, and through hunting equipment. In fish, the virus enters the pathogen through the damaged skin, through the gills, causing the disease. Related immunity is formed in the body of diseased fish.

**Clinical signs of the disease.** The latent period of the disease is 2–30 days. It occurs in acute, semi-acute and chronic flows. In the acute flow, some or all parts of the skin become hemorrhagic, water accumulates in the abdomen

(vodyanka), the eyes become blind (pucheglazie), there is a shedding of coins in the skin. Sick fish move less, move on the surface of the water, near the shore, slow or do not respond at all to the impressions of the external environment, and then die after 2-4 weeks with a violation of movement coordination.

The semi-acute course is characterized by a sudden accumulation of water in the abdomen, shedding of coins, pucheglazie, ascites and wounds of various sizes. Wounds are red in color, sometimes necrosis of muscle tissue can be observed due to the development of purulent processes in the wounds. Sometimes necrosis of the swimmers occurs. The semi-acute course of the disease lasts 1.5–3 months.

In chronic flow, open wounds form on the skin and scalp, and when the wounds heal, a bluish-green connective tissue forms in its place. The disease lasts 1.5–2.5 months and ends with recovery.

**Pathoanatomical changes.** In the acute course of the disease is observed serum-hemorrhagic inflammation of the skin, swollen and necrotic muscles, catarrhal or hemorrhagic inflammation of the intestines, encephalitis, hyperemia of the internal organs, the abdominal wall. The liver is black or dark blue, sometimes dark green, and the gallbladder is filled with bile fluid. The blood vessels of the swimming sac are dilated and filled with blood. Spotted bleeding in the pericardium. The abdomen is filled with water or blood mixed with water. Similar changes are observed in the semi-acute course of the disease. In the chronic course, no changes are observed in the internal organs.

**Diagnosis** . Diagnosis of the disease is based on epizootiological data, depending on the clinical manifestations, taking into account the pathological changes and the results of bacteriological examination. Under laboratory conditions, a virulent culture of the pathogen is isolated, and white mice or healthy fish are placed in a bioprobe.

**Treatment, prevention and control.** In the treatment uses the bath method. To do this, dissolve 300 mg of chloramphenicol in one liter of water and keep the sick fish for up to 12 hours. Syntomycin (600-1000 mg / l, methylene blue (50,75,100,200 mg / l), the duration of storage of fish in the bath is 12-16, 7-10, 4-6, 2-4 hours, respectively. Methylene blue is given to each fish at a dose of 1-2 mg per day (for 8-10 days) or syntomycin at a dose of 1-2 mg per day. Methylene blue 3-5 mg, syntomycin 2-3 mg per head of fish per day. Breeding and young fish (remontny molodnyak) are treated separately, chloramphenicol 20- Biomycin is given orally at a dose of 50 mg / kg for 2-4 days. Furazolidone is given to carp of all ages for 10 days at a rate of 60 g / 10 kg of feed. 2 every 5 days For prophylaxis, furazolidone is given for 10 days with a 2-day break in the following doses: At the rate of 10 kg of mixed fodder -0.4 g for breeding and repair group, -0.3g for two-year-olds, -0.4 g for one-year-olds (up to 50g) and -0.3g for segoletka.

In order to prevent the disease, prophylactic feeding is carried out until the temperature reaches 14 degrees. Re-feeding is carried out at a time when the disease is likely to occur. From the second half of July to October, prophylactic

feeding is carried out every 2–3 weeks. In addition, regular implementation of veterinary and fishery-reclamation measures, in particular, preventive disinfection and disinfection measures, regular medical inspections of farmed fish, quarantine of fish in the breeding and repair groups brought to the farm The installation is expedient. In some fisheries, dry cleaning of water bodies in the summer to prevent aeromonosis is also effective.

Quarantine in case of disease in unhealthy fisheries and natural fishery reservoirs. Regularly put workers in unhealthy water basins and provide them with separate inventory and hunting equipment. After capturing the carcasses of dead fish and disinfecting them with 20% chlorinated lime, bury them by digging 1.5 m deep . It is recommended to catch live sick fish and technically dispose of them with the conclusion of a veterinarian.

**"APPROVED"**
Head of the Department of Epizootology, Microbiology and Virology, Docent _____
Z.J. Shapulatova
“ ____ ” _____–
2021.

**"Disease-causing viruses in bees."**
**laboratory work (2 hours)**
**PASSPORTS**

***THE purpose of the study:*** The diagnosis of this disease is made on the basis of clinical signs and laboratory examination of pathological material. A portion of the mummies and at least 20 dead larvae and fungi, or altered larvae and fungi preserved in the same amount of 50% glycerin, are sent by a person with a referral letter.

IDR and direct and indirect IFR and coagglutination reactions (CoAR) are used in the laboratory for diagnostics on the basis of special "Guidelines" for the use of these methods .

***Required equipment, jet and instrumentation:*** Beehive, beeswax, 5% perhydrol, formic, acetic acid, sodium carbonate solution, 700 water baths, autoclave, Romanovsky-Gimza paint, grease, microscope, under experimental conditions 0, 5% copper sulphate, metronidazole solutions, sugar juice, test tubes, flasks, pipettes, magnetic stirrer, thermostat, centrifuge , etc.

***To make a diagnosis:***

For laboratory testing, most patients separate the larval wax needles, take a piece of 10x15 cm from it, and put all the copies in a box without wrapping them in paper. Copies are placed on the bottom and sides, on top of which is placed a wooden film so that it does not touch the box. A paper with the name of the family taken on each sample is hung. At the same time an appendix and a letter are drawn up, which indicate the name of the organization or the owner of the bee, surname, name, patronymic, address, date of receipt of pathological material, time of diagnosis, number of sick families. An appendix letter signed by a veterinarian will be sent to the veterinary laboratory immediately.

***Books:***

1. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2016.
2. Fenner's. Veterinary Virology (United States of America 2016 year).
3.B. F. Bessarabov et al. Infektsionnые bolezni jivotnyx M. Kolos, 2007
4. M.Jackson. Veterinary clinical pathology. America 2010 year.
5. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. Uchebnaya posobiya. M., Kolos, 2000.

***Developers:***

**Docent:** **Bazarov X.K.**

**Assistant:** **Nurgaliyeva J.S.**

## Disease-causing viruses in bees.

Sacculisatio contagiosa larvae (Lat. - Sacculisatio contagiosa larvae; English - Sacbrood; Russian - meshotchatiy rasplod, meshotchataya cherva, sukhaya gibel chervi; eng. - bag worm, worm death) - a viral disease of bees , larvae. and is characterized by bag rot of fungi.

**The causative agent.** RNA-protective virus with a diameter of 30 nm. Viral strains do not differ serologically. The virus grows well in primary cultures made from bee tissue. 72 hours after cell culture is infected with the virus, the mitotic division of the cells is accelerated, followed by the onset of the initial symptoms of SPT. This virus does not develop in a culture of endlessly intertwined cells made from vertebrate tissue .

Driver resistance. The virus is resistant to drying, ether and chloroform. It is inactivated in honey in an aqueous suspension at 59 ° C, at a temperature of 70-73 ° C for 10 minutes, in direct sunlight for 4-7 hours. It is stored actively in the dried object for 3 weeks. The virus is inactivated when boiled and in 0.3% potassium permanganate solution for 40 minutes. It is actively stored in honey at room temperature for about 1 month, in the refrigerator - 2 months, in the rotten mass for more than 10 days. The virus does not lose its activity for 10-15 days on the surface of wood with propolis, 5-10 days on the surface of metal, 80-90 days on wax. The virus is resistant to 3% sodium hydroxide and 0.3-10% rivanol.

**Diagnosis.** Diagnosis of this disease is made on the basis of characteristic clinical signs and laboratory examination of pathological material. A portion of the mummies and at least 20 dead larvae and fungi, or altered larvae and fungi preserved in the same amount of 50% glycerin, are sent by a person with a referral letter.

IDR and direct and indirect IFR and coagglutination reactions (CoAR) are used in the laboratory for diagnostics on the basis of special "Guidelines" for the use of these methods .

**Separate diagnosis.** It is necessary to distinguish this disease from other diseases of larvae and fungi (American, European rot, etc.). In all cases, a special laboratory test will be the basis for a final diagnosis.

Once the diagnosis is confirmed in the laboratory, beekeeping is *restricted* under the Veterinary Regulations . Endoglyukin (bacterial endonuclease) and ribonuclease are given as treatment and prophylaxis. The sick family is treated by giving 0.5% potassium permanganate along with sugar juice .

Beehives and beehives are disinfected with 5% perhydrol, all used inventory is burned in a gas flame after mechanical cleaning or treated with one of 5% perhydrol, formic, acetic acid . Then washed with water and dried. Bathrobes, canvas utensils, towels are boiled in sodium carbonate solution, thoroughly washed

in water and dried. The wax is disinfected and stored thawed in a water bath at 70 °C for 70 min or sterilized in an autoclave for 30 min.
*Restriction from the* farm *is* taken after the final disinfection, when the disease is completely eliminated.

## CHRONIC VIRAL PALACY

*Chronic paralysis* (Lat. - Paralysis chronic apium; English - Chronic paralysis; Russian - viral paralysis) - a viral disease of bees, fungi , young and pre - ima form, which can not fly in the flight area of the box, o ' characterized by paralysis of the wings.

**The causative agent** is an RNA-storing virus that develops in an elliptical shape, measuring 30–75 x 20–22 nm, 48 hours after infection in a primary cell and tissue culture made from bees, showing SPT.

The virus multiplies in the cytoplasm of cells of adult bee nerve tissue, small intestine, malpighian vessels, mandibular and hypopharyngeal glands. In virus-infected cells, they accumulate in various sizes and shapes, and in the small intestinal epithelial cells, they form cytoplasmic inclusions - Morrison inclusions. Chronic paralysis virus is usually detected at a temperature of 35 °C when infected with acute paralysis virus , but at 30 °C acute paralysis virus prevents the development of chronic paralysis virus .

**Driver resistance.** The virus is actively stored in the body of dead bees for more than half a year at a temperature of minus 70 ° C, more than 1 month at -15 ° C and 3-4 days at 4 ° C. At 60 ° C the virus is inactivated for 30-60 minutes, at 75 ° C for 10 minutes. However, there are reports that the virus is active for 30 minutes at 95 ° C , 7 days at 35 ° C, and 3 days at 35 ° C in 0.2% formalin solution . Under the influence of ultraviolet light, the virus is inactivated in 1 hour .

**Diagnosis and differential diagnosis.** The final diagnosis of this disease is based on clinical signs and, of course, the results of laboratory tests. Laboratory examination is performed by examining Morrison's bodies under a microscope in a histocosm of the small intestine of sick bees in the cytoplasm of the cell or in a smear prepared from there and stained with Romanovsky-Gimza dye. This entry can also be seen in IFR . The most accurate and easiest of these methods are IDR and NR.

Chronic paralysis requires differentiation of adult bees from other viral diseases, spirooplasmosis, phytotoxicosis, and pesticide poisoning. In all cases, complex laboratory tests allow to make a final diagnosis.

**Countermeasures.** Once the diagnosis is confirmed in the laboratory, beekeeping is *restricted* under the Veterinary Regulations . This will be reported to the nearest and district bee farms and veterinary specialists. It is prohibited for this bee farm to exchange mother bees or beeswax, honey and honey products, bee equipment, inventory with other farms . Veterinary and sanitary measures on the farm : old mummies are melted and turned into wax, mummies, frames, inventory, special clothes used in the family for 2-3 years are disinfected. It is not allowed to

replace larval and nutritious beehives in boxes, to use honey extracted and dried beeswax without cleaning and disinfecting, to keep families without weak and mother bees. Once the disease has been eliminated, the *restriction is lifted in* accordance with the Veterinary Regulations.

**Control questions**

1. How is bee sting disease transmitted within the bee family?
2. What are the symptoms of the disease in a troubled family of bees?
3. What pathological material is sent for virological examination?
4. What diseases of bees are accompanied by paralysis?
5. Name the forms of the disease with chronic paralysis.
6. What are the conditions that cause acute and chronic paralysis?
7. What insects, except bees, are infected with acute paralysis?

## 3.4. EDUCATIONAL MATERIALS FOR INDEPENDENT EDUCATION

**Topic 1: The topic of independent study**

**Topic: Poultry Newcastle, infectious laryngotracheitis, mackerel disease.**

(Preparation of abstracts from the literature)

**Questions**

1 About diseases, causes of origin.
2. Clinical signs.
3. Pathogenesis, diagnosis, comparative diagnosis.
4. Prevention and control measures.

**List of used literature**

**Main publications:**

1. Syurin V.N., Belousova R.V., Fomina N.V. Diagnosis of viral diseases of animals. Spravochnik. M. Agropromizdat 1991

2. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. M., Kolos 2000 g.

3. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2017

**Additional publications:**

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU “Uzbekistan”, 2017. - 29 p.

2. Mirziyoyev Sh.M. Ensuring the rule of law and human interests is a guarantee of the country's development and the well-being of the people. Tashkent, NMIU “Uzbekistan”, 2017. - 47 p.

3. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. M., Agropromizdat 1998

4. Andreev G.M., Davydov V.U., Zlobin V.S. Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg. 2004

**Websites:**

www. Ziyo.net.uz.
email: zooveterinariya @ mail.ru
email: sea @ mail.net 21.ru
email: veterinariy@actavis.ru

**Topic 2: The topic of independent study**

**Topic: European plague of pigs, African plague, Teshen disease, transmissible gastroenteritis.**

(Completion of individual assignments using the literature)

**Questions**

1 About diseases, causes of origin.
2. Clinical signs.
3. Pathogenesis, diagnosis, comparative diagnosis.
4. Prevention and control measures

**List of used literature**


**Main publications:**

1. Syurin V.N., Belousova R.V., Fomina N.V. Diagnosis of viral diseases of animals. Spravochnik. M. Agropromizdat 1991
2. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. M., Kolos 2000 g.
3. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2017

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email: veterinariy@actavis.ru


**Topic 3: The topic of independent study**

**Topic: Infectious anemia of horses, African plague**

(Completion of individual assignments using the literature)

**Questions**

1 About diseases, causes of origin.
2. Clinical signs.
3. Pathogenesis, diagnosis, comparative diagnosis.
4. Prevention and control measures.

## List of used literature


**Main publications:**

1. Syurin V.N., Belousova R.V., Fomina N.V. Diagnosis of viral diseases of animals. Spravochnik. M. Agropromizdat 1991
2. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. M., Kolos 2000 g.
3. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2017

**Additional publications:**

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3. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. M., Agropromizdat 1998
4. Andreev G.M., Davydov V.U., Zlobin V.S. Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg. 2004

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email: veterinariy@actavis.ru


## Topic 4: The topic of independent study

## Topic: Plague of dogs, infectious hepatitis, parvavirus enteritis

(Preparation of abstracts from the literature)

### 1. Questions

1.Kasalliklar reasons.
2. Clinical signs.
3. Pathogenesis, diagnosis, comparative diagnosis.
4. Prevention and control measures.

## List of used literature

**Main publications:**

1. Syurin V.N., Belousova R.V., Fomina N.V. Diagnosis of viral diseases of animals. Spravochnik. M. Agropromizdat 1991

2. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A.
Practicum on veterinary virology. M., Kolos 2000 g.

3. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2017

**Additional publications:**

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU "Uzbekistan", 2017. - 29 p.

2. Mirziyoyev Sh.M. Ensuring the rule of law and human interests is a guarantee of the country's development and the well-being of the people. Tashkent, NMIU "Uzbekistan", 2017. - 47 p.

3. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. M., Agropromizdat 1998

4. Andreev G.M., Davydov V.U., Zlobin V.S. Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg. 2004

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## Topic 5: The topic of independent study

## Topic: Rabies, smallpox, Auyeski, proteinuria, influenza, bovine spongiform encephalopathy, diarrhea, rhinotracheitis, parainfluenza-3, adenovirus diseases.

(Preparation of abstracts from the literature)

**Questions**

1 About diseases, causes of origin.
2. Clinical signs.
3. Pathogenesis, diagnosis, comparative diagnosis.
4. Prevention and control measures.

**List of used literature**

**Main publications:**

1. Syurin V.N., Belousova R.V., Fomina N.V. Diagnosis of viral diseases of animals. Spravochnik. M. Agropromizdat 1991

2. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A.
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**Additional publications:**

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU "Uzbekistan", 2017. - 29 p.

2. Mirziyoyev Sh.M. Ensuring the rule of law and human interests is a guarantee of the country's development and the well-being of the people. Tashkent, NMIU "Uzbekistan", 2017. - 47 p.

3. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A. Practicum on veterinary virology. M., Agropromizdat 1998

4. Andreev G.M., Davydov V.U., Zlobin V.S. Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg. 2004

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email: zooveterinariya @ mail.ru
email: sea @ mail.net 21.ru
email: veterinariy@actavis.ru

## Topic 6: The topic of independent study

**Topic: Respiratory syncytial virus of cattle, contagious ecthyma of sheep.**

(Preparation of abstracts from the literature)

**Questions**

1 About diseases, causes of origin.
2. Clinical signs.
3. Pathogenesis, diagnosis, comparative diagnosis.
4. Prevention and control measures.

**List of used literature**

**Main publications:**

1. Syurin V.N., Belousova R.V., Fomina N.V. Diagnosis of viral diseases of animals. Spravochnik. M. Agropromizdat 1991

2. Trotsenko N.I., Belousova R.V., Preobrazhenskaya E.A.
Practicum on veterinary virology. M., Kolos 2000 g.

3. Bazarov HK, Abdulakimova AB Textbook on veterinary virology. Samarkand 2017

**Additional publications:**

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU “Uzbekistan”, 2017. - 29 p.

2. Mirziyoyev Sh.M. Ensuring the rule of law and human interests is a guarantee of the country's development and the well-being of the people. Tashkent, NMIU “Uzbekistan”, 2017. - 47 p.

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4. Andreev G.M., Davydov V.U., Zlobin V.S. Spravochnik prakticheskogo vracha. Izd.Lan. St. Petersburg. 2004

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## 3.5. GLOSSARY OF SCIENCE (IN UZBEK LANGUAGE)

## ANNOTATED DICTIONARY

| | | |
|---|---|---|
| Abortive | - | (lot.abortivus-without specific symptoms of the disease) - short-term, mild course of the disease. For example, if the clinical course of the disease passes without a clear onset (under the influence of antibiotics, bacteriophages, vaccines, or immune serums), it is said that the disease has passed abortive. |
| Absorbents | - | (lat. absorbentia-absorbent) - absorbent, absorbing, absorbing, absorbing substances. For example, activated charcoal, erythrocytes. |
| Absorption | - | (Lat. absorbere- absorption) - a physical process is the absorption of a substance in a gas, light or liquid medium to the entire volume of the absorbent. |
| Adaptation | - | the adaptation of a living organism to the ever-changing conditions of the external environment during the period of evolutionary improvement. |
| Weeks | - | (wounds) are small areas of dead (necrotic) epithelium of the mucous membranes. Occurs mainly on the mucous membranes of the oral cavity. |
| Agar | - | a product derived from seaweed, the solution in water forms ilvira. In microbiology, it is used in the preparation of solid, semi-liquid nutrient media for the survival and reproduction of microorganisms, and as a substance that enhances the effectiveness of vaccines. |
| Agglutination | - | (Lat. agglutinatio - adhesion) - corpuscular particles - viruses, bacteria, erythrocytes, leukocytes, platelets, tissue cells, antibodies of corpuscular chemically active particles formed against them - agglutinins stick together and form kmaga fall. |
| Agglutination (direct) | - | direct adhesion, the process by which immune cells in the serum interact with microbes |
| Agglutination (indirect) | - | indirect adhesion.The immune cells attach to the antigens through the red blood cells. It attaches to erythrocytes and then binds to antigens. |
| Aggression | - | aggression occurs in, for example, psychopathic situations. |
| Allantois | - | embryonic bladder |
| Amnion | - | the inner curtain that surrounds the skull. |
| Anaerobes | - | microorganisms (bacteria) that live only in an oxygen-free environment. |
| Anaphylaxis | - | a type of allergic reaction that occurs as soon as an allergen is administered parenterally into the body. |

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| Anatoxins | - | bacterial toxins that lose their toxic properties and retain their antigenic and immunogenic properties after special treatment. |
| Antibiotics | - | substances emitted by microbes, animals and plants; prevents the growth of certain bacteria or kills them. |
| Antigens | - | any substance that enters the body and triggers an immune response is characterized by the formation of specific antibodies. |
| Anticoagulants | - | substances that impair the activity of the blood coagulation system. |
| Antibodies | - | protein immune substances that are formed in the blood and tissues when antigens enter the body. |
| Asepsis | - | a system of measures aimed at preventing the introduction of microorganisms into the wound, tissue, organs, cavities of the patient (wounded) in surgical operations, wound dressing, endoscopy and other diagnostic work. |
| Auto .., Auto | - | is an integral part of complex words that correspond in meaning to the words ‘own’, ‘original’ or ‘spontaneous’. |
| Autohemotherapy | - | treat the animal with its own blood. |
| Autointoxication | - | poisoning from toxins produced in the body in normal life activities, as well as in various diseases. |
| Autoreproduction | - | the ability of an organism or part of it to reproduce, as well as the ability of viruses to synthesize structures similar to the original in a given environment. |
| Autoclave | - | apparatus for sterilization with saturated water vapor under pressure. |
| Bacteriophage | - | a virus that lives in a bacterial cell, reproduces in large numbers, and has the ability to release phage particles into the environment in which the bacteria live by dissolving this process. |
| These viruses | - | bunyaviridae - a disease that transmits diseases to animals and humans through blood-sucking insects that unite more than 200 viruses belonging to the family. For example, Rift fever, Nairobi disease and others. |
| Item bottle | - | is a glass with a thickness of 2-3 mm, a width of 2.5 cm and a length of 5 cm, used in microscopic examinations, in the preparation of virological, bacteriological, hematological, helminthological and histological preparations. |
| Detrit | - | 1) remnants of decomposed tissue; |

| | | |
|---|---|---|
| | | 2) smallpox vaccine (smallpox detritus). |
| Disinsection | - | measures to combat arthritis . |
| Disinfection | - | (disinfection) - the elimination of viruses that cause infectious diseases through physical and chemical exposure. |
| Deoxyribonucleic acids (DNA) | - | nucleic acids of the deoxyribose type are present in every cell, in DNA-storing viruses, in micro-organisms. |
| Ecology | - | a branch of biology that studies the interactions of organisms with the external environment. |
| Epicrisis | - | discuss the disease event after the end of the illness; a final conclusion explaining the causes of this disease phenomenon, its treatment, and what it ended up with. |
| Epizootics | - | significant prevalence of any infectious disease. |
| Epizootology | - | a science that studies the laws of origin and development of epizootics, measures to prevent and combat them. |
| Erythrocytes | - | red blood cells. |
| Etiology | - | the doctrine of the causes and conditions of origin of diseases. |
| Phenotype | - | the sum of all the qualities and characteristics of the organism formed during the period of individual development. |
| Filtrate | - | filtered liquid. |
| Gastroenteritis | - | inflammatory disease of the stomach and small intestine. |
| Hemagglutination | - | the process of adhesion of red blood cells and subsequent sedimentation, which is caused by hemagglutinins ( antibodies that cause adhesions of erythrocytes ) bacteria and viruses, substances that have the property of being absorbed on the surface of erythrocytes. The hemagglutination reaction is based on the laws of blood transfusion and blood group determination . |
| Hematogen | - | (lat. haematiegenes - through the blood) - the spread of the pathogen through the blood. |
| Hemolysis | - | (gr. haima-kan, lysis-melting) - the breakdown of erythrocytes in the blood and the release of hemoglobin into the external environment. For example, it occurs in leptospirosis. |
| Hemolysins | - | (gr. haemolysina) - substances that cause the release of hemoglobin from red blood cells (erythrocytes), ie hemolysis (antibodies). |
| Hemorrhagic | - | the occurrence of multiple hemorrhages in the |

| | | |
|---|---|---|
| diathesis | | tissues as a result of poisoning. This condition often occurs in infectious diseases accompanied by viremia and bacteremia (swine fever, YUAN disease of horses, etc.). |
| Gen | - | (gr. genos- generation, origin) - a piece of DNA or RNA molecules that contain the genetic information of the ancestors, the simplest unit of heredity. A gene consists of special parts (loci) that vary in length along chromosomes. The emergence of any trait in the development of cells and the organism in general depends on these genes. |
| Generalization | - | the spread of the disease process from the initially limited source to the whole organism or organs. |
| Genetics | - | the science of heredity and organism variability |
| Genotype | - | (gr. genis-image, type) - all genetic factors of the organism, ie a set of genes - genetic information passed from generation to generation, the genetic basis of the organism. |
| Genetic engineering | - | A science that studies the laws of the formation of recombinant molecules of DNA and its effects on the cell. The goal of genetic engineering is to create a new recombinant molecular genetic ancestor, that is, to bind the necessary genetic part of the viral DNA to the genetic molecule of the cell, forcing the cell to produce the corresponding substance. |
| Herpes | - | viral skin diseases; morphologically characterized by overgrowth of blisters on the skin. |
| Herpes viruses | - | (herpes virus) is a family of viruses that multiply in the cell nucleus with DNA, many of which cause latent disease . |
| Hydrophobia | - | (gr. hydor-water, phobos-fear, fear of water) - fear of water, such a symptom is observed in rabies in humans and animals. |
| Hyperimmunization | - | repeatedly vaccinating animals with vaccines, toxins, or live microbes according to a specific system in order to obtain a special serum against bacteria or toxins. |
| Cell | - | the simplest living system , consisting of two main parts - the cytoplasm and the nucleus (nucleus) and the basis of the structure, development and activity of all animal and plant organisms. |
| Immunity | - | the body is not infected with an infection or any infectious substance |
| Immunization | - | a method of generating immunity in humans and animals as a means of preventing infectious |

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| | | diseases . |
| Immune serums | - | serums derived from the blood of animals immunized with viral and non-viral antigens and containing the appropriate specific antibodies. |
| Immunology | - | the doctrine of immunity. |
| Immunotherapy | - | treatment of infectious diseases with biological drugs (vaccines, immune serums or gamma globulins) |
| Injection | - | delivery of solutions to the body for the purpose of treatment or identification of the patient (subcutaneously, subcutaneously, intramuscularly, intravenously, in cavities or excretory tract). |
| Ingredient | - | component of a complex compound or mixture, component. |
| Infection | - | (infestio - infection, infection) - the entry of pathogenic viruses and microbes into the body. This condition causes an infectious disease that passes with certain clinical signs. There are also asymptomatic infections. The virus and germs that cause the disease are also sometimes called infections. |
| Infectious disease | - | an infectious disease caused by viruses and microorganisms that have evolved to become parasites in the animal body. Typically, the disease is characterized by the transition from one animal to another, gradual development, specific reactions of the macroorganism against viruses and microbes (allergies and antibodies), and the formation of immunity after recovery from the disease. |
| Infection (alimentary infection) | - | (lat. alimentarus - food) - the entry of the pathogen into the body through the mouth. |
| Infection (mixed infection) | - | a disease (various viruses and bacteria) that occurs when two or more pathogens enter the body. |
| Infection (associated infection) | - | (associatio - combined) - a co-infection of various viruses and microorganisms that enter the body of an animal. In this case, synergy, that is, an increase in the pathogenicity of one type of microbe in exchange for another type of microbe, can be observed. For example, staphylococci increase the ability of the microbe to cause disease. However, in some cases a microbial antagonism may be observed to counteract this phenomenon. see intercurrent disease. |
| Infection (aerogenic infection) | - | (gr. aer - air, genes - formation) - an infection caused by the entry of pathogens into the body |

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| | | through the air. |
| Infection (bacterial infection) | - | bacterial infection. |
| Infection (unknown infection) | - | an infectious disease that is invisible, latent, and does not show clinical signs. It is determined by immunobiological reactions, microbiological, virological methods. |
| Infection (exogenous infection) | - | (Lat. exo - except genes - birth, formation) - a disease caused by pathogenic viruses and microbes that enter the animal's body from the external environment . |
| Infection (wound infection) | - | an infection caused by the entry of certain pathogenic microbes into wounds, especially deep wounds. This condition is more common in the case of coronary heart disease. |
| Infection fungal infection) | - | infection caused by pathogenic fungi. |
| Infection (purulent infection) | - | infection of pus-forming microorganisms. |
| Infection (simple infection, monoinfection) | - | an infection caused by a virus or a type of microorganism. |
| Infected | - | the presence of pathogenic microbes and viruses in the animal body. |
| Exanthema infection | - | (gr. exanthema-rash) - a focal inflammatory lesion of the skin, caused by certain infectious diseases. For example, this has been observed in smallpox in animals. |
| Incubation period | - | the period from the time of infection to the appearance of clinical symptoms of the disease. |
| Incubation | - | hatching of chickens from poultry eggs at a certain set temperature. In virological examinations, 8-12-day-old chicken embryos and viruses should be stored at the appropriate temperature and for a certain period of time in order to grow normally. |
| Interferon | - | (Lat. inter- interaction, ferio-shock, damage) - a protein, a low-molecular-weight glycoprotein present in a virus-infected cell, which prevents the development of viral diseases. Its molecular theft is 20-40 thousand dalts, does not kill the virus, is non-toxic to cells. Interferon plays an important role in the formation of overall endurance. Interferon produced by one virus also prevents the replication of other viruses by another. |
| Intoxication | - | (Lat. in da gr. toxikon- poison) - a state of poisoning |

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| | | caused by the general action of substances that enter the body from the outside (exogenous) or formed in the body itself (endogenous). |
| Iridoviruses | - | a DNA virus belonging to the iridoviridae family. For example, the causative agent of African plague in pigs. |
| Calciviruses | - | (lat. calyx-compensation) is an RNA virus belonging to the family caliciviridae. The shape is convex, 35-39 nm in diameter, on the surface32 cup-shaped grooves are arranged in an icosahedral order. Causes vesicular exanthema in pigs. |
| Illness | - | an indicator that characterizes the number of animals infected with a disease, the ratio of infected animals to all animals in this or that group prone to this disease. This figure is taken as 100, 1000, 10000, relative to the animal. For example, 15 out of every 1,000 people prone to the disease are sick, which is 1.5 percent. |
| The mechanism of transmission of the pathogen | - | In the course of evolutionary development, certain ways of transmission of biologically adapted pathogenic microorganisms from the appropriate source of each species to healthy animals prone to this microbe. involves the processes of disease entry into a new organism. |
| Caprination | - | (Lat. caprinus-goat) - the adaptation of viruses in the body of a goat as a result of their growth and storage . |
| Capsid | - | (lat. capsa-box) - a component of the virion, the shell, which protects its nucleic acid from the external environment, is composed of a combination of capsomers. |
| Capsomers | - | (Latin capsat, hereditary part) - a formative unit that forms a virion capsid, asymmetric groups of virion composition, composed of one and more asymmetric protein molecules. |
| Quarantine | - | (itl.quarantia giorni - forty days) - a system of temporary measures to limit the spread of infectious diseases, to keep the disease in the exact place where it occurred, to allow its complete eradication. |
| Quarantine diseases | - | Infectious diseases registered by the General Directorate of State Veterinary are quarantined when they occur. Such diseases include proteinuria, anthrax, plague, blackleg, horse manure, swine fever, and others. |
| Insertion bodies | - | characteristic morphological changes in virus- |

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| | | infected cells. These come in a variety of shapes and sizes. CT can be located in the nucleus or cytoplasm of cells. It is very important in the diagnosis of some viral diseases. For example, in rabies - Babesh - Negri Kt, in humans - Gvarnieri, in chickens - Bollinger, in dogs - Lentsa, in chickens - infectious laryngotracheitis, Zeyfred, in sheep - Borrel, Kt, etc. 'licks and this Kt is seen under a normal microscope. |
| Clone | - | (gr. clone - offspring, seed) - the offspring of a bacterium, cell or virus, as well as a virus or a single-celled (multicellular) organism formed by the vegetative path (asexual reproduction), hereditary ancestor with the same feature (character) in terms of. |
| Contamination | - | (lat. contaminatio, compound) - contamination of hay, water, soil, tools and external parts of the animal body and other objects with pathogenic microorganisms, viruses, contamination of infectious substances; |
| Contagiousness | - | (lat. contagiosis - infectious) - a term that describes how quickly infectious diseases can spread. Very rapid and widespread contagious diseases include proteinuria, smallpox, swine fever, and influenza in horses. |
| Canning | - | (lot.conservare-storage) - a method of storing certain things (microorganisms, viruses, blood, organ or tissue, etc.) without affecting their physical and chemical properties for a long time without changing their properties. |
| Laboratory animals | - | small animals such as white mice, rats, guinea pigs, rabbits are used for scientific, practical purposes. |
| Lapinized strains | - | (fr. lapin - rabbit) microorganisms or viruses that have adapted to the rabbit organism and multiplied in its organism. |
| Latex | - | (lat. latex - wet, liquid) - occurs in milky liquid, rubber and other trees. Antigens are attached to bodies prepared from this source and used as an adsorbent in serological reactions. |
| Latex test | - | agglutination method, in which neutral substances are used to absorb antigens or antibodies, which dramatically increases the sensitivity of the reaction. |
| Latent period | - | (lat. latentis - latent) - the latent period of the disease, the period that passes after the pathogen enters the body until the appearance of any clinical or morphological signs of the disease. |

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| Lethal dose | - | (LD-50) (lat. Letalis - death) is the amount of viruses and micro-organisms that kill 50 percent of experimental animals. |
| Lethality | - | is an intensive indicator of how severe the disease is, and is the ratio of the number of animals killed by the disease to the total number of infected animals. |
| Leukoviruses | - | RNA viruses that cause leukemia in poultry, cats, mice, large horned animals, Retroviridae family, oncornaviruses belong to the first group C type. |
| Leukemia | - | (gr. leukosis - leukemia - stable leukocytosis) - an infectious viral disease of tumor nature, characterized by an overproduction of incompletely formed leukocytes in the blood as a result of overactivity of the tissues that produce white blood cells. RNA oncovirus causes leukemia in cattle, sheep, and poultry. |
| Leukemia | - | (white blood cell) is a systemic disease characterized by the proliferation of tissues that produce white blood cells. |
| Monovaccines | - | (gr. monos - one) - a vaccine prepared from one type of pathogen. For example, vaccines against anthrax, plague, yellow fever. |
| Mutagenic factors | - | environmental factors leading to mutations (ionizing radiation, ultraviolet light, a number of chemical compounds, etc.) |
| Mutation | - | (Lat. mutatio - change) - changes in which the genetic characteristics of genes and gene groups remain different, that is, any genetic changes that occur in the body. M. is a change in the composition of nucleic acids. M. is specific to all living things - from viruses to humans. |
| Neuraminidase | - | It is an enzyme catalyst in orthomyxoviruses, in the presence of which the virus receptors in erythrocytes are destroyed and the viruses can leave the cell and spread freely. |
| Neurogenic | - | (gr. nueron - nerve, nerve - genes) - the occurrence of the disease as a result of damage to nerve tissue. The direction of the virus through the nerve fibers. For example, the rabies virus is the N. virus. |
| Neurotropic | - | (gr. neuron + tropos - transfer) - a property of selective action of toxins, microbes and viruses on nerve tissue. For example, rabies, scrapes, encephalomyelitis, Aueski viruses. |
| Imperfect viruses | - | virions that are not nucleic acids but retain antigenic |

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| | | properties. Such virions were first recorded in orthomyxoviruses. |
| Nucleoid | - | (Lat. nusleus - nucleus, gr. eidos - species) - the nucleic acidic central part of the virus, the nucleus of bacteria - the nucleus. N. is also present in immature microorganisms (prokaryotes). The nucleus of prokaryotes consists of a large chromosome, i.e., it is not bounded by a membrane from the protoplasm. |
| Protein | - | an acute infectious disease caused by viruses, usually transmitted from sick animals. Fever passes with the formation of sores on the mucous membranes of the mouth, nose, tongue, between the hooves. |
| Reactivity of the organism | - | (Lat. re-again, aktivus-affective, active) - a feature of the body's response to foreign influences of the external environment by changing its activity. Reactivity allows the organism to adapt to the external conditions of the external environment. Reactivity is a change in the activity of the organism under pathological influences. |
| Routes of entry of the pathogen into the body | - | the routes of entry of the pathogen into the animal organism are diverse. The injured surface of the skin and mucous membranes are the gateway to infection. Most pathogens have evolved in an evolutionary way into the animal’s body. |
| Removal of the pathogen from the body | - | pathogens are released into the external environment from the animal's body through various products and wastes (milk, saliva, urine, feces and eyes, nose, as well as discharge from the genitals, etc.). In addition, the pathogen is released during coughing, as well as through skin wounds and blood. |
| Pandemic | - | (gr. pan - all, pandemos-common, common) - a widespread epidemic disease among the population, covering several countries. For example, influenza, AIDS and others. |
| Panzootia | - | (gr.pan + zoon - animal) - the epizootic of animal diseases, which covers several countries and continents, with the highest severity of the epizootic process. For example, protein, cattle plague. |
| Papula- | - | a dense nodule rising above the level of the skin; a rash element that spreads to the skin. |
| Papovaviruses | - | DNA viruses belonging to the family papovaviridae include two generations: papillomavirus and poliomavirus. In many species of animals, more |

than 20 species of warts form tumors.

Papules - (Lat. papula - nodule) - one of the manifestations of infectious exanthema, the appearance of small hard nodules on the skin. For example, it occurs in smallpox.

Paraagglutination - (gr. para - near) agglutination of non-pathogenic microbes in the blood serum of infected and cured animals.

Paraallergy - (gr. para + lot. alleus - other effect) - a change in the sensitivity of the sensitized animal organism under the influence of non-specific allergens.

Paraimmunity - (gr. para) - the main causative agent: the formation of immunity to viruses and microbes, as well as the formation of immunity to non-primary, ie closely related viruses and microbes.

Parainfection - (gr. para + lot. infektio - infection) - an infection caused by a change in the properties of another microorganism under the influence of a group of microbes

Parenteral - (gr. para + enteron - intestine) - the transfer of all medicinal substances to the body in another way, not through the gastrointestinal tract. For example, intradermally, subcutaneously, intramuscularly, intravenously, and so on

Passage - (fr. passaje - transition) - a series of infections of infected animals, chicken embryos and cultured cells with microorganisms and viruses that are susceptible to them.
P. allows to keep viruses in a pure state, to isolate, increase their number and keep their activity constant.

Pasteurization - pasteurization, sterilization of milk in special containers under the influence of a certain heat (65 °-70 °C) P. lasts a few minutes and the milk is rapidly cooled to 10-11º C. In this mode, the vegetative forms of microbes are inactivated.

Pathogenesis - (gr. pathos - pain, disease and genosis) disease progression, way of development.

Pathogenicity - the ability of microorganisms and viruses to cause disease. Pathogenicity is a complex set of pathogenic microorganisms and viruses that cause complex disease in the process of adaptation to free will in the body of plants, animals, humans and living things in general . P. is a characteristic feature of a particular type of microbe, i.e., each microbe

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| | | only causes a specific infectious disease. However, different strains of the same type of microbe can have the same pathogenicity. P. determines the virulence of microorganisms and viruses. |
| Peplos | - | (gr. peplos- coat) - the outer shell of some species of viruses, consisting of peplomers. |
| Peplomers | - | a formal unit composed of lipids that form a bulge in the lipoprotein shell of the virion. |
| Permissive temperature | - | Permissive temperature is 37 ° for viruses to reproduce in special environments . PH provides an opportunity to obtain mutants from viruses. |
| Picornaviruses | - | (gr. piccolo- small) - small-sized RNA viruses belonging to the family picornoviridae, which includes four generations (enteroviruses, cardioviruses, rhinoviruses, aftoviruses). The capsid of these viruses is icosahedral, 25–40 nm in diameter, with no lipoprotein shell. Virions grow in the same form under artificial conditions, multiplying well in cells. |
| Precipitins | - | antibodies involved in the precipitation reaction. Sediment formed in precipitation. |
| Prions | - | (protein-infected particles) are pathogens of slow-growing infectious diseases. P. is a protein that multiplies in living cells but has not been found to contain RNA and DNA, causing infectious encephalopathy in cattle, scraping in sheep, and Kreisfeld-Jacoba, dry disease in humans. P. Very resistant to environmental factors. For example, boiling for 30 minutes does not reduce its activity. P. Formalin, resistant to enzymes: DNA, RNA, pepsin, trypsin. The size of P. was 17–27 nm, first identified by SPPrusner in 1984 at the School of Medicine at the University of California, San Francisco. |
| Provirus | - | an incomplete virus particle is formed from DNA separated from chromosomes attached to the viral genome by the action of various factors (ultraviolet rays, various substances) on the cells. It goes through the reproductive stages as usual and produces virus offspring. Proviruses contain all the information needed to create a new virus . |
| Producer | - | (lat. producentis - manufacturer) - this term is widely used in veterinary science. For example, some poisonous microscopic fungi produce mycotoxins during development and reproduction, |

which are considered producers.

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| Prolongation | - | (gr.prolongation - prolongation) - prolongation of exposure. In most cases, the term refers to the prolongation of the effect of drugs on the body. For this purpose, various adjuvants, polymers are used. |
| Properdin | - | (for pro, curtain-kill, destroy, break) - is a normal serum protein, which contains some components of complement and magnesium ions, and is an antimicrobial factor. P. are supposed to be thermolabile immunoglobulins, but they do not have a specific effect, unlike antibodies. It has a devastating effect on many microorganisms and viruses. The bactericidal properties of blood depend on properding. |
| Preventive measures | - | (gr. prophulaktikos - prevention) - a set of measures aimed at preventing the emergence and spread of infectious diseases. |
| Polio- | - | an acute disease of the central nervous system caused by viruses. |
| Polyribosomes-(polysomes) | - | several (5-70) ribosomes joined together in a complex using an RNA molecule that reports. Polyribosomes are formed during the synthesis of large protein molecules. |
| Proliferation | - | regeneration of cells by division and proliferation. |
| Prophylaxis- | - | a set of measures aimed at preventing the emergence and spread of diseases, protecting and strengthening the health and physical development of the population and animals. |
| Pseudoagglutination | - | (gr. pseudes - fake, lat. agglutinatio, onis - sticking, accumulation) - adhesion and sedimentation of bacteria, erythrocytes, leukocytes, platelets as a result of changes in the balance of acid, alkali, salt concentration, temperature and other factors in the environment . |
| Pseudovirions | - | a virus particle wrapped in a viral shell, formed from a piece of cellular DNA. P. may be a carrier of genetic information in the biosphere. |
| Pustule | - | a substance that appears on the skin as an element of |
| | - | some dermatoses and infectious diseases, a purulent blister. |
| Rhabdoviruses | - | RNA cylindrical viruses belong to the Rhabdoviridae family, one end of which is 170 nm long and 70 nm in diameter. The lipoprotein shell is covered with bulging peplomers, the sheath is axillary. In addition to viruses that cause disease in |

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| | | animals (lyssavirus, Vesiculovirus), this family also includes some viruses of insects and plants. |
| Radioimmunology Method (RIU) | - | is an immunological method used in the detection of diseases caused by viruses, with the help of which the virus antigen is detected in the pathological material. This method tests the animal's resistance to the virus, an increase in the amount of immunoglobulin (antibodies) in single and double blood serum. |
| Reconvalescence | - | the period of recovery from the disease, in which there are no clinical signs of the disease, but the initial state of the organism is not fully restored. |
| Remission | - | relief of disease |
| Receptors | - | special structures that are the final receiving parts of the sensory (afferent) nerve fibers. |
| Resistance | - | (resistance) - resistance: 1) resistance of an organism to pathogenic factors;<br>2) resistance of microbes to antibiotics, sulfonamides and other chemicals |
| Ribonucleic acid- | - | (RNA) is a polymeric substance consisting of large molecule polynucleotide helical chains. RNA is part of the cell cytoplasm and nucleus. |
| Ribosomes- | - | spherical electron-dense grains that are freely located in the cytoplasm, contain ribosomal RNA and are the center for protein synthesis in the cytoplasm. |
| Rickettsiosis- | - | a group of infectious diseases caused by rickettsiae in humans and animals. |
| Sensitization | - | the process of increasing the body's sensitivity to an allergen. |
| Sepsis | - | a common infectious disease that usually results from the presence of a local infectious process in the body. |
| Serology | - | the science of diagnostic and experimental methods associated with immune serums. |
| Seroprophylaxis | - | a method of preventing infectious diseases in humans and animals using immune serums . |
| Serotherapy | - | method of treatment of diseases (mainly infectious diseases) using immune serum |
| Symptoms | - | signs found when a veterinarian examines a sick animal and used to diagnose the disease and its consequences. |
| Symptomatic treatment | - | treatment of symptoms (signs) without purposeful influence on the cause and mechanisms of development of the disease. |

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| Stress | - | a state of mental tension that arises in response to the influence of various adverse factors of the external or internal environment. |
| Tolerance | - | general stability, lack of specific reactivity to specific antigens. |
| Town | - | an acute infectious disease belonging to the group of anthropozoonoses. |
| Transduction | - | the mechanism by which genetic information is transferred from one cell to another. |
| Transplantation | - | transplantation of human and animal body parts (organs and tissues) |
| Transformation | - | change, alteration, change in shape or structure |
| Trypsin | - | an enzyme that belongs to the group of proteinases . The proferment in the juice produced by the pancreas is formed in the gut when enterokinase is exposed to trypsinogen. |
| Vaccine | - | (lat. vaccinum) - a special biological drug, prepared from pathogens. It is mainly used to prevent disease. |
| Vaccine (alimentary vaccine) | - | a vaccine given to an animal in addition to food, water, or by ingestion through a holster, probe . |
| Vaccine (vaccine depositor) | - | a vaccine containing slowly absorbed substances (bitters, fatty solutions) |
| Vaccine (monovalent vaccine) | - | a vaccine made from a single infectious antigen. |
| Vaccine (polyvalent vaccine) | - | a vaccine made from several infectious antigens. |
| Vaccine (live vaccine) | - | a vaccine prepared from pathogens that have lost their pathogenic properties due to weakening or weakening, but retain their immunogenic properties. |
| Vaccine (inactivated vaccine) | - | a vaccine prepared by completely losing the infectious activity of microorganisms and viruses by chemical or physical treatment without losing their antigenic properties. |
| Vaccine prophylaxis | - | vaccination with a vaccine to prevent infectious diseases. |
| Vaccine therapy | - | vaccine treatment. |
| The vacuole-forming virus | - | a virus belonging to the family papovaviridae, which alters the morphological properties of cells. They create a void in the cell. |
| Vesicle | - | (lat. vesicula, at, f - rash - blister) - one of the first morphological elements of skin rashes; a blister formed by the accumulation of exudate (fluid) in the outer layer of the skin (epidermis). |
| Virulence | - | the degree of pathogenicity of a particular infectious |

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| | | agent (microbial stem or virus). |
| Virology | - | doctrine of viruses and viral diseases. |
| Viruses | - | small microparasites that live inside cells that cause various infectious diseases. |
| Vital paint | - | staining of living cells and tissues with virtually harmless and a range of dyes (red neutral, trypan blue, etc.); the dye is sent to the body. |
| Chromosomes | - | ipsimon-like, spontaneous complex of the cell nucleus, structural elements that hold genetic factors (genes) in a linear order. |
| Instructions | - | Document, instruction on the use of biological drugs, chemotherapeutic drugs, approved by the General Directorate of State Veterinary. |
| Whey | - | 1) an aqueous component of a liquid (eg, blood, lymph, milk, etc.);<br>2) a clear liquid that moistens the surface of the serous membranes . |

# IV. QUESTIONS FOR SCIENCE CERTIFICATES

## 4.1. 1 ORAL QUESTIONS FOR OB (120)

1. Who is the Russian scientist who discovered that viruses cause disease in tobacco leaves?
2. What do you mean by the relevance of the science of virology to other sciences?
3. What proves that viruses cause diseases of genetic equality?
4. What is the difference between DNA-storing viruses and RNA-storing viruses?

## 4.1. 2 ORAL QUESTIONS FOR OB (120)

1. Where does the rhinotracheitis virus infect calves? Stages of development of virology
2. Scientists who have contributed to the development of science.
3. The role of viruses in the biosphere.
4. What is the composition of viruses?
5. What is the structure of the virus?
6. Where is the supercapsid shell synthesized?
7. What is a virus or virion?
8. What are the proteins of viruses, yukleic acids?
9. What role do the enzymes of viruses play?
10. What is the difference between RNA or DNA-storing viruses?
11. What do you mean by classification of viruses
12. DNA-storing virus families
13. RNA-storing virus families
14. Disadvantages of classification based on disease symptoms.
15. What is the definition of classification based on the tropism of the virus?
16. Tell us about the tariff of epizootiological classification.
17. What are the main criteria for classifying viruses?
18. Describe the effect of temperature, drying, ultraviolet light, solvents on viruse
19. How does the use of quicklime and phenol in disinfection affect viruses?
20. How to reduce the pathogenicity of viral strains?
21. When does the virulence of virus strains increase?
22. Effects of sunlight on viruses.
23. The effect of disinfectants on viruses.
24. Solvents for viruses.
25. The main stage of virus reproduction?
26. In what systems can viruses be grown?
27. In which part of the cell do DNA-storing viruses multiply?
28. In which part of the cell do RNA-protective viruses multiply?
29. What is the ecliptic phase?

30. What is meant by disjunctive reproduction?
31. How does the virus enter the cell?
32. What is a genome?
33. What is the structure and function of the viral gene?
34. What is phenotypic, genotic variability?
35. Explain the mutation of viruses.
36. Factors influencing the direction and effectiveness of mutagenesis.
37. What are the causes of mutation during adaptation?
38. What is the mutation of viruses from animal to animal?
39. What is meant by the ecology of viruses.
40. The concept of ecological *niche* .
41. **V The** main directions of irological research.
42. The nature of viruses, horizontal circulation
43. The vertical path of viruses circulating in nature.
44. How chemicals affect viruses.
45. List the physical factors that affect viruses.
46. What do you mean by a source of infection?
47. In what ways does the pathogen pass from a sick animal to a healthy anima
48. When does the latent period begin and where does it end?
49. What do you mean by the persistence of the virus?
50. What is your understanding of convalescent animals?
51. V Irusta how the effect of blood?
52. What is the function of interferon?
53. What is NAU and how can it be used to diagnose viral diseases?
54. What types of NAUs are used in virology?
55. What issues can be addressed using NAU?
56. What are the strengths and weaknesses of NAU?
57. What is the essence of DPR?
58. What issues can the DPR address?
59. What are the features and disadvantages of DPR?
60. What is the essence of PCR?
61. Name the areas of application of PCR.
62. List the PCR components.
63. What are primers?
64. What is denaturation?
65. Explain what amplification is.
66. What does "Otjig" mean?
67. What family and generation does the virus that causes rhinotracheitis belon?
68. What does the cryptogram look like?
69. What is the clinical presentation of infectious rhinotracheitis in large horneimals?
70. How can this disease be distinguished from the plague in large horned anima
71. Who is the scientist who proposed cryptogarm in the classification of viruse

72. Where can the cytopathogenic effects of viruses be seen?
73. What antibiotics are added to the pathological material?
74. Which of these serological reactions is correct?
75. Magnetic mixer, what is it used for?
76. Which viruses have the ability to hemagglutinate?
77. When does the pathogenicity rate of an infected virus increase?
78. When does the pathogenicity rate of an infected virus decrease?
79. What disease do paramyxoviruses cause?
80. What diseases do coronaviruses cause?
81. What diseases do retroviruses cause?
82. What diseases do rhabdoviruses cause?
83. In an incubator, what causes a 70% increase in humidity when growing a chickmbryo?
84. In an incubator, what causes a 40% decrease in air humidity during the growtf the chicken embryo?
85. How many ways is the virus transmitted to a chicken fetus?
86. What solutions do we use to label laboratory animals ?
87. What are the factors that lead to the emergence of diseases caused by viruse livestock complexes?
88. What are the forces acting on the adsorption of virions on the cell surfac
89. What forms the supercapidal shell in virions?
90. How many days before the birth of pigs in viral gastroenteritis should be vaccind?
91. What are the nutrient media used to grow a cell in vitro?
92. What are the solutions used to divide a cell into separate parts?
93. For what purpose is ice used in the process of dividing a cell into separate parts?
94. What type of cell division to increase the animal's blood serum used foyizl
95. What are the advantages of a cultured cell over laboratory animals, chickmbryos ?
96. Which animals are included in the laboratory animals?
97. What conditions are needed to care for laboratory animals?
98. What ration is required to feed laboratory animals?
99. What is the main purpose of using laboratory animals?
100. What dyes and solutions are used to identify laboratory animals?
101. What is the main focus of the transmission of the virus to laboratory anima
102. Describe the methods of transmission of the virus to laboratory animals.
103. ixation of experimental laboratory animals by all methods and study of methoof virus transmission.
104. nfection of ectromelia virus and ospavaksina virus in rabbits into the skin of whitee.
105. Determining the symptoms of the disease in infected animals.
106. o dissect infected animals to see pathological changes and obtain virus-protec material.
107. Making a stamp from the brain.

108. What are the species of laboratory animals and the purpose of their use in virololaboratories?

109. Do you know any of the most commonly used methods of infection for laboratory animals to experiment with?

110. What are the signs of viral replication in the body of laboratory animals?

111. What is the positiveness of a biological experiment and its importance in making a diagnosis?

112. What is a "blind" passage?

113. What is the basis for the selection of the organ when obtaining a virus-protective material by cracking?

114. Why are chicken embryos used in virology?

115. What is the structure of a developing chicken embryo?

116. Explain the methods of transmission of the virus to chicken embryos.

1.

2. How many calves are infected with rhinotracheitis?
3. How to fight infectious rhinotracheitis?
4. What family and generation of viruses cause smallpox?
5. What is the cryptogram of the virus that causes smallpox?
6. What are the clinical signs of smallpox in sheep, goats, pigs and large horned animals, camels, horses?
7. How is smallpox diagnosed and what is its specific prevention?
8. How to paint the prepared grease?
9. Can the sheep vaccine be applied to goats?
10. What are the similarities between smallpox and other diseases?
11. To which family and generation does the virus that causes transmissible gastroenteritis belong?
12. What is the cryptogram of a virus?
13. What are the specific features of transmissible gastroenteritis in pigs?
14. How is the disease diagnosed?
15. How is gastroenteritis different from other diseases?
16. What vaccine is used to prevent the disease?
17. In what country was the Riems vaccine produced?
18. Which family and generation of viruses cause renopneumonia in horses?
19. What is the cryptogram of the virus that causes influenza in horses?
20. Clinical signs of renopneumonia and influenza in horses?
21. What are the clinical signs and epizootiological features of renopneumonia in horses?
22. What information is used to diagnose rhinopneumonia in horses?
23. What are the measures to eliminate the disease?
24. In which laboratory animals can the influenza virus be grown in horses?
25. Infectious laryngotracheitis is caused by viruses belonging to which family and generation?
26. What is the cryptogram of the virus that causes Marek's disease?
27. What are the clinical signs of Newcastle disease?
28. Describe the source of influenza in birds and ways of its spread.

29. What are the methods of prevention and control of the disease?
30. Disease transmission factors and its spread
31. What is a diagnosis and a differential diagnosis?
32. What living systems are used to separate viruses from fish?
33. What is the basis of the biological sample and the final diagnosis?
34. What is the etiological cause of hemorrhagic septicemia in fish?
35. What antibiotics are used in treatment?
36. What are prevention and control measures?
37. What are the clinical symptoms and clinical forms of the disease?
38. What diseases of fish should be distinguished?
39. How is bee sting disease transmitted within the bee family?
40. What are the symptoms of the disease in a troubled family of bees?
41. What pathological material is sent for virological examination?
42. What are the different symptoms of tapeworm disease?
43. Have treatment methods been developed?
44. Which bee should be replaced in infected families?
45. Describe the main features of the rabies virus.
46. Talk about the epizootiological features and symptoms of the disease caused by the rabies virus.
47. What methods do you know to diagnose rabies in the laboratory?
48. What material is obtained from animals suspected of having rabies and what are the rules of operation.
49. What are the main features of the protein virus?
50. Describe the rules for working with protein virus-protective material .
51. What are the epizootiological features and symptoms of the disease caused by the protein virus ?
52. What methods do you know to diagnose proteinuria in the laboratory ?
53. What are the clinical and pathologic signs of pneumoenteritis in calves?
54. Describe how laboratory diagnosis of calf pneumoenteritis is made and differentiated.
55. What is the method of putting IFR ?
56. The main stages of development of virology. (Innovations created by DIIvanovsky in 1892).
57. How to prove that the virus is the cause of changes in the cell. (In the SPT example shown for cultured cells, the stage from the adsorption phase to the exit of the virus from the cell).
58. Which family does the leukemia virus of large horned animals belong to? (DNA, RNA storage, family, serological reactions in the diagnosis of the disease).
59. What are the similarities and differences between disease-causing viruses in animals and plants? (RNA or DNA storage and tropism).
60. General measures against epizootics in viral diseases. (Quarantine, symptomatic and specific treatments).
61. What is the morphology and chemical composition of the rabies virus. (Shape, structure of viral genome, sensitivity to ether).

62. Forms of virus interaction with the organism (virus-carrying carrier, convalescent animals).
63. Specificity of anti-epizootic measures in industrial animal husbandry. (specific and symptomatic treatment methods and its effectiveness).
64. Immunity and specific prophylaxis method in rabies. (vaccines used for prophylactic purposes).
65. How to explain the complexity of the production of specific drugs in viral diseases. (Preparation of vaccine strains; antigenic properties; multiplicity of options).
66. Classification of viral infection. RNA, DNA storage NK mass in virion composition, virion shape, transmitter, intermediate host.
67. How are rabies diagnosed? (virusoscopy, biological sample, DPR, IFR).
68. What is the eclipse phase. Influencing forces in the process of reproduction of viruses.
69. The TB virus family, generation, and structure of the virus. Methods of diagnosis and determination of type in the laboratory.
70. The science of gnotobiology and its role in the investigation of viruses.
71. What role do nucleic acids play in viruses. (Genetic information, transcription, translation, transduction).
72. Ways of transmission of Aueski's disease.
73. What solutions and nutrient media are used to grow cells. (Hanks, Erla, 199, GLA, Trypsin, Versen, FBE).
74. Which factors of antiviral immunity are almost irrelevant in bacterial immunity. (Isaac and Lindenman discovered interferon in 1957).
75. The cryptogram explains in writing what features of the virus are hidden
76. Smallpox, virus morphology and chemical composition. In birds and so on. naming of input bodies in.
77. What is the morphology and structure of the smallpox virus? What causes an icosahedron to be in shape.
78. When diagnosing proteinuria, describe which serological test is used to determine the type of virus. (Components required for CBR reaction and methods of their preparation).
79. Describe ways of biological control of antiviral immune serum. (Immune serum, use of anatoxins for prophylaxis).
80. What is the method of viroroscopy based on. Dyeing virions and viewing a group of virions under a microscope.
81. What are virus entry bodies and how can they be encountered. (Collection of virions Babesh-Negri, Borrell, Bollinger, Zeyfred, Lentsa).
82. Give a general description of viral diseases. (Differs in pathogenesis from bacterial diseases).
83. How to put a biological sample for bird flu. (On the leaves, due to irritation of the thigh muscles).
84. Describe the virus that causes smallpox. What are the clinical and epizootiological features of smallpox in different species of animals? (Occurrence of smallpox).
85. What is the role of nucleic acids. (DNA, RNA, single or double helix.

86. What is the structure of the parainfluenza-3 disease virus in aphids. (surrounded by a round, mucoid shell).
87. Describe Newcastle and influenza viruses. Which reaction can be used to differentiate Newcastle disease virus from influenza virus. (Explain the nature of the GATR reaction). The main pathological changes are manifested in which organ.
88. H What visible change is observed when the virus is exposed to the cell.
89. Describe the ways in which viral diseases are spread.
90. What pat.material is obtained from animals suspected of having rabies and what are the rules of examination.
91. How and by whom the structure of the protein disease virus was discovered. (Picorna virus, the smallest virus that stores RNA).
92. What are the signs of viral replication in the body of laboratory animals.
93. What pat.material is obtained from animals suspected of having rabies and what are the rules of examination. (The brain, the king of ammonia, is painted in the Muromtsev and Sellers method by preparing grease).
94. You know what factors affect the course of the epizootic process . (The biological nature of the virus, the physiological and immunological state of the organism, can go hand in hand with recovery and death.
95. What is the positiveness of a biological experiment and its importance in making a diagnosis. (Indicates the presence of the virus in the pathological material).
96. What are diagnostics and how are they prepared. (In biofactories, certain types of viral antigens are absorbed into erythrocytes. Erythrocytes are sensitized).
97. Chemical composition and physical properties of the virus fragment. (About capsid, nucleocapsid capsomer, supercapsid shell).
98. A family of rhabdoviruses. The rabies virus. (Tropism of the virus, routes of transmission. Diagnosis).
99. The role of viruses in the biosphere. The science of virology and its functions. Relationship with other disciplines. Contamination of the external environment with viruses.
100. Family of picornaviruses. Protein virus. (A, O, S. Sat-1, Sat-2, Sat-3, Asia - about species).
101. Chemical composition and physical properties of the virus fragment. Measurement of DNA and RNA chains, size and mass.
102. Family of paramyxoviruses. Parainfluenza virus of large horned animals. Visible clinical signs in PG-3 disease. Virus resistance.
103. P family of icornaviruses. Protein virus. (AOS SAT-1, SAT-2, SAT-3, Asian variants).
104. RNA is the reproduction of genomic viruses. Illuminate the process in the cytoplasm of the cell.
105. Rabdovirus family, a virus that causes vesicular stomatitis. Definition and structure of rhabdoviruses. Clinical signs of the disease. The difference from rabies.
106. RNA is the reproduction of genomic viruses. Which viruses contain RNA, cytoplasmic changes in the cell.

107. Slow-growing viruses. Dry virus and in humans. Kreytsfelda - YA guinea Skreypi, infectious encephalopathy is a disease causative virus.
108. A virus that causes scrapie disease in sheep and goats and transmissible encephalopathy (Aleut disease) in mink.
109. Immunofluorescence, immunoenzyme method of investigation. I - step, II - step, III - step IFR. Express methods of control.
110. The science of virology and its functions, its relationship with biological and veterinary sciences. Molecular biology, histology, pathoanatomy, zoology, epizootology and others.
111. A family of orthamikoviruses, a virus that causes influenza in pigs.
112. Calculating the titer of the virus using the Reed and Mench and Kerber methods.
113. Where the virus- storing material is sent for dermatopropic viruses to multiply in the body . (Focus on subcutaneous and subcutaneous delivery methods.)
114. The sheep are sick. Clinical signs: Temperature 41-42 °, purulent discharge from the eyes and nose. There are red, gray spots on the head, legs, hands, white necrotic nodules. Mortality among lambs is 3 percent. Identify and describe the disease.
115. What is the purpose of virus strains. (Note the importance in the biological industry).
116. In which shell of a chicken embryo are blood vessels developed?
117. What is the main component of the cell-growing nutrient medium?
118. What are the formulas used to determine the titer of viruses? ( How is $LD_{50}$ determined.)
119. Which taxa of the virus end with the word 'virus', e.g. Lissavirus.
120. Which object is infected with the virus in the allantois, amnion, yolk sac How many days should a chicken fetus be?

## ORAL QUESTIONS FOR YAB (300)

1. Who is the Russian scientist who discovered that viruses cause disease in tobacco leaves?
2. What do you mean by the relevance of the science of virology to other sciences?
3. What proves that viruses cause diseases of genetic equality?
4. What is the difference between DNA-storing viruses and RNA-storing viruses?
5. Stages of development of virology
6. Scientists who have contributed to the development of science.
7. The role of viruses in the biosphere.
8. What is the composition of viruses?
9. What is the structure of the virus?
10. Where is the supercapsid shell synthesized?
11. What is a virus or virion?
12. What are the proteins of viruses, yukleic acids?

13. What role do the enzymes of viruses play?
14. What is the difference between RNA or DNA-storing viruses?
15. What do you mean by classification of viruses
16. DNA-storing virus families
17. RNA-storing virus families
18. Disadvantages of classification based on disease symptoms.
19. What is the definition of classification based on the tropism of the virus?
20. Tell us about the tariff of epizootiological classification.
21. What are the main criteria for classifying viruses?
22. Describe the effect of temperature, drying, ultraviolet light, solvents on viruses.
23. How does the use of quicklime and phenol in disinfection affect viruses?
24. How to reduce the pathogenicity of viral strains?
25. When does the virulence of virus strains increase?
26. Effects of sunlight on viruses.
27. The effect of disinfectants on viruses.
28. Solvents for viruses.
29. The main stage of virus reproduction?
30. In what systems can viruses be grown?
31. In which part of the cell do DNA-storing viruses multiply?
32. In which part of the cell do RNA-protective viruses multiply?
33. What is the ecliptic phase?
34. What is meant by disjunctive reproduction?
35. How does the virus enter the cell?
36. What is a genome?
37. What is the structure and function of the viral gene?
38. What is phenotypic, genotic variability?
39. Explain the mutation of viruses.
40. Factors influencing the direction and effectiveness of mutagenesis.
41. What are the causes of mutation during adaptation?
42. What is the mutation of viruses from animal to animal?
43. What is meant by the ecology of viruses.
44. The concept of ecological *niche* .
45. **V The** main directions of irological research.
46. The nature of viruses, horizontal circulation
47. The vertical path of viruses circulating in nature.
48. How chemicals affect viruses.
49. List the physical factors that affect viruses.
50. What do you mean by a source of infection?
51. In what ways does the pathogen pass from a sick animal to a healthy animal?
52. When does the latent period begin and where does it end?
53. What do you mean by the persistence of the virus?
54. What is your understanding of convalescent animals?
55. V Irusta how the effect of blood?
56. What is the function of interferon?

57. What is NAU and how can it be used to diagnose viral diseases?
58. What types of NAUs are used in virology?
59. What issues can be addressed using NAU?
60. What are the strengths and weaknesses of NAU?
61. What is the essence of DPR?
62. What issues can the DPR address?
63. What are the features and disadvantages of DPR?
64. What is the essence of PCR?
65. Name the areas of application of PCR.
66. List the PCR components.
67. What are primers?
68. What is denaturation?
69. Explain what amplification is.
70. What does "Otjig" mean?
71. What family and generation does the virus that causes rhinotracheitis belong to?
72. What does the cryptogram look like?
73. What is the clinical presentation of infectious rhinotracheitis in large horned animals?
74. How can this disease be distinguished from the plague in large horned animals?
75. Where does the rhinotracheitis virus infect calves?
76. How many calves are infected with rhinotracheitis?
77. How to fight infectious rhinotracheitis?
78. What family and generation of viruses cause smallpox?
79. What is the cryptogram of the virus that causes smallpox?
80. What are the clinical signs of smallpox in sheep, goats, pigs and large horned animals, camels, horses?
81. How is smallpox diagnosed and what is its specific prevention?
82. How to paint the prepared grease?
83. Can the sheep vaccine be applied to goats?
84. What are the similarities between smallpox and other diseases?
85. To which family and generation does the virus that causes transmissible gastroenteritis belong?
86. What is the cryptogram of a virus?
87. What are the specific features of transmissible gastroenteritis in pigs?
88. How is the disease diagnosed?
89. How is gastroenteritis different from other diseases?
90. What vaccine is used to prevent the disease?
91. In what country was the Riems vaccine produced?
92. Which family and generation of viruses cause renopneumonia in horses?
93. What is the cryptogram of the virus that causes influenza in horses?
94. Clinical signs of renopneumonia and influenza in horses?
95. What are the clinical signs and epizootiological features of renopneumonia in horses?

96. What information is used to diagnose rhinopneumonia in horses?
97. What are the measures to eliminate the disease?
98. In which laboratory animals can the influenza virus be grown in horses?
99. Infectious laryngotracheitis is caused by viruses belonging to which family and generation?
100. What is the cryptogram of the virus that causes Marek's disease?
101. What are the clinical signs of Newcastle disease?
102. Describe the source of influenza in birds and ways of its spread.
103. What are the methods of prevention and control of the disease?
104. Disease transmission factors and its spread
105. What is a diagnosis and a differential diagnosis?
106. What living systems are used to separate viruses from fish?
107. What is the basis of the biological sample and the final diagnosis?
108. What is the etiological cause of hemorrhagic septicemia in fish?
109. What antibiotics are used in treatment?
110. What are prevention and control measures?
111. What are the clinical symptoms and clinical forms of the disease?
112. What diseases of fish should be distinguished?
113. How is bee sting disease transmitted within the bee family?
114. What are the symptoms of the disease in a troubled family of bees?
115. What pathological material is sent for virological examination?
116. What are the different symptoms of tapeworm disease?
117. Have treatment methods been developed?
118. Which bee should be replaced in infected families?
119. How to explain the geographical distribution of the disease depends on the age of the bees?
120. What is the role of viruses in infectious diseases of animals?
121. Talk about the rules of work and safety in the virology laboratory.
122. What method do you know to preserve viruses?
123. Tell us about how effective it is to eliminate viruses in laboratory practice.
124. Explain the general rules of obtaining material from sick and dead animals.
125. How is the pathological material preserved and shipped by vehicle?
126. What do you mean by preparing for the examination of pathological ml?
127. What is a virion and how can it be encountered?
128. Talk about the shape and structure of the virion of different viruses.
129. What are virus-infected bodies and how can they be encountered?
130. What is the diagnostic value of encountering virus entry bodies and virions?
131. Which animals are included in the laboratory animals?
132. What conditions are needed to care for laboratory animals?
133. What ration is required to feed laboratory animals?
134. What is the main purpose of using laboratory animals?
135. What dyes and solutions are used to identify laboratory animals?
136. What is the main focus of the transmission of the virus to laboratory ans?
137. Describe the methods of transmission of the virus to laboratory animals.

138. Fixation of experimental laboratory animals by all methods and study of ms of vs transmission.
139. Infection of ectromelia virus and ospavaksina virus in rabbits into the skin of wm
140. Determining the symptoms of the disease in infected animals.
141. To dissect infected animals to see pathological changes and obtain virus-privaterial.
142. Making a stamp from the brain.
143. What are the species of laboratory animals and the purpose of their use in viy laboories?
144. Do you know any of the most commonly used methods of infection for laory ani to experiment with?
145. What are the signs of viral replication in the body of laboratory animals?
146. What is the positiveness of a biological experiment and its importance in m a diagsis?
147. What is a "blind" passage?
148. What is the basis for the selection of the organ when obtaining a virus-prive matl by cracking?
149. Why are chicken embryos used in virology?
150. What is the structure of a developing chicken embryo?
151. Explain the methods of transmission of the virus to chicken embryos.
152. How do you know how to indicate viruses in a chicken fetus?
153. Do you know how to get virus-resistant material from a chicken embryo?
154. Explain the hemagglutination properties of viruses and their use, as well as thchsm of hemagglutination.
155. What are nutrient media?
156. What is the purpose of Hanks, 199, Gla, Igla solutions?
157. Trypsin, Versen solutions are used for this purpose?
158. For what purposes do we use cells grown in virology?
159. What are the advantages of cultured cells over other living systems?
160. How is the preparation of the vessels used in the cultivation of cells carried o
161. How to infect viruses in the tissues of the mattress?
162. What is an indicator added to the nutrient medium?
163. What does the change in color of the environment indicate?
164. What should be the pH of the nutrient medium?
165. What is the titer of the virus?
166. In what unit is the amount of virus measured?
167. Tell us about the detection of virus titers on CHB and BXB.
168. In 50% infectious units, what is the essence of calculating the titer of the vi
169. What is the method of calculating the titer of the virus in 50% infectious u
170. What is the point of view in determining the titer of the virus according to G
171. Talk about the advantages and disadvantages of titrating viruses in different w
172. What are antigens and antibodies?
173. What is a serological reaction and for what purpose is it used?
174. What are the basic rules for applying GATR?
175. Describe the modification of the GATR?

176. What is the essence of the neutralization reaction?
177. What modifications of the neutralization reaction do you know?
178. Explain what issues the neutralization reaction can solve.
179. What are the advantages and disadvantages of the neutralization reaction?
180. What is the essence of DPR?
181. What issues can the DPR address?
182. What are the features and disadvantages of DPR?
183. Types of IFA reaction?
184. What does the IFA reaction determine the composition of the serum?
185. How many days after the formation of antibodies in the serum?
186. What is the purpose and essence of the PCR reaction?
187. How many stages does a PCR reaction consist of?
188. What is the planning of PCR laboratory rooms?
189. How are viral diseases initially diagnosed?
190. What to follow when obtaining pathological material?
191. What are the methods of laboratory examination of pathological material and itpo
192. Describe the main features of the rabies virus.
193. Talk about the epizootiological features and symptoms of the disease caused by trabies virus.
194. What methods do you know to diagnose rabies in the laboratory?
195. What material is obtained from animals suspected of having rabies and what are rules of operation.
196. What are the main features of the protein virus?
197. Describe the rules for working with protein virus-protective material .
198. What are the epizootiological features and symptoms of the disease caused by tprotein virus ?
199. What methods do you know to diagnose proteinuria in the laboratory ?
200. What are the clinical and pathologic signs of pneumoenteritis in calves?
201. Describe how laboratory diagnosis of calf pneumoenteritis is made and difftiated.
202. What is the method of putting IFR ?
203. The main stages of development of virology. (Innovations created by DIIovsky in 1892).
204. How to prove that the virus is the cause of changes in the cell. (In the SPT exae shown for cultured cells, the stage from the adsorption phase to the exit of the s from the cell).
205. Which family does the leukemia virus of large horned animals belong to? NA, RNA storage, family, serological reactions in the diagnosis of the dise).
206. What are the similarities and differences between disease-causing viruses in aals and plants? (RNA or DNA storage and tropism).
207. General measures against epizootics in viral diseases. (Quarantine, symmatic and specific treatments).
208. What is the morphology and chemical composition of the rabies viruShape, structure of viral genome, sensitivity to ether).
209. Forms of virus interaction with the organism (virus-carrying carrier, conscent animals).

210. Specificity of anti-epizootic measures in industrial animal husdry. (specific and symptomatic treatment methods and its effectiveness).
211. Immunity and specific prophylaxis method in rabies. (vaccines used for prolactic purposes).
212. How to explain the complexity of the production of specific drugs in viral dises. (Preparation of vaccine strains; antigenic properties; multiplicity of opti).
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219. Ways of transmission of Aueski's disease.
220. What solutions and nutrient media are used to grow cells. (Hanks, Erla, 199LA, Trypsin, Versen, FBE).
221. Which factors of antiviral immunity are almost irrelevant in bacterial immity. (Isaac and Lindenman discovered interferon in 1957).
222. The cryptogram explains in writing what features of the virus are hidden
223. Smallpox, virus morphology and chemical composition. In birds and so on. ing of input bodies in.
224. At present, viruses are classified according to what criteria. (DNA, RNA stor, shape, transmitter and intermediate pathogen).
225. What are the common factors in immunity against viruses and bac. (Foreign AG enters the body and responds to it).
226. What is the titer of the virus. The amount of virus is measured in what unitum school, $_{50\text{ to }50}$, TsPT $_{50}$).
227. What are inactivated vaccines. (Under the influence of ultrasound, hea, ultra violet light, chemicals).
228. What are the perspectives and disadvantages of diagnosing viral diseases by logical (retrospective) methods.
229. What is the essence of calculating the titer of the virus in 50% infectious unit
230. The resistance of viruses to what environmental factors has been stud. (Heating, UBN, ether and other chemicals).
231. Rules of work and safety in the laboratory of virology. (Working with the regin, the employee must be vaccinated against the disease).
232. What are antigens and antibodies. GATR - What are the basic rules of apption. (Saline, serum, virus 1% chicken erythrocytes).
233. What is the resistance of viruses to factors in the external envment. (storage of lipids, mucoids, peplomers).
234. What do you mean by "attenuated" viruses? (Reducing the virulence of an infeus agent).

235. Describe and describe ways to prevent viral diseases in animals by spe and non-specific methods. (About immune serums, anatoxins, vaccines).
236. You know what live vaccines against the virus.
237. Discover why diseases caused by low-pathogenic viruses in livestock comxes are important. (parainfluenza-3, adenovirus disease of large horned ani, etc.).
238. What is the essence of a diffuse precipitation reaction and what problems cansolve. In titrating the virus, in determining the type , finding AT using anti, A G using AT .
239. What is the difference between mutation and adaptation? (Exchange, cha, adaptation).
240. Who invented the vaccine and how was it obtained? (On the example of E. Jer, L. Pasteur, Emil, Ru, Ricketts).
241. In what ways do viruses travel from where they land to find a place to reprce in the body? Aerogen, Alimentary transmissive.
242. What is the mechanism of radiation and chemical mutagenesis. (complex gen changes in the body under the influence of physical and chemical factors).
243. You know which vaccines are made from low-virulence strains in nature andat the positive side of it is.
244. The method of irradiated antibodies, its advantages and disadvantages, its apption in the practice of virology. Express diagnostics (in this method the addn of glycerin to the pathological material is not recommended).
245. Ways of entry of viruses into macroorganisms (from adsorption to the stagf virus exit from the cell).
246. What are the main processes in the biological control of antiviral vacs . (Sterility test. Determination of AT-titer.)
247. Write about parainfluenza in large horned animals and ways to diagnose it. (ction in naturally susceptible animals, serological reactions).
248. What is the tropism of viruses . (Dermatrop, pyevmatrop, enterotrop, neuop, pantrop viruses).
249. What is the morphology and structure of the smallpox virus? What causes an iahedron to be in shape.
250. When diagnosing proteinuria, describe which serological test is used to detene the type of virus. (Components required for CBR reaction and methods of t preparation).
251. Describe ways of biological control of antiviral immune serum. (Immune seruuse of anatoxins for prophylaxis).
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265. What pat.material is obtained from animals suspected of having rabies andat are the rules of examination. (The brain, the king of ammonia, is painted in tMuromtsev and Sellers method by preparing grease).
266. You know what factors affect the course of the epizootic process . (The biolcal nature of the virus, the physiological and immunological state of the orgm, can go hand in hand with recovery and death.
267. What is the positiveness of a biological experiment and its importance in mak a diagnosis. (Indicates the presence of the virus in the pathological matl).
268. What are diagnostics and how are they prepared. (In biofactories, certain typf viral antigens are absorbed into erythrocytes. Erythrocytes are sensitized).
269. Chemical composition and physical properties of the virus fragnt. (About capsid, nucleocapsid capsomer, supercapsid shell).
270. A family of rhabdoviruses. The rabies virus. (Tropism of the virus, routes of tmission. Diagnosis).
271. The role of viruses in the biosphere. The science of virology and its funns. Relationship with other disciplines. Contamination of the external envment with viruses.
272. Family of picornaviruses. Protein virus. (A, O, S. Sat-1, Sat-2, Sat-3, Asia - ab species).
273. Chemical composition and physical properties of the virus fragnt. Measurement of DNA and RNA chains, size and mass.
274. Family of paramyxoviruses. Parainfluenza virus of large horned ani. Visible clinical signs in PG-3 disease. Virus resistance.
275. P family of icornaviruses. Protein virus. (AOS SAT-1, SAT-2, SAT-3, Asivariants).
276. Implementation of decisions on the development of animal husbandry by ourvernment. The main tasks of the veterinarian in the performance. September 3, 1 R esp. Law on Veterinary Medicine (section 5, consisting of 20 articles).
277. A family of corona viruses. A virus that causes infectious bronchitis in chics.

278. Security techniques when working with viruses. About sterile box bacidal lamp, robe, cap, special sterile conditions. List the brands of bacidal lamps.
279. Family of paramyxoviruses. Newcastle disease virus. Illuminate the pro going on in the cell nucleus.
280. DNA is the reproduction of protective viruses.
281. RNA is the reproduction of genomic viruses. Illuminate the process in the cytosm of the cell.
282. Rabdovirus family, a virus that causes vesicular stomatitis. Definition and strue of rhabdoviruses. Clinical signs of the disease. The difference from rabi
283. RNA is the reproduction of genomic viruses. Which viruses contain RNA, cytosmic changes in the cell.
284. Slow-growing viruses. Dry virus and in humans. Kreytsfelda - YA guinea Skri, infectious encephalopathy is a disease causative virus.
285. A virus that causes scrapie disease in sheep and goats and transmissible encalopathy (Aleut disease) in mink.
286. Immunofluorescence, immunoenzyme method of investigation. I - step, II - stIII - step IFR. Express methods of control.
287. The science of virology and its functions, its relationship with biological andeterinary sciences. Molecular biology, histology, pathoanatomy, zoology, epizology and others.
288. A family of orthamikoviruses, a virus that causes influenza in pigs.
289. Calculating the titer of the virus using the Reed and Mench and Kerber mets.
290. Where the virus- storing material is sent for dermatopropic viruses to muly in the body . (Focus on subcutaneous and subcutaneous delivery mets.)
291. The sheep are sick. Clinical signs: Temperature 41-42 °, purulent discge from the eyes and nose. There are red, gray spots on the head, legs, han white necrotic nodules. Mortality among lambs is 3 percent. Identify and dese the disease.
292. What is the purpose of virus strains. (Note the importance in the biolcal industry).
293. In which shell of a chicken embryo are blood vessels developed?
294. What is the main component of the cell-growing nutrient medium?
295. What are the formulas used to determine the titer of viruses? ( How is $L_0$ determined.)
296. Which taxa of the virus end with the word ‘virus’, e.g. Lissavirus.
297. Which object is infected with the virus in the allantois, amnion, yolk sac Hoany days should a chicken fetus be?
298. Which are the 3 class T-cells that provide tissue immunity in the thymus (in example of helpers, killers, suppressors).
299. The virus that causes infectious rhinotracheitis is mainly reproduced in whiorgans. (Pathways associated with processes in the respiratory and genital org.
300. Which of the following includes peripheral lymphoid organs. (Function of lymnodes, spleen, lymphatic follicles)

## 4.4.WRITTEN WORK QUESTIONS (150)

1. o is the Russian scientist who discovered that viruses cause disease in cco leaves?
2. at do you mean by the relevance of the science of virology to other nces?
3. at proves that viruses cause diseases of genetic equality?
4. at is the difference between DNA-storing viruses and RNA-storing viruses?
5. es of development of virology
6. ntists who have contributed to the development of science.
7. role of viruses in the biosphere.
8. at is the composition of viruses?
9. at is the structure of the virus?
10. Where is the supercapsid shell synthesized?
11. What is a virus or virion?
12. What are the proteins of viruses, yukleic acids?
13. What role do the enzymes of viruses play?
14. What is the difference between RNA or DNA-storing viruses?
15. What do you mean by classification of viruses
16. DNA-storing virus families
17. RNA-storing virus families
18. Disadvantages of classification based on disease symptoms.
19. What is the definition of classification based on the tropism of the virus?
20. Tell us about the tariff of epizootiological classification.
21. What are the main criteria for classifying viruses?
22. Describe the effect of temperature, drying, ultraviolet light, solvents on uses.
23. How does the use of quicklime and phenol in disinfection affect viruses?
24. How to reduce the pathogenicity of viral strains?
25. When does the virulence of virus strains increase?
26. Effects of sunlight on viruses.
27. The effect of disinfectants on viruses.
28. Solvents for viruses.
29. The main stage of virus reproduction?
30. In what systems can viruses be grown?
31. In which part of the cell do DNA-storing viruses multiply?
32. In which part of the cell do RNA-protective viruses multiply?
33. What is the ecliptic phase?
34. What is meant by disjunctive reproduction?
35. How does the virus enter the cell?
36. What is a genome?
37. What is the structure and function of the viral gene?
38. What is phenotypic, genotic variability?
39. Explain the mutation of viruses.
40. Factors influencing the direction and effectiveness of mutagenesis.
41. What are the causes of mutation during adaptation?
42. What is the mutation of viruses from animal to animal?

43. What is meant by the ecology of viruses.
44. The concept of ecological *niche* .
45. **V The** main directions of irological research.
46. The nature of viruses, horizontal circulation
47. The vertical path of viruses circulating in nature.
48. How chemicals affect viruses.
49. List the physical factors that affect viruses.
50. What do you mean by a source of infection?
51. In what ways does the pathogen pass from a sick animal to a healthy animal?
52. When does the latent period begin and where does it end?
53. What do you mean by the persistence of the virus?
54. What is your understanding of convalescent animals?
55. V Irusta how the effect of blood?
56. What is the function of interferon?
57. What is NAU and how can it be used to diagnose viral diseases?
58. What types of NAUs are used in virology?
59. What issues can be addressed using NAU?
60. What are the strengths and weaknesses of NAU?
61. What is the essence of DPR?
62. What issues can the DPR address?
63. What are the features and disadvantages of DPR?
64. What is the essence of PCR?
65. Name the areas of application of PCR.
66. List the PCR components.
67. What are primers?
68. What is denaturation?
69. Explain what amplification is.
70. What does "Otjig" mean?
71. What family and generation does the virus that causes rhinotracheitis belong to?
72. What does the cryptogram look like?
73. What is the clinical presentation of infectious rhinotracheitis in large horned animals?
74. How can this disease be distinguished from the plague in large horned animals?
75. Who is the scientist who proposed cryptogarm in the classification of viruses?
76. Where can the cytopathogenic effects of viruses be seen?
77. What antibiotics are added to the pathological material?
78. Which of these serological reactions is correct?
79. Magnetic mixer, what is it used for?
80. Which viruses have the ability to hemagglutinate?
81. When does the pathogenicity rate of an infected virus increase?
82. When does the pathogenicity rate of an infected virus decrease?

83. What disease do paramyxoviruses cause?
84. What diseases do coronaviruses cause?
85. What diseases do retroviruses cause?
86. What diseases do rhabdoviruses cause?
87. In an incubator, what causes a 70% increase in humidity when growing a chicken embryo?
88. In an incubator, what causes a 40% decrease in air humidity during the growth of the chicken embryo?
89. How many ways is the virus transmitted to a chicken fetus?
90. What solutions do we use to label laboratory animals ?
91. What are the factors that lead to the emergence of diseases caused by viruses in livestock complexes?
92. What are the forces acting on the adsorption of virions on the cell surface?
93. What forms the supercapidal shell in virions?
94. How many days before the birth of pigs in viral gastroenteritis should be vaccinated?
95. What are the nutrient media used to grow a cell in vitro?
96. What are the solutions used to divide a cell into separate parts?
97. For what purpose is ice used in the process of dividing a cell into separate parts?
98. What type of cell division to increase the animal's blood serum used foyizlisi?
99. What are the advantages of a cultured cell over laboratory animals, chicken embryos ?
100. Which animals are included in the laboratory animals?
101. What conditions are needed to care for laboratory animals?
102. What ration is required to feed laboratory animals?
103. What is the main purpose of using laboratory animals?
104. What dyes and solutions are used to identify laboratory animals?
105. What is the main focus of the transmission of the virus to laboratory animals?
106. Describe the methods of transmission of the virus to laboratory animals.
107. Fixation of experimental laboratory animals by all methods and study of methods of virus transmission.
108. Infection of ectromelia virus and ospavaksina virus in rabbits into the skin of white mice.
109. Determining the symptoms of the disease in infected animals.
110. To dissect infected animals to see pathological changes and obtain virus-protective material.
111. Making a stamp from the brain.
112. What are the species of laboratory animals and the purpose of their use in virology laboratories?
113. Do you know any of the most commonly used methods of infection for laboratory animals to experiment with?
114. What are the signs of viral replication in the body of laboratory animals?

115. What is the positiveness of a biological experiment and its importance in making a diagnosis?
116. What is a "blind" passage?
117. What is the basis for the selection of the organ when obtaining a virus-protective material by cracking?
118. Why are chicken embryos used in virology?
119. What is the structure of a developing chicken embryo?
120. Explain the methods of transmission of the virus to chicken embryos.
121. How do you know how to indicate viruses in a chicken fetus?
122. Do you know how to get virus-resistant material from a chicken embryo?
123. Explain the hemagglutination properties of viruses and their use, as well as the mechanism of hemagglutination.
124. What are nutrient media?
125. What is the purpose of Hanks, 199, Gla, Igla solutions?
126. Trypsin, Versen solutions are used for this purpose?
127. For what purposes do we use cells grown in virology?
128. What are the advantages of cultured cells over other living systems?
129. How is the preparation of the vessels used in the cultivation of cells carried out?
130. How to infect viruses in the tissues of the mattress?
131. What is an indicator added to the nutrient medium?
132. What does the change in color of the environment indicate?
133. What should be the pH of the nutrient medium?
134. What is the titer of the virus?
135. In what unit is the amount of virus measured?
136. Tell us about the detection of virus titers on CHB and BXB.
137. In 50% infectious units, what is the essence of calculating the titer of the virus?
138. What is the method of calculating the titer of the virus in 50% infectious units?
139. What is the point of view in determining the titer of the virus according to GAB?
140. Talk about the advantages and disadvantages of titrating viruses in different ways?
141. What are antigens and antibodies?
142. What is a serological reaction and for what purpose is it used?
143. What are the common factors in immunity against viruses and bacteria. (Foreign AG enters the body and responds to it).
144. What is the titer of the virus. The amount of virus is measured in what unit. (Yum school, $_{50\ to\ 50}$, TsPT $_{50}$).
145. What are inactivated vaccines. (Under the influence of ultrasound, heating, ultra violet light, chemicals).
146. What are the perspectives and disadvantages of diagnosing viral diseases by serological (retrospective) methods.

147. What is the essence of calculating the titer of the virus in 50% infectious units.
148. The resistance of viruses to what environmental factors has been studied. (Heating, UBN, ether and other chemicals).
149. Rules of work and safety in the laboratory of virology. (Working with the regimen, the employee must be vaccinated against the disease).
150. What are antigens and antibodies. GATR - What are the basic rules of application. (Saline, serum, virus 1% chicken erythrocytes).

## 4.5. 2 WRITTEN WORK QUESTIONS FOR OB (150)

1. Explain the methods of transmission of the virus to chicken embryos.
2. How do you know how to indicate viruses in a chicken embryo?
3. Do you know how to get virus-resistant material from a chicken embryo?
4. Explain the hemagglutination properties of viruses and their use, as well as the mechanism of hemagglutination.
5. What are nutrient media?
6. What is the purpose of Hanks, 199, Gla, Igla solutions?
7. Trypsin, Versen solutions are used for this purpose?
8. For what purposes do we use cells grown in virology?
9. What are the advantages of cultured cells over other living systems?
10. How is the preparation of the vessels used in the cultivation of cells carried out?
11. How to infect viruses in the tissues of the mattress?
12. What is an indicator added to the nutrient medium?
13. What does the change in color of the environment indicate?
14. What should be the pH of the nutrient medium?
15. What is the titer of the virus?
16. In what unit is the amount of virus measured?
17. Tell us about the detection of virus titers on CHB and BXB.
18. In 50% infectious units, what is the essence of calculating the titer of the virus?
19. What is the method of calculating the titer of the virus in 50% infectious units?
20. What is the point of view in determining the titer of the virus according to GAB?
21. Talk about the advantages and disadvantages of titrating viruses in different ways?
22. What are antigens and antibodies?
23. What is a serological reaction and for what purpose is it used?
24. What are the basic rules for applying GATR?
25. Describe the modification of the GATR?
26. What is the essence of the neutralization reaction?
27. What modifications of the neutralization reaction do you know?
28. Explain what issues the neutralization reaction can solve.

29. What are the advantages and disadvantages of the neutralization reaction?
30. What is the essence of DPR?
31. What issues can the DPR address?
32. What are the features and disadvantages of DPR?
33. Types of IFA reaction?
34. What does the IFA reaction determine the composition of the serum?
35. How many days after the formation of antibodies in the serum?
36. What is the purpose and essence of the PCR reaction?
37. How many stages does a PCR reaction consist of?
38. What is the planning of PCR laboratory rooms?
39. How are viral diseases initially diagnosed?
40. What to follow when obtaining pathological material?
41. What are the methods of laboratory examination of pathological material and its purpose?
42. Describe the main features of the rabies virus.
43. Talk about the epizootiological features and symptoms of the disease caused by the rabies virus.
44. What methods do you know to diagnose rabies in the laboratory?
45. What material is obtained from animals suspected of having rabies and what are the rules of operation.
46. What are the main features of the protein virus?
47. Describe the rules for working with protein virus-protective material .
48. What are the epizootiological features and symptoms of the disease caused by the protein virus ?
49. What methods do you know to diagnose proteinuria in the laboratory ?
50. What are the clinical and pathologic signs of pneumoenteritis in calves?
51. Describe how laboratory diagnosis of calf pneumoenteritis is made and differentiated.
52. What is the method of putting IFR ?
53. The main stages of development of virology. (Innovations created by DIIvanovsky in 1892).
54. How to prove that the virus is the cause of changes in the cell. (In the SPT example shown for cultured cells, the stage from the adsorption phase to the exit of the virus from the cell).
55. Which family does the leukemia virus of large horned animals belong to? (DNA, RNA storage, family, serological reactions in the diagnosis of the disease).
56. What are the similarities and differences between disease-causing viruses in animals and plants? (RNA or DNA storage and tropism).
57. General measures against epizootics in viral diseases. (Quarantine, symptomatic and specific treatments).
58. What is the morphology and chemical composition of the rabies virus. (Shape, structure of viral genome, sensitivity to ether).
59. Forms of virus interaction with the organism (virus-carrying carrier, convalescent animals).

60. Specificity of anti-epizootic measures in industrial animal husbandry. (specific and symptomatic treatment methods and its effectiveness).
61. Immunity and specific prophylaxis method in rabies. (vaccines used for prophylactic purposes).
62. How to explain the complexity of the production of specific drugs in viral diseases. (Preparation of vaccine strains; antigenic properties; multiplicity of options).
63. Classification of viral infection. RNA, DNA storage NK mass in virion composition, virion shape, transmitter, intermediate host.
64. How are rabies diagnosed? (virusoscopy, biological sample, DPR, IFR).
65. What is the eclipse phase. Influencing forces in the process of reproduction of viruses.
66. The TB virus family, generation, and structure of the virus. Methods of diagnosis and determination of type in the laboratory.
67. The science of gnotobiology and its role in the investigation of viruses.
68. What role do nucleic acids play in viruses. (Genetic information, transcription, translation, transduction).
69. Ways of transmission of Aueski's disease.
70. What solutions and nutrient media are used to grow cells. (Hanks, Erla, 199, GLA, Trypsin, Versen, FBE).
71. Which factors of antiviral immunity are almost irrelevant in bacterial immunity. (Isaac and Lindenman discovered interferon in 1957).
72. The cryptogram explains in writing what features of the virus are hidden
73. Smallpox, virus morphology and chemical composition. In birds and so on. naming of input bodies in.
74. At present, viruses are classified according to what criteria. (DNA, RNA storage, shape, transmitter and intermediate pathogen).
75. What are the common factors in immunity against viruses and bacteria. (Foreign AG enters the body and responds to it).
76. What is the titer of the virus. The amount of virus is measured in what unit. (Yum school, $_{50\text{ to }50}$, TsPT $_{50}$).
77. What are inactivated vaccines. (Under the influence of ultrasound, heating, ultra violet light, chemicals).
78. What are the perspectives and disadvantages of diagnosing viral diseases by serological (retrospective) methods.
79. What is the essence of calculating the titer of the virus in 50% infectious units.
80. The resistance of viruses to what environmental factors has been studied. (Heating, UBN, ether and other chemicals).
81. Rules of work and safety in the laboratory of virology. (Working with the regimen, the employee must be vaccinated against the disease).
82. What are antigens and antibodies. GATR - What are the basic rules of application. (Saline, serum, virus 1% chicken erythrocytes).
83. What is the resistance of viruses to factors in the external environment. (storage of lipids, mucoids, peplomers).

84. What do you mean by "attenuated" viruses? (Reducing the virulence of an infectious agent).
85. Describe and describe ways to prevent viral diseases in animals by specific and non-specific methods. (About immune serums, anatoxins, vaccines).
86. You know what live vaccines against the virus.
87. Discover why diseases caused by low-pathogenic viruses in livestock complexes are important. (parainfluenza-3, adenovirus disease of large horned animals, etc.).
88. What is the essence of a diffuse precipitation reaction and what problems can it solve. In titrating the virus, in determining the type , finding AT using antigen, A G using AT .
89. What is the difference between mutation and adaptation? (Exchange, change, adaptation).
90. Who invented the vaccine and how was it obtained? (On the example of E. Jenner, L. Pasteur, Emil, Ru, Ricketts).
91. In what ways do viruses travel from where they land to find a place to reproduce in the body? Aerogen, Alimentary transmissive.
92. What is the mechanism of radiation and chemical mutagenesis. (complex genetic changes in the body under the influence of physical and chemical factors).
93. You know which vaccines are made from low-virulence strains in nature and what the positive side of it is.
94. The method of irradiated antibodies, its advantages and disadvantages, its application in the practice of virology. Express diagnostics (in this method the addition of glycerin to the pathological material is not recommended).
95. Ways of entry of viruses into macroorganisms (from adsorption to the stage of virus exit from the cell).
96. What are the main processes in the biological control of antiviral vaccines . (Sterility test. Determination of AT-titer.)
97. Write about parainfluenza in large horned animals and ways to diagnose it. (Infection in naturally susceptible animals, serological reactions).
98. What is the tropism of viruses . (Dermatrop, pyevmatrop, enterotrop, neurotrop, pantrop viruses).
99. What is the morphology and structure of the smallpox virus? What causes an icosahedron to be in shape.
100. When diagnosing proteinuria, describe which serological test is used to determine the type of virus. (Components required for CBR reaction and methods of their preparation).
101. Describe ways of biological control of antiviral immune serum. (Immune serum, use of anatoxins for prophylaxis).
102. What is the method of viroroscopy based on. Dyeing virions and viewing a group of virions under a microscope.
103. What are virus entry bodies and how can they be encountered. (Collection of virions Babesh-Negri, Borrell, Bollinger, Zeyfred, Lentsa).
104. Give a general description of viral diseases. (Differs in pathogenesis from bacterial diseases).

105. How to put a biological sample for bird flu. (On the leaves, due to irritation of the thigh muscles).
106. Describe the virus that causes smallpox. What are the clinical and epizootiological features of smallpox in different species of animals? (Occurrence of smallpox).
107. What is the role of nucleic acids. (DNA, RNA, single or double helix.
108. What is the structure of the parainfluenza-3 disease virus in aphids. (surrounded by a round, mucoid shell).
109. Describe Newcastle and influenza viruses. Which reaction can be used to differentiate Newcastle disease virus from influenza virus. (Explain the nature of the GATR reaction). The main pathological changes are manifested in which organ.
110. H What visible change is observed when the virus is exposed to the cell.
111. Describe the ways in which viral diseases are spread.
112. What pat.material is obtained from animals suspected of having rabies and what are the rules of examination.
113. How and by whom the structure of the protein disease virus was discovered. (Picorna virus, the smallest virus that stores RNA).
114. What are the signs of viral replication in the body of laboratory animals.
115. What pat.material is obtained from animals suspected of having rabies and what are the rules of examination. (The brain, the king of ammonia, is painted in the Muromtsev and Sellers method by preparing grease).
116. You know what factors affect the course of the epizootic process . (The biological nature of the virus, the physiological and immunological state of the organism, can go hand in hand with recovery and death.
117. What is the positiveness of a biological experiment and its importance in making a diagnosis. (Indicates the presence of the virus in the pathological material).
118. What are diagnostics and how are they prepared. (In biofactories, certain types of viral antigens are absorbed into erythrocytes. Erythrocytes are sensitized).
119. Chemical composition and physical properties of the virus fragment. (About capsid, nucleocapsid capsomer, supercapsid shell).
120. A family of rhabdoviruses. The rabies virus. (Tropism of the virus, routes of transmission. Diagnosis).
121. The role of viruses in the biosphere. The science of virology and its functions. Relationship with other disciplines. Contamination of the external environment with viruses.
122. Family of picornaviruses. Protein virus. (A, O, S. Sat-1, Sat-2, Sat-3, Asia - about species).
123. Chemical composition and physical properties of the virus fragment. Measurement of DNA and RNA chains, size and mass.
124. Family of paramyxoviruses. Parainfluenza virus of large horned animals. Visible clinical signs in PG-3 disease. Virus resistance.
125. P family of icornaviruses. Protein virus. (AOS SAT-1, SAT-2, SAT-3, Asian variants).

126. Implementation of decisions on the development of animal husbandry by our government. The main tasks of the veterinarian in the performance. September 3, 1993 R esp. Law on Veterinary Medicine (section 5, consisting of 20 articles).
127. A family of corona viruses. A virus that causes infectious bronchitis in chickens.
128. Security techniques when working with viruses. About sterile box bactericidal lamp, robe, cap, special sterile conditions. List the brands of bactericidal lamps.
129. Family of paramyxoviruses. Newcastle disease virus. Illuminate the process going on in the cell nucleus.
130. DNA is the reproduction of protective viruses.
131. RNA is the reproduction of genomic viruses. Illuminate the process in the cytoplasm of the cell.
132. Rabdovirus family, a virus that causes vesicular stomatitis. Definition and structure of rhabdoviruses. Clinical signs of the disease. The difference from rabies.
133. RNA is the reproduction of genomic viruses. Which viruses contain RNA, cytoplasmic changes in the cell.
134. Slow-growing viruses. Dry virus and in humans. Kreytsfelda - YA guinea Skreypi, infectious encephalopathy is a disease causative virus.
135. A virus that causes scrapie disease in sheep and goats and transmissible encephalopathy (Aleut disease) in mink.
136. Immunofluorescence, immunoenzyme method of investigation. I - step, II - step, III - step IFR. Express methods of control.
137. The science of virology and its functions, its relationship with biological and veterinary sciences. Molecular biology, histology, pathoanatomy, zoology, epizootology and others.
138. A family of orthamikoviruses, a virus that causes influenza in pigs.
139. Calculating the titer of the virus using the Reed and Mench and Kerber methods.
140. Where the virus- storing material is sent for dermatopropic viruses to multiply in the body . (Focus on subcutaneous and subcutaneous delivery methods.)
141. The sheep are sick. Clinical signs: Temperature 41-42 °, purulent discharge from the eyes and nose. There are red, gray spots on the head, legs, hands, white necrotic nodules. Mortality among lambs is 3 percent. Identify and describe the disease.
142. What is the purpose of virus strains. (Note the importance in the biological industry).
143. In which shell of a chicken embryo are blood vessels developed?
144. What is the main component of the cell-growing nutrient medium?
145. What are the formulas used to determine the titer of viruses? ( How is $LD_{50}$ determined.)
146. Which taxa of the virus end with the word ‘virus’, e.g. Lissavirus.
147. Which object is infected with the virus in the allantois, amnion, yolk sac How many days should a chicken fetus be?

148. Which are the 3 class T-cells that provide tissue immunity in the thymus (in the example of helpers, killers, suppressors).
149. The virus that causes infectious rhinotracheitis is mainly reproduced in which organs. (Pathways associated with processes in the respiratory and genital organs).
150. Which of the following includes peripheral lymphoid organs. (Function of lymph nodes, spleen, lymphatic follicles)

## 4.5. WRITTEN WORK QUESTIONS FOR YAB (500)

1. Who is the Russian scientist who discovered that viruses cause disease in tobacco leaves?
2. What do you mean by the relevance of the science of virology to other sciences?
3. What proves that viruses cause diseases of genetic equality?
4. What is the difference between DNA-storing viruses and RNA-storing viruses?
5. Stages of development of virology
6. Scientists who have contributed to the development of science.
7. The role of viruses in the biosphere.
8. What is the composition of viruses?
9. What is the structure of the virus?
10. Where is the supercapsid shell synthesized?
11. What is a virus or virion?
12. What are the proteins of viruses, yukleic acids?
13. What role do the enzymes of viruses play?
14. What is the difference between RNA or DNA-storing viruses?
15. What do you mean by classification of viruses
16. DNA-storing virus families
17. RNA-storing virus families
18. Disadvantages of classification based on disease symptoms.
19. What is the definition of classification based on the tropism of the virus?
20. Tell us about the tariff of epizootiological classification.
21. What are the main criteria for classifying viruses?
22. Describe the effect of temperature, drying, ultraviolet light, solvents on viruses.
23. How does the use of quicklime and phenol in disinfection affect viruses?
24. How to reduce the pathogenicity of viral strains?
25. When does the virulence of virus strains increase?
26. Effects of sunlight on viruses.
27. The effect of disinfectants on viruses.
28. Solvents for viruses.
29. The main stage of virus reproduction?
30. In what systems can viruses be grown?
31. In which part of the cell do DNA-storing viruses multiply?
32. In which part of the cell do RNA-protective viruses multiply?
33. What is the ecliptic phase?
34. What is meant by disjunctive reproduction?

35. How does the virus enter the cell?
36. What is a genome?
37. What is the structure and function of the viral gene?
38. What is phenotypic, genotic variability?
39. Explain the mutation of viruses.
40. Factors influencing the direction and effectiveness of mutagenesis.
41. What are the causes of mutation during adaptation?
42. What is the mutation of viruses from animal to animal?
43. What is meant by the ecology of viruses.
44. The concept of ecological *niche* .
45. **V The** main directions of irological research.
46. The nature of viruses, horizontal circulation
47. The vertical path of viruses circulating in nature.
48. How chemicals affect viruses.
49. List the physical factors that affect viruses.
50. What do you mean by a source of infection?
51. In what ways does the pathogen pass from a sick animal to a healthy animal?
52. When does the latent period begin and where does it end?
53. What do you mean by the persistence of the virus?
54. What is your understanding of convalescent animals?
55. V Irusta how the effect of blood?
56. What is the function of interferon?
57. What is NAU and how can it be used to diagnose viral diseases?
58. What types of NAUs are used in virology?
59. What issues can be addressed using NAU?
60. What are the strengths and weaknesses of NAU?
61. What is the essence of DPR?
62. What issues can the DPR address?
63. What are the features and disadvantages of DPR?
64. What is the essence of PCR?
65. Name the areas of application of PCR.
66. List the PCR components.
67. What are primers?
68. What is denaturation?
69. Explain what amplification is.
70. What does "Otjig" mean?
71. What family and generation does the virus that causes rhinotracheitis belong to?
72. What does the cryptogram look like?
73. What is the clinical presentation of infectious rhinotracheitis in large horned animals?
74. How can this disease be distinguished from the plague in large horned animals?
75. Where does the rhinotracheitis virus infect calves?

76. How many calves are infected with rhinotracheitis?
77. How to fight infectious rhinotracheitis?
78. What family and generation of viruses cause smallpox?
79. What is the cryptogram of the virus that causes smallpox?
80. What are the clinical signs of smallpox in sheep, goats, pigs and large horned animals, camels, horses?
81. How is smallpox diagnosed and what is its specific prevention?
82. How to paint the prepared grease?
83. Can the sheep vaccine be applied to goats?
84. What are the similarities between smallpox and other diseases?
85. To which family and generation does the virus that causes transmissible gastroenteritis belong?
86. What is the cryptogram of a virus?
87. What are the specific features of transmissible gastroenteritis in pigs?
88. How is the disease diagnosed?
89. How is gastroenteritis different from other diseases?
90. What vaccine is used to prevent the disease?
91. In what country was the Riems vaccine produced?
92. Which family and generation of viruses cause renopneumonia in horses?
93. What is the cryptogram of the virus that causes influenza in horses?
94. Clinical signs of renopneumonia and influenza in horses?
95. What are the clinical signs and epizootiological features of renopneumonia in horses?
96. What information is used to diagnose rhinopneumonia in horses?
97. What are the measures to eliminate the disease?
98. In which laboratory animals can the influenza virus be grown in horses?
99. Infectious laryngotracheitis is caused by viruses belonging to which family and generation?
100. What is the cryptogram of the virus that causes Marek's disease?
101. What are the clinical signs of Newcastle disease?
102. Describe the source of influenza in birds and ways of its spread.
103. What are the methods of prevention and control of the disease?
104. Disease transmission factors and its spread
105. What is a diagnosis and a differential diagnosis?
106. What living systems are used to separate viruses from fish?
107. What is the basis of the biological sample and the final diagnosis?
108. What is the etiological cause of hemorrhagic septicemia in fish?
109. What antibiotics are used in treatment?
110. What are prevention and control measures?
111. What are the clinical symptoms and clinical forms of the disease?
112. What diseases of fish should be distinguished?
113. How is bee sting disease transmitted within the bee family?
114. What are the symptoms of the disease in a troubled family of bees?
115. What pathological material is sent for virological examination?
116. What are the different symptoms of tapeworm disease?

117. Have treatment methods been developed?
118. Which bee should be replaced in infected families?
119. How to explain the geographical distribution of the disease depends on the age of the bees?
120. What is the role of viruses in infectious diseases of animals?
121. Talk about the rules of work and safety in the virology laboratory.
122. You know which way to conserve viruses
123. Tell us about how effective it is to eliminate viruses in laboratory practice.
124. Explain the general rules of obtaining material from sick and dead animals.
125. How is the pathological material preserved and shipped by vehicle?
126. What do you mean by preparing for the examination of pathological material?
127. What is a virion and how can it be encountered?
128. Talk about the shape and structure of the virion of different viruses.
129. What are virus-infected bodies and how can they be encountered?
130. What is the diagnostic value of encountering virus entry bodies and virions?
131. Which animals are included in the laboratory animals?
132. What conditions are needed to care for laboratory animals?
133. What ration is required to feed laboratory animals?
134. What is the main purpose of using laboratory animals?
135. What dyes and solutions are used to identify laboratory animals?
136. What is the main focus of the transmission of the virus to laboratory animals?
137. Describe the methods of transmission of the virus to laboratory animals.
138. Fixation of experimental laboratory animals by all methods and study of methods of virus transmission.
139. Infection of ectromelia virus and ospavaksina virus in rabbits into the skin of white mice.
140. Determining the symptoms of the disease in infected animals.
141. To dissect infected animals to see pathological changes and obtain virus-protective material.
142. Making a stamp from the brain.
143. What are the species of laboratory animals and the purpose of their use in virology laboratories?
144. Do you know any of the most commonly used methods of infection for laboratory animals to experiment with?
145. What are the signs of viral replication in the body of laboratory animals?
146. What is the positiveness of a biological experiment and its importance in making a diagnosis?
147. What is a "blind" passage?
148. What is the basis for the selection of the organ when obtaining a virus-protective material by cracking?
149. Why are chicken embryos used in virology?
150. What is the structure of a developing chicken embryo?
151. Explain the methods of transmission of the virus to chicken embryos.
152. How do you know how to indicate viruses in a chicken fetus?
153. Do you know how to get virus-resistant material from a chicken embryo?

154. Explain the hemagglutination properties of viruses and their use, as well as the mechanism of hemagglutination.
155. What are nutrient media?
156. What is the purpose of Hanks, 199, Gla, Igla solutions?
157. Trypsin, Versen solutions are used for this purpose?
158. For what purposes do we use cells grown in virology?
159. What are the advantages of cultured cells over other living systems?
160. How is the preparation of the vessels used in the cultivation of cells carried out?
161. How to infect viruses in the tissues of the mattress?
162. What is an indicator added to the nutrient medium?
163. What does the change in color of the environment indicate?
164. What should be the pH of the nutrient medium?
165. What is the titer of the virus?
166. In what unit is the amount of virus measured?
167. Tell us about the detection of virus titers on CHB and BXB.
168. In 50% infectious units, what is the essence of calculating the titer of the virus?
169. What is the method of calculating the titer of the virus in 50% infectious units?
170. What is the point of view in determining the titer of the virus according to GAB?
171. Talk about the advantages and disadvantages of titrating viruses in different ways?
172. What are antigens and antibodies?
173. What is a serological reaction and for what purpose is it used?
174. What are the basic rules for applying GATR?
175. Describe the modification of the GATR?
176. What is the essence of the neutralization reaction?
177. What modifications of the neutralization reaction do you know?
178. Explain what issues the neutralization reaction can solve.
179. What are the advantages and disadvantages of the neutralization reaction?
180. What is the essence of DPR?
181. What issues can the DPR address?
182. What are the features and disadvantages of DPR?
183. Types of IFA reaction?
184. What does the IFA reaction determine the composition of the serum?
185. How many days after the formation of antibodies in the serum?
186. What is the purpose and essence of the PCR reaction?
187. How many stages does a PCR reaction consist of?
188. What is the planning of PCR laboratory rooms?
189. How are viral diseases initially diagnosed?
190. What to follow when obtaining pathological material?
191. What are the methods of laboratory examination of pathological material and its purpose?

192. Describe the main features of the rabies virus.
193. Talk about the epizootiological features and symptoms of the disease caused by the rabies virus.
194. What methods do you know to diagnose rabies in the laboratory?
195. What material is obtained from animals suspected of having rabies and what are the rules of operation.
196. What are the main features of the protein virus?
197. Describe the rules for working with protein virus-protective material .
198. What are the epizootiological features and symptoms of the disease caused by the protein virus ?
199. What methods do you know to diagnose proteinuria in the laboratory ?
200. What are the clinical and pathologic signs of pneumoenteritis in calves?
201. Describe how laboratory diagnosis of calf pneumoenteritis is made and differentiated.
202. What is the method of putting IFR ?
203. The main stages of development of virology. (Innovations created by DIIvanovsky in 1892).
204. How to prove that the virus is the cause of changes in the cell. (In the SPT example shown for cultured cells, the stage from the adsorption phase to the exit of the virus from the cell).
205. Which family does the leukemia virus of large horned animals belong to? (DNA, RNA storage, family, serological reactions in the diagnosis of the disease).
206. What are the similarities and differences between disease-causing viruses in animals and plants? (RNA or DNA storage and tropism).
207. General measures against epizootics in viral diseases. (Quarantine, symptomatic and specific treatments).
208. What is the morphology and chemical composition of the rabies virus. (Shape, structure of viral genome, sensitivity to ether).
209. Forms of virus interaction with the organism (virus-carrying carrier, convalescent animals).
210. Specificity of anti-epizootic measures in industrial animal husbandry. (specific and symptomatic treatment methods and its effectiveness).
211. Immunity and specific prophylaxis method in rabies. (vaccines used for prophylactic purposes).
212. How to explain the complexity of the production of specific drugs in viral diseases. (Preparation of vaccine strains; antigenic properties; multiplicity of options).
213. Classification of viral infection. RNA, DNA storage NK mass in virion composition, virion shape, transmitter, intermediate host.
214. How are rabies diagnosed? (virusoscopy, biological sample, DPR, IFR).
215. What is the eclipse phase. Influencing forces in the process of reproduction of viruses.
216. The TB virus family, generation, and structure of the virus. Methods of diagnosis and determination of type in the laboratory.

217. The science of gnotobiology and its role in the investigation of viruses.
218. What role do nucleic acids play in viruses. (Genetic information, transcription, translation, transduction).
219. Ways of transmission of Aueski's disease.
220. What solutions and nutrient media are used to grow cells. (Hanks, Erla, 199, GLA, Trypsin, Versen, FBE).
221. Which factors of antiviral immunity are almost irrelevant in bacterial immunity. (Isaac and Lindenman discovered interferon in 1957).
222. The cryptogram explains in writing what features of the virus are hidden
223. Smallpox, virus morphology and chemical composition. In birds and so on. naming of input bodies in.
224. At present, viruses are classified according to what criteria. (DNA, RNA storage, shape, transmitter and intermediate pathogen).
225. What are the common factors in immunity against viruses and bacteria. (Foreign AG enters the body and responds to it).
226. What is the titer of the virus. The amount of virus is measured in what unit. (Yum school, $_{50\text{ to }50}$, TsPT $_{50}$).
227. What are inactivated vaccines. (Under the influence of ultrasound, heating, ultra violet light, chemicals).
228. What are the perspectives and disadvantages of diagnosing viral diseases by serological (retrospective) methods.
229. What is the essence of calculating the titer of the virus in 50% infectious units.
230. The resistance of viruses to what environmental factors has been studied. (Heating, UBN, ether and other chemicals).
231. Rules of work and safety in the laboratory of virology. (Working with the regimen, the employee must be vaccinated against the disease).
232. What are antigens and antibodies. GATR - What are the basic rules of application. (Saline, serum, virus 1% chicken erythrocytes).
233. What is the resistance of viruses to factors in the external environment. (storage of lipids, mucoids, peplomers).
234. What do you mean by "attenuated" viruses? (Reducing the virulence of an infectious agent).
235. Describe and describe ways to prevent viral diseases in animals by specific and non-specific methods. (About immune serums, anatoxins, vaccines).
236. You know what live vaccines against the virus.
237. Discover why diseases caused by low-pathogenic viruses in livestock complexes are important. (parainfluenza-3, adenovirus disease of large horned animals, etc.).
238. What is the essence of a diffuse precipitation reaction and what problems can it solve. In titrating the virus, in determining the type , finding AT using antigen, A G using AT .
239. What is the difference between mutation and adaptation? (Exchange, change, adaptation).

240. Who invented the vaccine and how was it obtained? (On the example of E. Jenner, L. Pasteur, Emil, Ru, Ricketts).
241. In what ways do viruses travel from where they land to find a place to reproduce in the body? Aerogen, Alimentary transmissive.
242. What is the mechanism of radiation and chemical mutagenesis. (complex genetic changes in the body under the influence of physical and chemical factors).
243. You know which vaccines are made from low-virulence strains in nature and what the positive side of it is.
244. The method of irradiated antibodies, its advantages and disadvantages, its application in the practice of virology. Express diagnostics (in this method the addition of glycerin to the pathological material is not recommended).
245. Ways of entry of viruses into macroorganisms (from adsorption to the stage of virus exit from the cell).
246. What are the main processes in the biological control of antiviral vaccines . (Sterility test. Determination of AT-titer.)
247. Write about parainfluenza in large horned animals and ways to diagnose it. (Infection in naturally susceptible animals, serological reactions).
248. What is the tropism of viruses . (Dermatrop, pyevmatrop, enterotrop, neurotrop, pantrop viruses).
249. What is the morphology and structure of the smallpox virus? What causes an icosahedron to be in shape.
250. When diagnosing proteinuria, describe which serological test is used to determine the type of virus. (Components required for CBR reaction and methods of their preparation).
251. Describe ways of biological control of antiviral immune serum. (Immune serum, use of anatoxins for prophylaxis).
252. What is the method of viroroscopy based on. Dyeing virions and viewing a group of virions under a microscope.
253. What are virus entry bodies and how can they be encountered. (Collection of virions Babesh-Negri, Borrell, Bollinger, Zeyfred, Lentsa).
254. Give a general description of viral diseases. (Differs in pathogenesis from bacterial diseases).
255. How to put a biological sample for bird flu. (On the leaves, due to irritation of the thigh muscles).
256. Describe the virus that causes smallpox. What are the clinical and epizootiological features of smallpox in different species of animals? (Occurrence of smallpox).
257. What is the role of nucleic acids. (DNA, RNA, single or double helix.
258. What is the structure of the parainfluenza-3 disease virus in aphids. (surrounded by a round, mucoid shell).
259. Describe Newcastle and influenza viruses. Which reaction can be used to differentiate Newcastle disease virus from influenza virus. (Explain the nature of the GATR reaction). The main pathological changes are manifested in which organ.
260. H What visible change is observed when the virus is exposed to the cell.

261. Describe the ways in which viral diseases are spread.
262. What pat.material is obtained from animals suspected of having rabies and what are the rules of examination.
263. How and by whom the structure of the protein disease virus was discovered. (Picorna virus, the smallest virus that stores RNA).
264. What are the signs of viral replication in the body of laboratory animals.
265. What pat.material is obtained from animals suspected of having rabies and what are the rules of examination. (The brain, the king of ammonia, is painted in the Muromtsev and Sellers method by preparing grease).
266. You know what factors affect the course of the epizootic process . (The biological nature of the virus, the physiological and immunological state of the organism, can go hand in hand with recovery and death.
267. What is the positiveness of a biological experiment and its importance in making a diagnosis. (Indicates the presence of the virus in the pathological material).
268. What are diagnostics and how are they prepared. (In biofactories, certain types of viral antigens are absorbed into erythrocytes. Erythrocytes are sensitized).
269. Chemical composition and physical properties of the virus fragment. (About capsid, nucleocapsid capsomer, supercapsid shell).
270. A family of rhabdoviruses. The rabies virus. (Tropism of the virus, routes of transmission. Diagnosis).
271. The role of viruses in the biosphere. The science of virology and its functions. Relationship with other disciplines. Contamination of the external environment with viruses.
272. Family of picornaviruses. Protein virus. (A, O, S. Sat-1, Sat-2, Sat-3, Asia - about species).
273. Chemical composition and physical properties of the virus fragment. Measurement of DNA and RNA chains, size and mass.
274. Family of paramyxoviruses. Parainfluenza virus of large horned animals. Visible clinical signs in PG-3 disease. Virus resistance.
275. P family of icornaviruses. Protein virus. (AOS SAT-1, SAT-2, SAT-3, Asian variants).
276. Implementation of decisions on the development of animal husbandry by our government. The main tasks of the veterinarian in the performance. September 3, 1993 R esp. Law on Veterinary Medicine (section 5, consisting of 20 articles).
277. A family of corona viruses. A virus that causes infectious bronchitis in chickens.
278. Security techniques when working with viruses. About sterile box bactericidal lamp, robe, cap, special sterile conditions. List the brands of bactericidal lamps.
279. Family of paramyxoviruses. Newcastle disease virus. Illuminate the process going on in the cell nucleus.
280. DNA is the reproduction of protective viruses.
281. RNA is the reproduction of genomic viruses. Illuminate the process in the cytoplasm of the cell.

282. Rabdovirus family, a virus that causes vesicular stomatitis. Definition and structure of rhabdoviruses. Clinical signs of the disease. The difference from rabies.
283. RNA is the reproduction of genomic viruses. Which viruses contain RNA, cytoplasmic changes in the cell.
284. Slow-growing viruses. Dry virus and in humans. Kreytsfelda - YA guinea Skreypi, infectious encephalopathy is a disease causative virus.
285. A virus that causes scrapie disease in sheep and goats and transmissible encephalopathy (Aleut disease) in mink.
286. Immunofluorescence, immunoenzyme method of investigation. I - step, II - step, III - step IFR. Express methods of control.
287. The science of virology and its functions, its relationship with biological and veterinary sciences. Molecular biology, histology, pathoanatomy, zoology, epizootology and others.
288. A family of orthamikoviruses, a virus that causes influenza in pigs.
289. Calculating the titer of the virus using the Reed and Mench and Kerber methods.
290. Where the virus- storing material is sent for dermatopropic viruses to multiply in the body . (Focus on subcutaneous and subcutaneous delivery methods.)
291. The sheep are sick. Clinical signs: Temperature 41-42 °, purulent discharge from the eyes and nose. There are red, gray spots on the head, legs, hands, white necrotic nodules. Mortality among lambs is 3 percent. Identify and describe the disease.
292. What is the purpose of virus strains. (Note the importance in the biological industry).
293. In which shell of a chicken embryo are blood vessels developed?
294. What is the main component of the cell-growing nutrient medium?
295. What are the formulas used to determine the titer of viruses? ( How is $LD_{50}$ determined.)
296. Which taxa of the virus end with the word ‘virus’, e.g. Lissavirus.
297. Which object is infected with the virus in the allantois, amnion, yolk sac How many days should a chicken fetus be?
298. Which are the 3 class T-cells that provide tissue immunity in the thymus (in the example of helpers, killers, suppressors).
299. The virus that causes infectious rhinotracheitis is mainly reproduced in which organs. (Pathways associated with processes in the respiratory and genital organs).
300. Which of the following includes peripheral lymphoid organs. (Function of lymph nodes, spleen, lymphatic follicles)
301. Count the disease called primary group
of viruses in humans and animals , and a brief description . (DNA and
RNA viruses protect the website)
302. Loss of activity of vaccines What? (Ultrasound, heat,
ultraviolet light, chemical exposure)

303. Virus disease serological methods (retrospective) What is the diagnosis with the acquisition in perspective , and the negative aspects?
304. What is the role of viruses in infectious diseases of animals ?
305. What is the essence of the units affected 50% of the
infectious viral titer calculation ?
306. In which viral infection of pets is long -term virus isolation observed? (White TB disease animal recovers a smooth process, pathogenesis).
307. Why are chicken embryos used in virology ?
308. Family of paramyxoviruses . Parainfluenza virus
of large horned animals . PG-3 's
disease visible clinical signs. Virus resistance.
309. Mad cow disease, which is distinguished from other diseases ?
310. Family of rhabdoviruses . Rabies virus. ( Tropism of the virus , routes of transmission , diagnosis )
311. Currently , the criteria which viruses are classified? (DNA, RNA storage, shape, transmitter and intermediate pathogen)
312. What are
the common factors in immunity against viruses and bacteria ? (Body piercing ente r the AG answered and said unto him )
313. What is interferon and its biological significance? (Viral cell resistance to a falling out, a few viral effect ).
314. Any order to respond to diseases caused by viruses describe. ( Response to fever , pain reactions, antibody-phagocytosis)
315. What is the titer of the virus ? In what unit is the amount
of virus measured? (YUM $_{50}$, OM $_{50,}$)
316. To what factors of the external environment have the resistance
of viruses been studied? (Heating, UBN, ether and other chemicals )
317. Do you know which vaccines have lost their activity ? (Vrus genome killing, propiolactan, formaldehyde)
318. At the moment , there is no virus in patients with a specific method of treatment of the animals how to explain ? (Antibiotics , not viruses that affect cell proliferation)
319. Rules of work and safety in the laboratory of virology .
320. Antigen and antibody what? GATR use of the basic procedures , what is it? (Saline , serum, virus, 1% chicken erythrocytes)
321. What are viruses that reproduce in all types
of cells called? (Pantrop Dermatrop for the growth of the virus in the body where the virus a protective material samples be sent?
Antiviral bring)
322. How is the animal fixed when the virus infects the abdominal cavity
of laboratory animals ?
323. The sheep are sick. Clinical signs: temperature 41-42
degrees, purulent discharge from the eyes and nose . At the beginning of her feet, glue red, gray, white spots, necrotic knots . Mortality among lambs
is 3%. Identify and describe the disease .

324. Virus strains for what purpose ? ( Note the importance in the biological industry )
325. Where is the virus- protective material sent for the multiplication of dermatropic viruses in the body ? (The skin and into the bottom of the ways to stop)
326. Describe Newcastle and influenza viruses . What reaction can be used to distinguish Newcastle disease virus from influenza virus ? (GATR information about the nature of the reaction )
327. What are autoimmune diseases ? ( Disorders of the immune-competent system )
328. What are the class 3 T cells of tissue immunity in the thymus ? (On the example of helpers, killers, suppressors )
329. What is the interference of viruses ?
330. Indirect uninstall gemagglyutinatsiya reaction of antibody in the blood serum to find what you used to? ( What is the process of preparing diagnostics ?)
331. What is a protective antibody in the serum gomogenli factions of the radiation method of autoantibodies with the character names and their website.
332. Two cows and a heifer were sick. Symptoms include: appetite loss, abdominal excitability decreased, a lot of saliva ban on divorce, moving, people . Trying to escape . Tirnalgan- chewed the skin . This disease definition.
333. What is the difference between BGAR and GAR ?
334. What are the formulas used to determine the titer of viruses ? ( How is $LD_{50}$ determined?)
335. White TB family, descendants of the virus , and the virus structure. Laboratory diagnosis and detection methods.
336. The science of gnotobiology and its importance in the investigation of viruses .
337. Describe Newcastle and influenza viruses . What reaction can be used to distinguish Newcastle disease virus from influenza virus ? (GATR information about the nature of the reaction )
338. Virus strains for what purpose ? ( Note the importance in the biological industry )
339. The ecology of viruses and virus infection epizootiolo migratory birds in the role. Influenza and Newcastle virus.
340. Slow- growing viruses. Dry virus in humans. The virus that causes Jacoba disease in Kresfel .
341. A virus that causes scrapie disease in sheep and goats and transmissible encephalopathy (Aulet's disease) in mink .
342. Interference and interferon. Viral cell entry process provisions.

343. Immunofluorescence, an immunoenzyme method of investigation . 1-stage, 2-stage, 3-stage IFR. Express methods of verification .
344. What is the addition of a virus to
a cell called? (viropexis, pinicitosis)
345. What factors do you know that affect the course of
the epizootic process ? (Viral biological properties, physiological and immunologic al status, recovery and end )
346. What is the antigenic varibility of white
tuberculosis virus ? ( Distinguished between enterovirus, rhinovirus, poliovirus, C BD )
347. Biological be a positive experience and the importance of its acquisition
in diagnosis, what is it? (Pathological material indicates the presence of the
virus )
348. What are diagnostics and how are they prepared? (In
biofactories, certain types of viral antigens are absorbed
into erythrocytes . Erythrocytes are sensitized)
349. What is the difference between mutation and adaptation ? (Exchange, change, adaptation).
350. Vaccines and opened by anyone in any way ? (On the example of E. Jenner, L. Pasteur, Emil Ru, Ricketts )
351. Viruses from the ways in which the body moving reproduksiyalanish to
find a parking space ? (aerogenic, alimentary, transmissive).
352. What are the general rules for obtaining material
from sick and dead animals ?
353. The essence and practical application of
the indirect hemagglutination reaction (specific to
hemagglutination smallpox, influenza, Newcastle viruses ).
354. Animals and plants from disease called viral What are
the similarities and differences ? (RNA or DNA storage
and tropism).
355. Where the effect of the virus sitopatogen time and how is
it determined?
356. Mad cow disease, which is distinguished from other diseases ?
357. Epidemic prevention of disease of dogs which vaccines are used?
358. Isolation of the virus antigen identification, collect as diagnosticum and the preparation of vaccine against the virus should be where the most modern methods of cultivation of the virus ?
359. N'yukasl gemagglyutinatsiyalash ability to learn how viruses virus protection material , in red , and the reaction is performed at a temperature
of hand?
360. The science
of virology and its functions, its relationship with biological and veterinary science s . (Molecular biology, histology, pathoanatomy, zoology,
epizootology , etc.)

361. DPR reaction and its functions. Petri Plates
reaction Difko for the training. Vibration of whey .
362. Work in the laboratory of virology and
its characteristics . (laboratory structure and process equipment, process
control, for example , diagnostic examination and anemia).
363. A family of orthamikoviruses . Calling for influenza in pigs virus.
364. Calculation of virus titer by Rida and Mencha method.
365. The disease is spreading among chickens of all ages . Chickens 70-80% of chickens died of 20-30%. Clinical symptoms: breathing qiyinlashuvi,
cough, tears flow, diarrhea, back and leg paralysis . Blood flow was observed in the muscular stomach . Describe the disease .
366. What is the eclipse phase ? Viruses that affect the process
of reproduksiyasilanish forces.
367. White TB disease virus family, descendants of the virus structure. Laboratory diagnosis and detection methods.
368. The science of gnotobiology and its role in the investigation of viruses .
369. What features of viruses does cryptogram secretly explain in writing ?
370. Cell virus effect when visible changes occur? (SPT, rounding, discoloration of the environment ).
371. Describe ways of spreading viral diseases . (separated from
the liquids fekaliy , Airgel, alementar transmissible).
372. White tuberculosis virionining how and by whom the structure was
opened? (Picarnovirus, the smallest virus that stores RNA ).
373. What are the signs of viral replication in the body
of laboratory animals ?
374. Mad cow disease from animals suspected of any feather. material
is obtained and what are the inspection rules ? ( brain, ammonium horn, prepared by greasing and painted in the method of Muromsev and
Sellers ).
375. The disease is spreading among chickens of all ages . Chickens 70-80% of chickens died of 20-30%. Clinical symptoms: breathing qiyinlashuvi,
cough, tears flow, diarrhea, back and leg paralysis . Blood flow was observed in the muscular stomach . Describe the disease .
376. What is the essence of the units affected 50% of the
infectious viral titer calculation ?
377. Loss of activity of vaccines What? (Ultrasound, heat,
ultraviolet light, chemical exposure)
378. Viral reproduksiyasidagi turns compatible
with these recipes. (Virionning cells surrounding the emergence of Brownian move ment and opposed the power starts).
379. Komplimentli binding reaction and its components in the definition. (AG, AT, hemolysin, compliment, erythrocyte).
380. What is the virus entering cells , and how to meet them ?
(Virionlarning collection of Babes-Negri, Borre, Bollinger).

381. What is the method of viroroscopy based on? ( staining virions and viewing a group of virions under a microscope ).
382. Smallpox pathogen virus definitions. Various types of smallpox disease in animals , clinical disease characterized what is your reaction? (Smallpox rash appears ).
383. Give a general description of viral diseases . The pathogenesis of bacterial diseases ( differences ).
384. What are the formulas used to determine the titer of viruses ? ( How is $LD_{50}$ determined?)
385. Smallpox pathogen virus definitions. Various types of smallpox disease in animals , clinical disease characterized what is your reaction? (Smallpox rash appears ).
386. Give a general description of viral diseases . The pathogenesis of bacterial diseases ( differences ).
387. What are the formulas used to determine the titer of viruses ? ( How is $LD_{50}$ determined?)
388. Describe Newcastle and influenza viruses . What reaction can be used to distinguish Newcastle disease virus from influenza virus ? (GATR information about the nature of the reaction )
389. What are the class 3 T cells of tissue immunity in the thymus ? (On the example of helpers, killers, suppressors )
390. What are autoimmune diseases ? ( Disorders of the immune-competent system )
391. Describe Newcastle and influenza viruses . What reaction can be used to distinguish Newcastle disease virus from influenza virus ? (GATR information about the nature of the reaction )
392. What are viruses that reproduce in all types of cells called? ( Give examples of pantropic viruses )
393. Virus strains for what purpose ? ( Note the importance in the biological industry )
394. White TB family, descendants of the virus , and the virus structure. Laboratory diagnosis and the type of wniqlash methods.
395. Application of growing cells in virology . (Vaccine mass production, vi godforsaken place to collect, sitopatogen impact study).
396. Why call on the less complex pathogens of animal viruses to discover an important role in diseases ? (parainfluenza-3, adenovirus disease of large horned animals , etc.).
397. Komplimentli binding reaction and its components in the definition. (AG, AT, hemolysin, compliment, erythrocyte).

398. Founders of virology and
the development of information about viruses . Works by DI Ivanovsky, E. Jenner, L. Pasteur .
399. Family of picarnoviruses . White TB virus. (A .OS SAT-1, SAT-2, SAT-3, Asian variants).
400. Electron microscope radioimmunological examination methods. (preparation of the drug , excitation of electron beams ).
401. Virus strains for what purpose ? ( Note the importance in
the biological industry )
402. White TB family, descendants of the virus , and the virus structure. Laboratory diagnosis and detection methods.
403. What are the formulas used to determine the titer of viruses ? ( How is $LD_{50}$ determined?)
404. The essence of the neutralization reaction . In which biological objects is the reaction tested ?
405. White TB family, descendants of the virus , and the virus structure. Laboratory diagnosis and detection methods.
406. Family of coronaviruses . The
chickens called infectious bronchitis disease virus.
407. Immunity to the virus . ( Focus on natural, species- related, artificial, acquired active, passive, sterile, and nosteric ).
408. What is the method of viroroscopy based
on? ( staining virions and viewing a group of virions under
a microscope ).
409. What is the essence of
a diffuse precipitation reaction and what problems can it solve ? ( Detection of AG using AT, AT in titration of the virus , type identification,
antigen ).
410. Which generation of viruses causes viral disease in birds ? (In the example of Ortomixoviridae )
411. What is the name given to the proliferation of a biological structure within a cell ? Stages of reproduction of viruses .
412. Which generation of viruses causes gastroenteritis in pigs ? Koronaviruslarga described .
413. Leukemia disease in mammals which generation of the
virus provokes? Onkoviruslarga described .
414. What is immunity ? What is the response of the body for the protection of the pathogen reactions last night?
415. Where is the virus- protective material sent for the multiplication of dermatropic viruses in the body ? (The skin and into the bottom of
the ways to stop)
416. How is the animal fixed when the virus infects the abdominal cavity of laboratory animals ?
417. The sheep are sick. Clinical signs: temperature 41-42
degrees, purulent discharge from the eyes and nose . At the beginning of her

feet, glue red, gray, white spots, necrotic knots . Mortality among lambs is 3%. Identify and describe the disease .
418. Virus strains for what purpose ? ( Note the importance in the biological industry )
419. Calculating the titer of the virus using the Reed and Mencha method .
420. Taxa with the word "virus" in which the virus is completed? (In the example of Lissavirus )
421. Which objects allantois, amnion, yellow bag virus infected? How many days old should a chicken fetus be?
422. Which biological structure outside the cell , the cell body , they live ?
423. The body's lymph plazmositar row immune system cells which , you know? What are the functions of lymphocytes and plasmocytes ?
424. Cell virus effect when visible changes occur?
425. Describe the ways in which viral diseases are spread .
426. Virionining foot structure, how and by whom opened?
427. What are the signs of viral replication in the body of laboratory animals ?
428. Any animal suspected of mad cow disease feather. material is obtained and what are the inspection rules ?
429. Chemical composition and physical properties of the virus fragment . (About capsid, nucleocapsid capsomer, supercapsid shell ).
430. A family of rhabdoviruses . Mad cow disease virus. ( Tropism of the virus , routes of transmission , diagnosis ).
431. The role of viruses in the biosphere . The science of virology and its functions. Relationship with other disciplines . Contamination of the external environment with the virus .
432. Application of growing cells in virology . (Vaccine mass production, vi godforsaken place to collect, sitopatogen impact study).
433. What is the role of viruses reproduksilanisida virus protein ? (The role of viral nucleic acids in the transmission of genetic information ).
434. Give a general description of viral diseases . The pathogenesis of bacterial diseases ( differences ).
435. Application of growing cells in virology . (Vaccine mass production, vi godforsaken place to collect, sitopatogen impact study).
436. What is the role of viruses reproduksilanisida virus protein ? (The role of viral nucleic acids in the transmission of genetic information ).
437. Give a general description of viral diseases . The pathogenesis of bacterial diseases ( differences ).
438. How to put a biological sample for smallpox in birds ? ( due to irritation of the leaves, thigh muscles )
439. What is the diagnostic value of encountering virus entry bodies and virions ? ( virus multiplication in a cell or accumulation of virions in a cell ).

440. Smallpox pathogen virus definitions. Various types of smallpox disease in animals , clinical disease characterized what is your
reaction? (Smallpox rash appears ).
441. Give a general description of viral diseases . The pathogenesis
of bacterial diseases ( differences ).
442. How to put a biological sample for smallpox in birds ? ( due to irritation of the leaves, thigh muscles )
443. What is the diagnostic value
of encountering virus entry bodies and virions ? ( virus multiplication in
a cell or accumulation of virions in a cell ).
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of encountering virus entry bodies and virions ? ( virus multiplication in
a cell or accumulation of virions in a cell ).
447. Application of growing cells in virology . (Vaccine mass production, vi godforsaken place to collect, sitopatogen impact study).
448. White TB disease virus (green) generation of the family, and the
virus structure. Laboratory diagnosis and detection methods.
449. The importance of the various factors affecting the practical knowledge
of viral resistance What is it? (virus infectivity is lost)
450. What live vaccines do you know against the virus ?
451. Why call on the less complex pathogens of animal viruses to discover an important role in diseases ? (parainfluenza-3, adenovirus disease
of large horned animals , etc.).
452. In laboratory practice , it is effective
in which way viruses are eliminated
453. Viral reproduksiyasidagi turns compatible
with these recipes. (Virionning cells surrounding the emergence of Brownian move ment and opposed the power starts).
454. Describe ways to biologically control immune serum against
the virus . (Immune serums, use of anatoxins
for prophylactic purposes ).
455. What is the method of viroroscopy based
on? ( staining virions and viewing a group of virions under
a microscope ).
456. What is the virus entering cells , and how to meet them ? ( collection
of virions Babesh-Negri, Borrel ', Bollinger).
457. Komplimentli binding reaction and its components in the definition. (AG, AT, hemolysin, compliment, erythrocyte).
458. Safety precautions when working with viruses . ( regarding sterile boxing, bactericidal lamp, gown, cap, special sterile conditions ).

459. Family of paromyxoviruses . The virus of Newcastle disease . the process taking place in the nucleus of cells ( brightness).
460. Reproduction of DNA- storing viruses .
461. Immunity to the virus . ( Focus on natural, species- related, artificial, acquired active, passive, sterile, and nosteric ).
462. 1 ml fil'tratda much concentration in the presence of the virus is detected? ( Detection of $LD_{50}$ due to virus titration, infection in laboratory animals, chicken embryos by Reid and Mench method )
463. The importance of immunity to bacterial immunity against the virus which factors are almost no? (Isaac and Lindenman discovered interferon in 1957 ).
464. What is the essence of using laboratory animals ? (in the separation of the virus , in the accumulation of mass , in the preparation of hyperimmune serum ).
465. Smallpox , virus morphology and chemical composition. (In birds , e.g. the naming of insertion bodies ).
466. What are the advantages of a cultured cell over other laboratory systems ? ( direct involvement in the infectious process , low cost, the possibility of growing all viruses , in the preparation of vaccines ).
467. Viruses from the ways in which the body moving reproduksiyalanish to find a parking space ? (aerogenic, alimentary, transmissive).
468. Smallpox , virus morphology and chemical composition. (In birds , e.g. the naming of insertion bodies ).
469. What are the advantages of a cultured cell over other laboratory systems ? ( direct involvement in the infectious process , low cost, the possibility of growing all viruses , in the preparation of vaccines ).
470. Viruses from the ways in which the body moving reproduksiyalanish to find a parking space ? (aerogenic, alimentary, transmissive).
471. What are autoimmune diseases ? (Impairment of the immune-competent system ).
472. What are the general rules for obtaining material from sick and dead animals ?
473. Family of paromyxoviruses . The virus of Newcastle disease . The process taking place in the nucleus of cells ( brightness).
474. Virus Disease spesifik to explain the complexity of the production of drugs ? ( Preparation of vaccine strains, antigenic properties, multiplicity of options .)
475. Classification of viral infections . RNA, DNA storage, NK mass in virion, virion shape, transmitter, intermediate host.)
476. Virus disease diagnosis methods. (clinical, epizootological, pathoanatomical, serological.)
477. What is mad cow disease, methods of diagnosis are placed? (virusoscopy, biological sample, DPR, IFR).

478. Describe the hemagglutination properties of viruses and their use, as well as the mechanism of hemagglutination . (in the example of smallpox, influenza, Newcastle viruses ).
479. Which generation of viruses causes viral disease in birds ? (In the example of Ortomixoviridae )
480. What is the role of viruses reproduksiyalanishida virus protein ? (The role of viral nucleic acids in the transmission of genetic information ).
481. Give a general description of viral diseases . The pathogenesis of bacterial diseases ( differences ).
482. How to put a biological sample for smallpox in birds ? ( due to irritation of the leaves, thigh muscles )
483. In which shell of the chicken embryo are the blood vessels developed ?
484. What is the main component of the nutrient medium that grows the cell ?
485. What are the formulas used to determine the titer of viruses ? ( How to determine $LD_{50}$)
486. What is the resistance of viruses to factors in the external environment ? (contains lipids, mucoids, peplomers ).
487. What do you mean by "attenuated" viruses ? (Infectious disease virulence reduction).
488. Spesifik of diseases and viruses in animals are not spesifik methods and ways of preventing website and describe. (about immune serums, anatoxins, vaccines )
489. What methods do you know to conserve viruses ? (cooling, in phosphate buffer solution, glycerin, in the example of HENKS solutions )
490. What is the essence of the neutralization reaction ? NR which is able to solve the issues . (homologous antibodies, neutralization of homologous antigens )
491. What is the tropism of viruses ? (dermatrop, pneumotropic, enterotropic, neurotropic viruses)
492. How are antiviral serums preserved? (in the example of penicillin, streptomycin, nystatin ).
493. What is the morphology and structure of the smallpox virus ? What causes it to be in the shape of an icosahedron ?
494. Each different viruses virionining about the shape and structure of the website. (DNA and RNA viruses form of protection )
495. White TB diagnosis , the virus which type of serological reaction is calculated using the definition. (KBR reaction components and prepare them for the roads)

496. Ways of entry of viruses into macroorganisms . ( from adsorption to the exit stage of the virus ).

497. Vaccines against the virus and controlling biological processes ? (sterility test, determination of AT titer )
498. The most recent was diagnosed with what is required and how it is done? (talk about serological reactions )
499. What is a virion and how can it be encountered ? (virusoskopiya method, the drug is painted, counting cells uchratiladi)
500. Great horned animals paragripp disease and diagnosis methods (naturally pro ne to infections in animals, serological reactions )

**1 TEST QUESTIONS FOR OB (200)**

**1. When did DIIvanovsky discover viruses?**

A.1892 y
B. 1881 y
D. 1890 y
E.1889 y

**2. In what order do the four phases of cell mitosis take place?**

A.Prophase, metophase, anaphase, telophase
B. Prophase, anaphase, metophase, telophase
D.Prophase, telophase, anaphase, metophase
E. Telophase, anaphase, metophase, prophase

**3. In infectious rhinotracheitis of large horned animals, where is the pathological material obtained within 7 days after the onset of the disease?**

A. Nasal discharge from the throat, conjunctiva, feces
B. From saliva, from the brain
D. Lymph nodes, lungs
E. From divorce, from the mouth

**4. In parainfluenza of large horned animals 3-5 days of illness, where is the pathological material obtained?**

A. From the nasal fluid, feces, lungs, lymph nodes, part of the trachea
B. From his left, from his blood
D. From injured skin
E. From the liver, from the spinal cord

**5. What does the change in color of the cell growth fluid indicate?**

A. From the RN change and death of the environment
B. From the separation of the cell from the mattress wall
D. Cell death and air ingress
E. From the falling contamination of bacteria

**6. Where is the pathological material obtained on the first day of the disease in transmissible gastroenteritis in pigs?**

A. Fecal, from the mucous membrane of the intestine
B. From blood, nasal fluid, saliva
D. From the composition of vesicles, pustules, aphthae
E. From the brain, conjunctiva, skin

**7. Which enzyme involved in viral RNA is involved in the specific RNA synthesis of virions?**

A.Transcriptase
B. Hyaluronidase
D. Neuraminidase
E. DNA-aza

**8. What does the second of the four symbols in the cryptogram mean?**

A. The type and size of nucleic acid
B. The number of spirals
D. The external structure of the virion
E. The symbol of the transmitter

**9. Where does the interference occur?**

A. In animals, in cultured cells, in chicken embryos
B. Mattress, test tube, on the item window
D. Hanks, Erla, Igla in solution
E. In live and killed vaccines

**10. What is the name of the bodies formed in infectious laryngotracheitis of birds?**

A. Zeyfred
B. Bollinger
D. Lentsa
E. Babesh-Negri

**11. From what substrate are vaccines against proteinuria of large horned animals prepared?**

A. From the epithelium of the tongue
From the suppressed cell

D. From organs and tissues
E. From a chicken embryo

**12. What are the ingredients needed for a complement binding reaction?**

A.Antigen, Antibody, Complement, Hemolysin, Erythrocyte
BOS, Asian, Sat-1 types
D. Hanks, Erla, 199, GLA, Igla
E.Trinsin, FBR, Erythrocyte, tannin.

**13. Who is the scientist who proposed cryptogarm in the classification of viruses?**

A. Gibss, 1966
B. Gaydushek, 1976
D. Zilber, 1968
E. Zhdanov, 1976

**14. Who is the scientist who says that virology is just as important for biology as atomic physics is for classical physics?**

A. Nikolau
B. Joulian
D. Naruna
E. Teugita

**15. What is a dalton equal to?**

A. 1.67. $10^{-24}$
B. 1.50. $10^{-24}$
D. 1.76. $10^{-23}$
E. 1.52. $10^{-19}$

**16. What measures the size of viruses?**

A. 1NM = $10^{-9}$
B. 1MKM = $10^{-6}$
D. 1MM = 100 (MKM)
E. 1MKM = 100 (NM)

**17. Where can the cytopathogenic effects of viruses be seen?**

A. In cultured cells
B. In chicken embryos
D. In laboratory animals
E. In a suspension cell

**18. What antibiotics are added to the pathological material?**

A. Streptomycin, penicillin, nystatin
B. Penicillin, Bisillin-3
D. Kanamycin, erythromycin
E.Amantadin, ramantadin

**19. Which of these serological reactions is correct?**

A.NR, GATR, GADTR, KBR, DPR, IFR
B. NR, RP, RA, KBR, DPR, IFR
D. BTAR, RP, RA, KBR, GAR, IFR, NR
E. DPR, KBR, RA, NR, IFR, GATR

**20. What disease do paramyxoviruses cause?**

A. Influenza
B. Leukemia
D. Newcastle
E. Gastroentritis

**21. What diseases do coronaviruses cause?**

A. Bronchitis, gastroenteritis
B. Chechak, influenza
STATE, protein
E Exanthema, entima

**22. What diseases do retroviruses cause?**

A. Leukemia, sarcoma
B. Newcastle, parainfluenza
D. Rhinotracheitis, Auyeski
E. Catarrhal istma, yalat

**23. What diseases do rhabdoviruses cause?**

A. Vesicular stamatitis, rabies
B.Chechak, yalat
D. Exanthema, Rhinotracheitis
E. Newcastle, parainfluenza

**24. What diseases do papovaviruses cause?**

A. Polioma, papilloma
B. Rabies, stomatitis
D. Catarrhal isthmus, polioma
E. Newcastle, parainfluenza

**25. What disease do iridoviruses cause?**

A African plague
B. Rabies
D.Nyukasl

E.Chechak

**26. What happens if an animal does not die from a viral illness?**

A. Reconvalent, carrier, separator
B.Aerogenic carrier
D. Alimentary carrier
E. Respiratory carrier

**27. Where is the visible pathological anatomical change observed in Newcastle disease?**

A. In the glandular and muscular stomach
B. In the brain, in the spleen
D. In the lungs, in the liver
E. In the kidney, in the lymph node

**28. How many hours should the pathological material sent to the laboratory be delivered?**

A.2 hours
B. As soon as possible
D.4 in hours
E. within 12 hours

**29. What causes a rise in temperature in viral disease?**

A. To heal
To the department
D.Septineuritis
E. Virusemiya

**30. What are gnotobiont animals?**

A. Animals bred under sterile conditions
B. Animals of the same species
D. Animals of the same sex
E. Animals used in the laboratory

**31. What clinical signs are observed in humans and animals with herpes virus diseases?**

A. Symptoms of herpes
B. Symptoms of rabies
D. Flower symptoms
E.Allergy, Anaphylaxis

**32. What formula do we use to calculate the titer of a virus?**

A. Reed and Mench, Kerber
B.Student, fisher
D.Fisher, Kerber
E.Bradis, Reed, Ashmarin

**33. What is interferon?**

A. A cell-produced protein
B. Acquired immunity
D.Antiv immunity
E. Passive immunity

**34. What is homologous interference?**

A. The resistance of viruses of the same generation
B. Infection of chicken embryos
Infection of the fertilized cell
E. Reproduction of viruses of the same generation

**35. What is heterologous interference?**

A. Resistance of viruses of different generations
B. Reproduction of viruses of different generations
Infection of fertilized cells
E. Infection of the chicken fetus

**36. In which tissues do pantropic viruses multiply?**

A. In all tissues
B. In nerve tissue
D. In the tissues of the internal organs
E. In the respiratory organs

**37. What do you mean by viral tropism?**

A. Cells that facilitate the reproduction of viruses
B. Cells in which the virus is easy to infect
D. Cells in which the virus is easy to exit
E. Cells grown in vitro under artificial conditions

**38. Which compound is most often used in the preservation of viruses** ?

A.Glycerin, FBR
B.Zardob, FBR
D.FBR, blood
E.Lyugol, Formalin

**39. How does rabies occur in animals?**
It is sharp and hidden
B. Chronic
D. It is sharp
E. Hidden night
**40. How is the long-term storage of laboratory strains?**
A. Due to the passage
B. Due to conservation
D. Due to cooling
E. Due to heating
**41. What are diagnostics?**
A. Erythrocyte, antigen, serum
B. Vaccines, antigens
D. Hyperimmune serum
E. Hemolysin, erythrocyte, antigen
**42. Magnetic mixer, what is it used for?**
A. In the preparation of trypsinized cells
B. In tissue decontamination
D. In cell growth
E. When mixing a cell with a virus
**43. Which viruses have the ability to hemagglutinate?**
A. Newcastle, influenza, smallpox
B. Rabies, Auyeski, vesicular stomatitis
D.Oqsil, marek, Teshen
E. Gastroenteritis plague, bronchitis
**44. When does the level of pathogenicity of an infected virus increase?**
A. When infected with naturally inclined animals
B. In laboratory animals
D. In chicken embryos
In EO-grown cells
**45. When does the pathogenicity of an infected virus decrease?**
A. When infected in animals that are not susceptible to this virus
B. In laboratory animals
D. In chicken embryos
E. In naturally inclined animals
**46. Using which serological reaction to the leukemia virus find out**
A.DPR, IFR
B.KBR, IFR
D.GATR, GADTR
E.NR, GAR, RP
**47. What serological test is used to identify the rabies virus?**
A.DPR, IFR
B. KBR, GART
D. GADTR, NR
E. BGAR, GAR
**48. What should be the size of the box room built to work with viral material?**
A.Boxing 8m $^2$, boxing received 4m $^2$
B.Boxing 9m $^2$, boxing received 4m $^2$
D.Boxing 7m $^2$, boxing received 3m $^2$
E.Boxing 10m $^2$, boxing received 6m $^2$
**49. Identify the protective factors against the virus during the circulation of the virus in the body through the blood, ie secondary viremia?**
A.Antitelo, phagocytosis, complement
B. Skin, mucous membranes, fluid secreted by the glands
D. Specific inhibitors of the virus in the periphery
Non-specific inhibitors and antibodies to the virus
**50. Identify protective factors against the virus during the entry of the virus into the body?**
A. Skin, mucous membranes, fluid secreted by the glands
B.Interferon, interference
D. Specific inhibitors of the virus in the periphery
E.Antitelo, phagocytosis, complement
**51. What is the name of the process that takes place during the multiplication of the virus inside the cell?**

A.Eklips
B.Mitosis
D.Adsorption
E. Transcription

**52. In an incubator, what causes a 70% increase in humidity when growing a chicken embryo?**

A. The air chamber is enlarged
B. The fetus does not grow
D. The fetus dries up
E. Air exchange is disrupted

**53. What causes a 40% decrease in humidity in the incubator during the rearing of hens?**

A. The fetus does not grow
B. Air exchange is disrupted
D.Horionallantois thickens the membrane
E. An air chamber is formed

**54. How many ways to transmit the virus to a chicken fetus?**

A. In two ways
B. In three ways
D. In five ways
E. In many ways

**55. What solutions do we use to label laboratory animals?**

A.Brilliant green, from picric acid
B. From iodine and alcohol
D. Chlorine and ether
From a solution of E. glycerin and lugol

**56. Induced by viruses in livestock complexes**
**What are the causes of the disease?**

A. Lack of vaccines
B. Weakness of animals
D. Lack of movement, lack of timely access to sunlight and greenery
E. Infecting each other

**57. What are the forces acting on the adsorption of virions on the cell surface?**

A. Receptors and ionic forces
B. Primary transcription
D. Repeated transcription
E. Secondary transcription

**58. What makes a supercapidic shell in virions?**

A. From a virus or cell
B.Kapsomerdan
D. Genomidan
E.Peplomerdan

**59. How many days before the birth of pigs in viral gastroenteritis should be vaccinated?**

A.40 days left
B.4 months left
D.2 months left
E.3 months left

**60. What are the nutrient media used in in vitro cell culture?**

A.GLA, 199, Igla
B.Trinsin, igla, FBR
D.Versen, trypsin, igla
E. Phosphate buffer solutions

**61. What are the solutions used to separate the cell into separate parts?**

A.Tripsin, Versen
B.199, Igla, GLA
D.Tirode, FBR
E. Physiological solution, trypsin

**62. For what purpose is ice used in the process of cell division?**

To reduce the effect of A. trypsin
B. For cell conservation
D. To clot the blood in the cell
E. To keep the cell alive

**63. What percentage of the serum of which species of animal is used for cell division and reproduction?**

A. 5% of the bull
B. 10% of pigs
D.Sigirning10%
E. 5% of the ram

**64. Inside the thermostat should the test tubes on which the cell is growing be placed on a sloping slope?**

A.15 °
B.180 °

D.90 °
E.45 °

**65. What are the advantages of a cultured cell over laboratory animals, chicken embryos?**

A. Cheapness can directly interfere with the infectious process
B. Strong susceptibility to the virus
D. Easy to find and prepare
E. Hyperimmune whey is convenient to prepare

**66. What are the advantages of the chicken embryo over laboratory animals?**

A. Cheapness, sterility and no need for extra cocktails
B.Virus susceptibility and ease of infection
D. Possibility of preparation of hyperimmune serum
E. Neutralization reaction is possible

**67. What causes the fetus to cool when opening a chicken embryo?**

A. To narrow blood vessels
B. For the preservation of patmaterial
D. For better separation of the fetus from the yolk sac
E. For rapid separation of XAP

**68. What serological test is used to differentiate between avian influenza and Newcastle disease virus?**

A.GATR
B.DPR
D.IFR
E.NR

**69. How many different functions does a diffuse precipitation reaction perform focused?**

A. Four types
B. Many kinds
D. Same
E.Two types

**70. What is done in the absence of Babesh-Negri corpses in the pathological material sent in rabies?**

A. Infected mice and put DPR-
An act is written stating that there are no Babesh-Negri bodies
D. Infected with other species of animals
E.KBR-put

**71. What is the sign of antibodies in the immunofluorescence reaction?**

A. Rhodamine sulfochloride, with isothiocyanate
B.Methyl blue, with FS-1, SS-4 + SS-8
D. Fuchsin with ML-1, ML-2
With E. phenolrot

**72. Who is the scientist who studied the biological properties of "slow-growing viruses" on the example of the dry virus?**

A.Gaydushek, 1976
B.lyumberg, 1976
D.Jdanov, 1974
E.Zilber, 1968

**73. What conditions should be prepared for the transmission of HAP virus to the chicken fetus?**

A. When viewed on an ovoscope, it should be marked with a pencil
B. Perforated by the air chamber and the XAP
D. Store in a thermostat for 2-3 days
E. The hole should be covered with paraffin, keeping it vertical

**74. What solution should be cleaned before infecting a chicken fetus with the virus?**

A.Spirt, iodine
B.Lizol, lime
D. Creolin, formalin
E. Physiological solution

**75. In which laboratory systems can be detected OM $_{50}$ (lethal dose ) of viruses ?**

A. In laboratory animals

B. In chicken embryos
In fertilized cells
E. In primary-trisinized cells

**76. Which viruses have a cubic shape?**

A. Smallpox viruses, ectromelia
B. Tobacco mosaic disease
D. Mix viruses
E.Adeno viruses

**77.Where to get material on the first day of the disease to diagnose proteinuria?**

From the composition of A.Afta, from the injured skin
B. From the fluid secreted from the nose
D. From feces, liver, spleen
E. From the brain, lungs, spleen

**78. Where is the pathological material obtained in viral diarrhea of large horned animals?**

A. Blood, fecal, lymph nodes, lungs, liver, spleen
B. From the saliva, from the brain
D.Blood, from injured conjunctiva
E. From the kidneys, from the brain

**79. Where is the pathological material obtained in adenovirus infection of large horned animals?**

A. From nasal fluid, blood, feces, lungs, lymph nodes, bronchi and trachea
B. From the composition of vesicles, pustules, aphthae
D. Saliva, from injured skin, from brain
E. From the liver, from the spinal fluid, from the brain

**80. Where to get pathological material in contagious ecthyma of sheep and goats ?**

A. From the contents of the vesicle, pustule, aphthae
B. Left, from the blood
D. Injured skin, brain, spleen
E. Liver, spinal fluid, kidneys

**81. Which vaccines are used in transmissible gastroenteritis in pigs?**

A.Riyemz, № 5 VGNKI
B.Saponin, farmol vaccine
D. Polyvalent vaccine
E. Bivalent vaccine

**82. Where is the pathological material obtained from avian influenza?**

A. From the composition of nasal fluid, vesicles, aphthae, pustules
B. From injured skin, conjunctiva, kidneys
D. Saliva, blood, feces
E. Brain, lungs, liver, lymph nodes

**83. What is the name of the carcasses formed in the plague of carnivores?**

A.Lentsa
B. Guarniyeri
D. Zeyfred
E. Babesh-Negri

**84. What are poxviruses?**

A.DNA, 200-300, X, +, cytoplasm, inside the cell, + -
B.DNA, 70-120, X, +, cytoplasm, inside the cell, -
D.RNA, 100, X, +, cytoplasm, within, +
E.DNA, 30-50, 72, -, nucleus, within cells, -

**85. What are picornaviruses?**

A.RNA, 20-30, 60-62, -, cytoplasm, inside the cell, -
B.RNA, 100, X, +, cytoplasm, within cells, +
D.RNA, 80-200, X, -, nucleus and cytopl, intracellular, +
E.RNA, 100-200, X, -, nucleus and cytoplasm, within, +

**86. In what way is the causative agent of parainfluenza-3 transmitted to large horned animals?**

A.Respirator
B.Transmissive
Not checked
E. Because of the bite

**87. In what way the pathogen of infectious laryngotracheitis is transmitted to birds?**
A.Respirator
B. Due to the bite
D.Transmissive
Not studied
**88. From what substrate are vaccines against smallpox in birds made?**
From a grown cell
B. From organs and tissues
D. From the brain of a mouse
E. From a virus with reduced activity
**89. Identify a family of classified viruses?**
A.Retroviride
B. Picornaviride
D. Herpesviride
E.Adenoviride
**90. Who is the scientist who studied the biological properties of slow-growing viruses on the example of dry virus?**
A.Gaydushek, 1976
B.Blumberg, 1976
D.Jdanov, 1974
E.Zilber, 1968
**91. What is meant by contamination of viruses?**
A. Decrease in infection
B. Non-communicable diseases
D. The formation of immunity
E. Antigen-antibody complexes
**92. What is convalescence?**
A. The period of recovery from the disease
B. The period of infection
D. Post-vaccination condition
The situation on the eve of EO
**93. Who is the scientist who paracrystally isolated the mosaic disease virus in tobacco?**
A.Stenli, 1935
B.Tvort, 1915
D.Shlessinger, 1934
E.Bavden, 1937
**94. What are picornaviruses?**
A.RNA, 20-30, 60-62, -, cytoplasm, papule, +
B.RNA, 100, X, +, cytoplasm, within cells, +
D.RNA, 80-20, X, -, nucleus and cytopl, pustule, +
E. RNA, 10-200, X, -, nucleus and cytoplasm, roseola-
**95. What are coronaviruses?**
A.RNA, 70-120, X, +, cytopl, small intestine, +
B.RNA, 100-200, X, -, nucleus and cytoplasm, within, +
D. RNA, 65-80, X, nucleus and cytopl, intracellular, +
E. RNA, 20-100, X, -, nucleus and cytopl, stomach, +
**95. What are orthomyxoviruses?**
A.RNA, 80-200, 2000, +, nucleus and cytopl, shell, +
B. RNA, 70-80, 92, -, cytopl, xuj.ichida, -
D. RNA, 20-100, X, -, cytopl and nucleus, external, +
E. RNA, 65-80, X, -, nucleus and cytoplasm, xuj.ichida, +
**97. What are paramyxoviruses?**
A. RNA, 100-200, X, -, nucleus and cytopl, xuj.old, +
B.RNA, 70-120, X, +, cytopl, xuj.ichida, +
D.RNA, 65-80, X, -, nucleus and cytopl, xuj.ichida, x
E.DNA, 200-300, X, +, cytopl, xuj.ichida, - or +
**98. Which of the stages in the reproduction of viruses in the cell is correct?**
A.Adsorption, introduction, deproteinization, protein synthesis, components
synthesis, formation, output

B. Adsorption, deproitenization, introduction, protein synthesis, formation,
output
D. Synthesis of proteins, synthesis of components, introduction, formation,
output, deproteinization
E. Introduction, adsorption, deproitenization, synthesis of proteins, components
synthesis, formation, emergence

**99. What vaccines and what substances are used for disinfection for the prevention of plague in dogs?**

A.EPM, KF-668, 2% -NaON, 2% - active chlorine, 3% -lysol emulsion
B.№5 VGNKI, Riyemz, alkali, formaldehyde, chlorine, phenol
DV ,LA-Sota, Bor-74, VGNKI, N, 1% - phenol, formalin, cresol, 3% - NaON
E. VNIVIP, VNIIBP, soda solution №1: 10000, chlorine vapor, lactic acid, organic acids, essential oils

**100. What microorganisms are most often associated with the semi-acute and chronic forms of swine fever?**

A. Pasteurellosis, paratyphoid, yellow fever, enterococci
B. Tuberculosis, brucellosis, Actinomycosis, smallpox
D. Rhinotracheitis, laryngotracheitis, parainfluenza, leukemia, trichomoniasis
E. White tuberculosis, rabies, smallpox, necrobacteriosis

**101. What is viroroscopy?**

A. Finding virus entry bodies
B. Identification of microbes
D. Preparation of branded drug
E. Dye staining drug.

**102 . What are the methods of serological diagnostics?**

A.BGAR, KBR
B.SPT, Biological Method
D.Luminis-sensory method
E. Fluorochrome stained antibody method

**103. What method do we use to diagnose parainfluenza in large horned animals?**

A. Hemagglutination cessation, Hemadsorption cessation reaction
B. From a diffuse precipitation reaction
D. From the complement binding reaction
E. From the neutralization reaction.

**104. What is the name of the pathology of the tongue, hooves, snake in proteinuria?**

A.Aftalar
B. Plaques
D. Furuncle
E. Carbuncle

**105. Identify the family and offspring of the proteinuria virus .**

A. Picornaviridae, Aphtavirus
B. Picornaviridae, Enterovirus
D.Poxviridae, Orthopoxvirus
E. Picornaviridae, Rinovirus.

**106. What method is used in the diagnosis of rabies?**

A. IFR, detection of antigen using DPR, encountering Babesh Negri corpuscles and placing a biological sample.
B. using FAU, NR, GATR.
D. NR, using GATR, met Babesh Negri corpses and placed a biological sample.
E. Antigen detection using CBR, BGAR, IFR, DPR.

**107. How do we identify the entry bodies of viruses?**

A. Light, using an electron microscope.
B. Using serological reactions
D. Using a biological sample
E. Using preservatives.

**108. What methods are included in the method of irradiated antibodies?**

A. Luminescence, fluorescence, phosphorescence.
B. Binding of erythrocytes to antigens.

D. Determination of antigens by dyes
E. Dyeing antigens in simple and complex methods

**109. What are fluorochromes?**

A. Light-emitting colors
B. Staining of erythrocytes
D. Determination of antigens
E. Painting preparations.

**110 . What antibodies are involved in the method of irradiated antibodies?**

A. Antibodies stained with fluorochrome.
B. Erythrocyte adhesions.
D.Normal antibodies.
E. Antibodies attached to antibodies.

**111. What is the process of irradiated antibody method?**

A. Luminescence process.
B. X-ray process
D.Scanner process.
E. Process in biological microscope.

**112.How is the DPR reaction set.**

A. Gellik's glasses, on Petri plates.
B. In test tubes.
D. Using pipettes.
E. In biological objects.

**113.What is a virus antigen?**

A. Viral proteins.
B. Microbes.
D. Bacteria.
E. Antibodies.

**114.What is the DPR reaction based on?**

A. Antithelial and dissolved antigens diffuse in the gel and form a precipitation line.
B. Detection of the presence of active virus after a certain period of time by adding a virus suspension with the same amount of serum.
D. The ability of a certain amount of virus to agglutinate a washed erythrocyte suspension with 1%.
E. Diffusion of antibodies in the serum against the virus obtained in the animal body.

**115. What is the test object in the neutralization reaction?**

A. Laboratory animals.
B.Probir-kada execution
Putting D.DPR.
E. Vibration of viruses.

**116.How many ways to technically perform the neutralization reaction?**

A.Two types.
B. Same.
D.Three types.
E. Four types.

**117. What is the essence of the neutralization reaction?**

**A.** Detection of the presence of an active virus after a certain period of time by adding a virus suspension with the same amount of serum.
B. To determine the presence of an active virus after a certain period of time by adding a suspension of antibodies with the same amount of serum.
D. Detection of the presence of an active virus after a certain period of time by adding a vaccine suspension with the same amount of antibodies
E. Detection of the presence of active virus after a certain period of time by adding a vaccine suspension with the same volume of blood serum.

**118. In which part of the cell do viruses that store DNA form inserted cells?**

A. In the nucleus
B. in the cytoplasm
D. in mitochondria
E.vakuolada

**119.1 What is the amount of GAB?**

A. A certain amount of virus is able to agglutinate 1% washed erythrocyte suspension
B. Dilution coefficient.
D. Number of dilute tests.
E. Positive response to the diluted effect.

**120. Where is the virus-retaining material obtained when birds are infected with the influenza virus in chickens?**

A. Divorce, from the brain **.**
From the trachea
D. Heart, brain.
E.Egg, from the brain.

**121. List the stages of infectious disease** ?

A. latent period, appearance of clinical sign 1, manifestation, recovery period, excitability.
B. latent period, bright manifestation of the disease, period of recovery.
D. latent period, bright manifestation of the disease, exacerbation of the pathogen.
E. The formation of immunity after infection.

**122. What is the word disinfection?**

A. Loss of infection
B. Pollution of the external environment
D. Killing a pathogenic microorganism
E. Effects on the epizootic chain .

**123. What are vaccines made of?**

A. from the causative agent of the disease or some of its parts or elements, including its venom.
B.only from the pathogen.
D.only from certain elements of the pathogen, including its venom.
Ederatization, patient isolation and treatment.

**124. List the types of vaccine?**

A. live, inactivated, deposited, chemical and anatoxins.
B. live, inactivated, weakened, and anatoxins.
D. alive, inactivated, weakened, and deposited.
E. inactivated, depleted, and deposited

**125. What are the ways of administering the vaccine?**

A. subcutaneously, subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
B.
subcutaneously, intramuscularly, orally.

D. subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
E. by scratching the skin and through the mouth.

**126. What are the signs of reproduction of the virus in the body of laboratory animals?**

A. Clinical signs of the disease, pathoanatomical changes, death.
B. clinical signs, cytopathic effect.
D. pathopathological changes, critical bodies, fragmentation.
E. Clinical, pathological, allergic changes.

**127. How many types and serovariants of protein virus are there?**

A.7 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1 and more than 80 serovariants.
There are B.8 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1, Panazia-2 and more than 80 serovariants.
Type D.6: O, A, S, SAT-1, SAT-2, SAT-3 and more than 80 serovariants.
Type E.4: SAT-1, SAT-2, SAT-3 and more than 80 serovariants.

**128. What types of protein virus are found in Asia?**

Types AA, O and Asia-1.
Types BA, S, SAT-1.
Types DO, S, SAT-1, SAT-2, SAT-3.

Types E.SAT-1, SAT-2, SAT-3.

**129. List the species of animals prone to proteinuria?**

A. all species of ungulates and wild animals.

B. all species of pairs and ungulates are farm and wild animals.

D. all species of agricultural and wild animals.

E. Only wild animals.

**130. What diseases should be distinguished from proteinuria?**

A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.

B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot and necrobacteriosis.

D. from vesicular stomatitis of pigs, parainfluenza-3, infectious rhinotracheitis, hoof rot and necrobacteriosis.

E. from hoof rot and necrobacteriosis.

**131. Signs of viral replication in chicken embryos?**

A. death, pathological changes.

B. clinical signs, death.

D. cytoparic effect, clanic symptoms.

E. Clinical signs, critical bodies, virions.

**132 What are the phases of growth of cultured cells?**

A. adaptation, logarithmic growth, cell death due to aging.

B. cessation of cell division, death.

D. adaptation, reproduction, wear, transition to tissue.

E. adaptation, the emergence of a cytopathic effect in the cell, cell death

**133. How many types of smallpox virus are there and in which species do they cause disease in animals?**

A. bovine spongiform encephalopathy and smallpox vaccine virus - orthopoxvirus genus; natural smallpox virus of sheep and goats - genus Carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; Avipoxvirus is a genus of avian Pox virus.

Natural

bovine spongiform encephalopathy is a genus of orthopoxvirus; natural smallpox virus of sheep and goats - genus Carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; The natural smallpox virus of birds is a genus of avipoxvirus.

D. smallpox vaccine virus of cows - orthopoxvirus generation; natural smallpox virus of sheep and goats - genus Carpi-Poxvirus; The natural smallpox virus of pigs is a genus of suipoxvirus.

The natural smallpox virus of E. coli is a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; The natural avian Pox virus is a genus of avipoxvirus.

**134. What is the diagnosis of smallpox?**

A. The diagnosis is made on the basis of clinical signs, epizootiological data, immunological examination (IFR and IDR), microscopy results and biosynthesis of susceptible animals, cell cultures and chicken embryos .

B. diagnosis is made on the basis of clinical signs, epizootiological data, microscopy results .

D. The diagnosis is made on the basis of clinical signs, epizootiological data and biosynthesis of susceptible animals, chicken embryos .

E. Results of microscopy.

**135. What type of virus is the causative agent of parainfluenza ?**

A. paramyxovirus

B. gerpesvirus.
D.ortomixovirus.
E.rabdovirus.

**136.Which species of animals are infected with the parainfluenza pathogen ?**

A.only cattle.
B.only pork.
D.only a bird.
E. Cattle, pigs and poultry.

**137. Which animals are the source of the parainfluenza pathogen ?**

A. sick cattle.
B. pathogen- carrying pigs.
D. sick birds
E. sick birds and pigs

**138. What measures are based on the prevention of parainfluenza?**

A. special and non-special preventive measures.
B. special preventive measures.
D. to special preventive measures.
E. measures to increase animal resistance.

**139.What type of virus is the causative agent of swine fever ?**

A.togaviridi family, Pestivirus-RNA.
B.herpesvirus-DNA.
D.ortomyxovirus - RNA.
E.rabdovirus - RNA.

**140. In what ways the pathogen is isolated from the organism in pigs?**

A. with urine, faeces, nasal and eye fluids.
B. with fluids flowing from the genitals.
D. with mucous substances excreted through the respiratory system.
E.with saliva.

**141. How many days is the latent period in the plague of pigs?**

A.3-20 days.
B.22-25 kun
D.25-30 kun.
E.26-32 kun.

**142. What types of cultured cells are there?**

A. Primary trypsin-treated cells, subcultures, intertwined tissue cultures, diploid cell cultures.
B. Suspended cell culture, tissues.
D. cells, subcultures, tissues treated with primary trypsin.
E. Cells, subcultures, cell tissues treated with primary trypsin.

**143. Which bird species is prone to Newcastle disease?**

A. chicken, turkey, sesarka, tustovuq, peacock, dove, sparrow, hakka, parrot, hawk
B.only chicken, turkey, turkey.
D.only chicken, sesarka, tustovuq, kaftar, sparrow.
E.only chicken, turkey, peacock, hakka, parrot, hawk.

**144.Which birds are the source of Newcastle disease ?**

A. sick and pathogenic carrier birds.
B.only pathogen- carrying pigs.
D.only sick birds.
E.only sick birds and pigs.

**145. In Newcastle disease, how does the virus get into the environment?**

A. sick and diseased pathogen with all secretions and excretions, breath and eggs through the mouth, nose, eyes and cloaca of the carrier bird.
B.only with secretions and excretions secreted by the mouth and cloaca of the sick bird.
D.only with the secretions and excretions secreted by the sick pathogen through the mouth and cloaca of the carrier bird.
E. only with the breath and eggs of a bird carrying a sick and diseased pathogen.

**146. How many serovariant strains of avian influenza virus are there?**

There are 8 strains of A. influenza virus (A1-A8). To date, the virus has been found to contain 15 hemagglutinins and 9 neuraminidase serovariants.
There are 7 strains of B. influenza virus (A1-A7).
There are 6 strains of D. influenza virus (A1-A6).
There are 5 strains of E. influenza virus (A1-A5).

**147. According to which group of diseases belongs to the rate of spread of avian influenza virus?**

A.panzootic.
B.epizootic.
D.enzootic.
E.sporadik.

**148. What is the percentage of morbidity and mortality in avian influenza?**

A. morbidity is 80-100%, mortality is 10-90%.
B. morbidity 50-60%, mortality 5-10%.
D. morbidity 40-50%, mortality-3-8%.
E. sickness 30-40%, mortality-2-6%.

**149. In what ways does the avian influenza virus enter the body?**

A.alimentary, respiratory, transovarial (through the egg).
B.only alimentary.
D. respirator only.
E. transovarial only (through the egg).

**150. What diseases should be distinguished from influenza?**

From diseases of A. Newcastle, pasteurellosis, spirochetosis, infectious laryngotracheitis, infectious bronchitis.
B. from mycoplasmosis, infectious laryngotracheitis, bronchitis.
D. from infectious encephalomyelitis, infectious anemia, salmonellosis.
From E. colibacillosis, pullorosis, leukemia.

**151.Which virus causes Marek's disease?**

A. herpesvirus.
B.togavirus
D.reovirus
E.paramyxovirus

**152. In what ways the Marek virus enters the body?**

A. respiratory organs, alimentary, through the skin pat follicle, insect, mite, beetle, transovarial.
B.only alimentary, through the skin pat follicle, transovarial.
D.only through the respiratory organs and transovarial.
E. alimentary and transmissible only.

**153. What type of virus causes avian leukemia?**

A. oncornavirus.
B. gerpesvirus.
D.ortomixovirus.
E.paramyxovirus

**154. What species of birds are prone to avian leukemia?**

A. chicken, turkey, sesarka, duck, goose, hawk, dove, parrot, canary, quail and others.
B.only chicken, turkey, duck, turkey , dove.
D.only chicken, goose, cesarean, smoker, parrot.
E.only a goose, a cesarean, a white bird, a parrot.

**155. In what ways the avian leukemia virus enters an organism?**

A. through the respiratory organs, alimentary tract and transovarial.
B.only alimentary, through the skin pat follicle.
D.only transovarial.
E.only alimentary and transmissible.

**156.Who is the causative agent of infectious laryngotracheitis?**

A. herpesvirus.
B.togavirus
D.reovirus
E.paramyxovirus

**157. What are the signs of viral replication in cultured cells?**

A. Cytopathic effect, fragmentation, rounding, simple formation, GADR.

B. Cytopathic effect, fragmentation, clinical manifestations, death.

D. Cytopathic effect, fragmentation, rash formation, cell death.

E. Cytopathic effect, fragmentation, clinical signs, rounding, simple formation, GADR.

**158. Who is the causative agent of infectious bronchitis?**

A. coronavirus.

B.togavirus

D.reovirus

E.paramyxovirus.

**159. What type of virus causes horse flu?**

A. ortho-mixoviride family, RNA virus belonging to the genus Influenza virus.

B.togavirus

D.reovirus

E.paramyxovirus.

**160. What is the titer of the virus?**

A. the amount of virus stored in the material per unit volume.

B. Immunoglobulins in the material.

D. Weight of live vaccines.

E. Unit of action of gamma globulins.

**161. What is a conjugate?**

A. Antibodies marked with fluorochromes.

B. Hyperimmune serum.

D. Interferon, immunofluorescent.

E. ready antibodies.

**162. What disease should be distinguished from smallpox?**

A. Contagious ecthyma, temiraiki, scabies.

B. Brucellosis, piroplasmidosis, salmonellosis.

D.Auyeski, listeriosis, leptospirosis, enterotoxemia.

E.salmonellosis, senurosis, rabies.

**163. From which disease should Aujeszky's disease be distinguished?**

A. Enterotoxemia, hemorrhagic septicemia, laptospirosis, listeriosis.

B. Poisoning, inflammation of the joints, salmonellosis.

D. Rabies, trichophytosis, listeriosis.

E. Pneumonia, scrapes, anthrax.

**164. What antigens does the rabies virus contain?**

A. Glycoproteins, nucleoproteins.

B. Nucleocapsidli.

D.Superproteinli.

E. Glycocapsidli.

**165. How many reagents are used for the diagnosis of smallpox?**

A.3 pcs, Ruge, chemical, ammonia silver.

B.2 ta, Ruge, ammonia silver.

D.1 per ammonia silver.

E.4 pcs Ruge, chemical, carbolic acid, ammonia silver.

**166. What are the specific factors that constantly affect the immune system after the pathogen enters the body?**

A. specific macrophages, plasma cells, cells of the lymphoid system, antibodies.

B. antibodies, cells of the lymphoid system.

D. specific macrophages, antibodies-immunoglobulins.

E.antitelolar-immunoglobulins.

**167. List the types of immunity?**

A. antibacterial, antitoxic, antiviral, hereditary, acquired, active, passive, sterile, nosteril, humoral, cellular.

B. antibacterial, antiviral, hereditary, acquired, active, passive, humoral.

D. antibacterial, antitoxic, increased , active, passive, sterile, nosteril.

E.passive, sterile, nosteril.

**168. List the diseases that spread panzootic?**

A. proteinuria, avian influenza, bovine plague.
B. anthrax, black brucellosis, tuberculosis.
D. anthrax, brucellosis, leptospirosis.
E. anthrax, brucellosis.

**169. What are vaccines made of?**

A. from the causative agent of the disease or some of its parts or elements, including its venom.
B.only from the pathogen.
D.only from certain elements of the pathogen, including its venom.
E.deratization, patient isolation and treatment.

**170. List the types of vaccine?**

A. live, inactivated, deposited, chemical and anatoxins.
B. live, inactivated, weakened, and anatoxins.
D. alive, inactivated, weakened, and deposited.
E. inactivated, depleted, and deposited

**171. What are the ways of administration of the vaccine?**

A. subcutaneously, subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
B.
subcutaneously, intramuscularly, orally.

D. subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
E. by scratching the skin and through the mouth.

**172. List the types of disinfection?**

A.4 types: prophylactic, current, mandatory, final.
B.3 is different: prophylactic, mandatory, final.
D.3 is different: prophylactic, current, mandatory.
E.2 is different: prophylactic, mandatory.

**173. How many types of disinfection are there according to the methods of exposure?**

A.3 types: physical, chemical, biological.
B.4 types: mechanical cleaning, physical, chemical, biological.
D.5 types: physical, mechanical cleaning, drying, chemical, biological.
E.2xil: physical, mechanical cleaning.

**174. How many types of physical disinfection are there?**

A.5 types: mechanical cleaning, under the influence of light (sunlight, UFN, gamma light), ultrasound, drying, high temperature (boiling, hot steam, dry hot, fire burning, ironing, aqueous steam autoclave.
Type B.6: mechanical cleaning, exposure to light (sunlight, UFN, gamma light), ultrasound, drying, burning, high temperature (boiling, hot steam, dry hot, ironing), autoclaving.
Type D.4: mechanical cleaning, exposure to light (sunlight, UFN, gamma light), drying, high temperature (boiling, hot steam, dry hot, fire burning, ironing, aqueous steam-autoclave).
Type E.2: mechanical cleaning, high temperature (boiling, hot steam, dry hot, fire burning, ironing, aqueous steam-autoclave).

**175. What are the different types of chemicals used in disinfection ?**

A.7 types: alkalis, acids, chlorinated substances, oxidizing agents (potassium permanganate, hydrogen peroxide) phenols, formalin, triethylene glycol.
Type B.6: alkalis, acids, chlorinated substances, oxidizing agents (potassium permanganate, hydrogen peroxide) phenols, formalin.
D.5 various alkalis, acids, chlorinated substances, phenols, formalin.

Type E.4: alkalis, acids, chlorinated substances.

**176. What are the main clinical signs of proteinuria?**

A. occurs in the mucous membranes of the mouth, gums, palate and tongue 1 week, between the udder and hooves 2 weeks, the temperature of the animal rises. Salivation, loss of appetite, thirst, lameness are observed. The hooves may fall off. Heart activity decreases sharply in milk and young calves.

B. ulcers appear on the mucous membranes of the mouth, gums, palate , and between the tongue, udder, and hooves. In young calves the disease is mild.

D. ulcers appear in the mouth and tongue, the temperature of the animal does not rise. Lameness is observed due to the wound on the hooves. Passes easily in young calves.

In young calves the disease is mild

**177. What diseases should be distinguished from proteinuria?**

A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.

B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot and necrobacteriosis.

D. from vesicular stomatitis of pigs, parainfluenza-3, infectious rhinotracheitis, hoof rot and necrobacteriosis.

E. from hoof rot and necrobacteriosis.

**178. List the species of animals susceptible to rabies virus?**

A. all species of warm-blooded animals, rodents, bats, birds, humans.

B. pairs of ungulates and ungulates, rodents, humans.

D. all horned farm and wild animals, rodents, dogs, cats, humans.

E.it, cat

**179. What species of animals are the reservoir of rabies virus in nature ?**

A. all wild animals.

B.it, cat.

D. bat.

**180. How is rabies diagnosed?**

A. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions, the results of biological tests in mice .

B. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions.

D. epizootiological data, clinical signs, microscopy of smears prepared from the brain.

E. based on the results of biological tests in mice .

**181. What is the method of staining the drug in smallpox?**

In the silvering method of A. Morozov.

B. Mixin method.

D. Romanovskiy Gimza.

E. Microscopy results.

**182. What is the method of staining the drug in the diagnosis of rabies?**

In the method of A. Sellers.

In the silvering method of B. Morozov.

In the method of D. Mixin.

E. Results of microscopy

**183. Family and generation of parainfluenza virus of large horned animals?**

A.Myxoviridae, Paromixovirus.

B. Picornaviridae, Aphtovirus.

D.Myxoviridae, Ortomixovirus.

E.Poxviridae, Orthopoxvirus **.**

**184. Family and generation of smallpox virus?**

A.Poxviridae, Orthopoxvirus.
B.Myxoviridae, Paromixovirus.
D.Myxoviridae, Ortomixovirus.
E. Picornaviridae, Aphtovirus.

**185. What is the mortality rate of chickens in Newcastle disease?**

A.90%
B.50%
D.40%
E.10%

**186. Retrospective diagnosis of proteinuria?**

A.RIDR, BIFR.
B.NR, DPR.
D.GATR, IFR.
E.IFR, DPR.

**187. Identify an example of viral respiratory diseases of birds.**

A. Newcastle, Influenza, infectious laryngotracheitis, infectious bronchitis.
B. Smallpox, viral hepatitis, infectious bronchitis.
D. Viral hepatitis, infectious bronchitis, Newcastle.
E. Influenza, infectious laryngotracheitis, smallpox.

**188. What are input bodies?**

Characteristic morphological changes in a cell infected with A. virus.
B. latent period of the disease.
D. changes in the cell.
E. Some changes in tissues.

**189.Nucleoid bu-?**

Nucleic acid central part of A. virus, nucleus of bacteria.
B. antigen of pathogens in animals.
D. The formation of a new cell by division and reproduction.
A component of the E. virion.

**190. Allantois which cavity?**

A. Embryonic bladder.
B. The inner curtain that surrounds the cocoon.
D. Fetal body.
E. fluid around the fetus.

**191. What is an antibody?**

A. Protein-immune substances formed in the blood and tissues when antigens enter the body.
B. Substances that enter the body and cause an immune response.
D. systems with the ability to reproduce an organism or parts.
E. substances that retain their properties after special processing.

**192. Anticoagulants are -?**

A. Substances that impair the activity of the blood coagulation system.
B. Substances that enter the body and cause an immune response.
D. systems with the ability to reproduce an organism or parts.
E. substances that retain their properties after special treatment.

**193. What is hemolysis?**

A. The breakdown of erythrocytes in the blood and the release of hemoglobin into the environment.
B. adhesion of red blood cells to the sediment.
D. Bleeding in the tissue as a result of damage.
E. Occurrence of red blood cells in animal secretions.

**194. Incubation period-?**

A. The period from the time of infection to the appearance of clinical symptoms of the disease.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material .

**195. Capsomers-?**

The form unit that forms the A. virion capsid is composed of several asymmetric protein molecules.
B. A component of a virion.
D. Fragment of the virus.
A fragment composed of E. nucleic acids.

**196.Pathogenesis-?**
A. Outbreaks of the disease.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material .
**197. What is proliferation?**
A. The formation of a new cell by dividing and multiplying.
B. The duration of action of the cell.
D. Cell death.
E. The period from the time of infection to the appearance of clinical symptoms of the disease.
**198. What is a vesicle?**
A. Early morphological elements of skin rashes.
B. appearance of infectious exanthema, tumor.
D. smallpox, papule.
E. papular and pustular condition.
**199. What is a passage?**
A. Infection of animals prone to microorganisms and viruses with pathogens.
B. Isolation of viruses.
D. Diagnosis of the disease.
E. Infection of allergens.
**200. What is the purpose of trypsin?**
A. In the separation of cells from tissues.
B. In cell nutrition.
D. As solvent substances.
E. When dividing a cell from a glass mattress.

## 2 TEST QUESTIONS FOR OB (200)

**1. Who is the scientist who introduced the word antigen in virology?**
ALDoych.
B.Donne.
D.Duklo.
E.Dyurgem
**2. Who is the scientist who introduced the word antibiotic in medicine and veterinary medicine?**
ALAVissman.
BTXVeller.
DJAVillemen.
BVVoskressenskiy
**3. How many types and serovariants of protein virus are there?**
A.7 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1 and more than 80 serovariants.
There are B.8 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1, Panazia-2 and more than 80 serovariants.
Type D.6: O, A, S, SAT-1, SAT-2, SAT-3 and more than 80 serovariants.
Type E.4: SAT-1, SAT-2, SAT-3 and more than 80 serovariants
**4. What types of protein virus are found in Asia?**
Types AA, O and Asia-1.
Types BA, S, SAT-1.
Types DO, S, SAT-1, SAT-2, SAT-3.
Types E.SAT-1, SAT-2, SAT-3}
**5. List the species of animals prone to proteinuria?**
A. all species of ungulates and wild animals.
B. all species of pairs and ungulates are farm and wild animals.
D. all species of agricultural and wild animals.
E. Only wild animals
**6. What diseases should be distinguished from proteinuria?**
A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.
B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot and necrobacteriosis.
D. from vesicular stomatitis of pigs, parainfluenza-3, infectious

rhinotracheitis, hoof rot and necrobacteriosis.

E. from hoof rot and necrobacteriosis

**7. In what clinical forms of infectious rhinotracheitis is manifested?**

A. The disease takes the following forms: respiratory, vulvovaginitis (blistering rash), conjunctivitis and meningoencephalitis.

B. The disease takes the following forms: respiratory, vulvovaginitis (vesicular rash) and meningoencephalitic forms.

D. The disease takes the following forms: respiratory, vulvovaginitis (blistering rash), and conjunctivitis.

E. Air, food, water, seeds, inventory, vehicles, poultry are the carriers of the virus. Under natural conditions, the virus enters mainly through the genitals, mucous membranes of the eyes during respiration and exhalation

**8. What methods are used to diagnose YURT?**

A. is based on clinical signs, epizootiological data, pathological changes and, of course, the results of laboratory tests. For retrospective diagnosis, serum is serologically (IDR, NR, and BGAR) checked at the beginning of the disease and 2-3 weeks later. If the antibody titer increases 4 times , the diagnosis is considered definite.

B. based on clinical signs, epizootiological data and, of course, the results of laboratory tests. Blood serum at the beginning of the disease and after 2-3 weeks for a retrospective diagnosis1erologic (IDR, NR, and BGAR) are examined. If the antibody titer increases 10 times , the diagnosis is considered definite.

D. based on clinical signs, epizootiological data and, of course, the results of laboratory tests.

E. For retrospective diagnosis, serum is serologically (IDR, NR, and BGAR) checked at the beginning of the disease and 2-3 weeks later.

**9. How many types of smallpox virus are there and which species cause the disease in animals** ?

A. natural smallpox virus and smallpox vaccine virus in cows - orthopoxvirus generation; natural smallpox virus of sheep and goats - a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; Avipoxvirus is a genus of avian Pox virus.

B. natural smallpox virus of cows - orthopoxvirus genus; natural smallpox virus of sheep and goats - a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; The natural smallpox virus of birds is a genus of avipoxvirus.

D. smallpox vaccine virus of cows - orthopoxvirus generation; natural smallpox virus of sheep and goats - carpi-poksvirus generation; The natural smallpox virus of pigs is a genus of suipoxvirus.

The natural smallpox virus of E. coli is a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; birds of natural smallpox virus - avipoksvirus avlodi.Uning 8 Greko, chicken base and canary pox viruses

**10. What is the diagnosis of smallpox?**

A. The diagnosis is made on the basis of clinical signs, epizootiological data, immunological examination (IFR and IDR), microscopy results

and biosynthesis of susceptible animals, cell culture and chicken embryo .
B. The diagnosis is made on the basis of clinical signs, epizootiological data, microscopy results .
D. The diagnosis is made on the basis of clinical signs, epizootiological data and biosynthesis of susceptible animals, chicken embryos .
E. Results of microscopy

**11. What type of virus is the causative agent of parainfluenza ?**

A. paramyxovirus
B. gerpesvirus.
D.ortomixovirus.
E.Rabdovirus

**12. What species of animals are infected with the parainfluenza pathogen ?**

A.only cattle.
B.only pork.
D.only a bird.
E. Cattle, pigs and poultry

**13. Paragripp the causative source of the animals?**

A. sick cattle.
B. pathogen- carrying pigs.
D. sick birds
E. sick birds and pigs

**14. What measures are based on the prevention of parainfluenza?**

A. special and non-special preventive measures.
B. special preventive measures.
D. to special preventive measures.
E. measures to increase animal resistance

**15. What type of virus is the causative agent of swine fever ?**

A.togaviridi family, Pestivirus-RNA.
B.herpesvirus-DNA.
D.ortomyxovirus - RNA.
E.rabdovirus - RNA

**16. In what ways is the pathogen released from the body in pigs?**

A. with urine, faeces, nasal and eye fluids.
B. with fluids flowing from the genitals.
D. with mucous substances excreted through the respiratory system.
E.with saliva

**17. What is the word disinfection?**

A. Loss of infection
B. Pollution of the external environment
D. Killing a pathogenic microorganism
E. Effects on the epizootic chain

**18. How is the diagnosis of infectious diseases made?**

A. The diagnosis is made on the basis of epizootiological data, clinical, pathological, bacteriological, virological, serological, histological, allergic, hematological examination and biopsy results.
B. epizootiological data, clinical, bacteriological, virological, serological, diagnostic and bioclinical results.
D. The diagnosis is made on the basis of epizootiological data, clinical, pathoanatomical, allergic examination results.
E. The diagnosis is made based on the results of clinical, pathological, allergic examination

**19. How many days is the latent period in the swine fever?**

A.3-20 days.
B.22-25 kun
D.25-30 kun.
E.26-32 kun

**20. What measures are taken in the swine fever?**

A. quarantine measures.
B. restrictive measures.
D. quarantine and restrictive measures.
E. No quarantine and restrictive measures are taken, isolation and treatment of patients are carried out on the farm

**21. Which bird species are prone to Newcastle disease?**
A. chicken, turkey, sesarka, tustovuq, peacock, dove, sparrow, hakka, parrot, hawk
B.only chicken, turkey, turkey.
D.only chicken, sesarka, tustovuq, kaftar, sparrow.
E.only chicken, turkey, peacock, hakka, parrot, hawk
**22. Which birds are the source of the pathogen of Newcastle disease ?**
A. sick and pathogenic carrier birds.
B.only pathogen- carrying pigs.
D.only sick birds.
E.only sick birds and pigs
**23. How does the virus get into the environment in Newcastle disease?**
A. sick and diseased pathogen with all secretions and excretions, breath and eggs through the mouth, nose, eyes and cloaca of the carrier bird.
B.only with secretions and excretions secreted by the mouth and cloaca of the sick bird.
D.only with the secretions and excretions secreted by the sick pathogen through the mouth and cloaca of the carrier bird.
E.only with the breath and eggs of a bird carrying a sick and diseased pathogen
**24. How many serovariant strains of avian influenza virus are there?**
There are 8 strains of A. influenza virus (A1-A8). To date, the virus has been found to contain 15 hemagglutinins and 9 neuraminidase serovariants.
There are 7 strains of B. influenza virus (A1-A7).
There are 6 strains of D. influenza virus (A1-A6).
There are 5 strains of E. influenza virus (A1-A5)
**25. What group of diseases does the avian influenza virus belong to in terms of the rate of spread?**
A.panzootic.
B.epizootic.
D.enzootic.
E.Sporadik
**26. What is the percentage of morbidity and mortality in avian influenza?**
A. morbidity is 80-100%, mortality is 10-90%.
B. morbidity 50-60%, mortality 5-10%.
D. morbidity 40-50%, mortality-3-8%.
E. sickness 30-40%, mortality-2-6%
**27. In what ways does the avian influenza virus enter the body?**
A.alimentary, respiratory, transovarial (through the egg).
B.only alimentary.
D. respirator only.
E. transovarial only (through the egg)
**28. What diseases should be distinguished from influenza?**
From diseases of A. Newcastle, pasteurellosis, spirochetosis, infectious laryngotracheitis, infectious bronchitis.
B. from mycoplasmosis, infectious laryngotracheitis, bronchitis.
D. from infectious encephalomyelitis, infectious anemia, salmonellosis.
From E. colibacillosis, pullorosis, leukemia
**29. Which virus causes Marek's disease?**
A. herpesvirus.
B.Togavirus
D.reovirus
E.paramyxovirus
**30. In what ways does the Marek virus enter the body?**
A. respiratory organs, alimentary, through the skin pat follicle, insect, mite, beetle, transovarial.

B.only alimentary, through the skin pat follicle, transovarial.
D.only through the respiratory organs and transovarial.
E.only alimentary and transmissible

**31. What type of virus causes avian leukemia?**

A. oncornavirus.
B. gerpesvirus.
D.ortomixovirus.
E.Paramyxovirus

**32. What species of birds are prone to avian leukemia?**

A. chicken, turkey, sesarka, duck, goose, hawk, dove, parrot, canary, quail and others.
B.only chicken, turkey, duck, turkey , dove.
D.only chicken, goose, cesarean, smoker, parrot.
E.only a goose, a cesarean, a white bird, a parrot

**33. In what ways does the avian leukemia virus enter the body?**

A. through the respiratory organs, alimentary tract and transovarial.
B.only alimentary, through the skin pat follicle.
D.only transovarial.
E.only alimentary and transmissible

**34. Who is the causative agent of infectious laryngotracheitis?**

A. herpesvirus.
B.Togavirus
D.reovirus
E.paramyxovirus

**35. In what ways the virus of infectious laryngotracheitis enters the body?**

A. through respiratory organs, contact, and insects.
B.only alimentary, through the skin pat follicle.
D.only transmissible and transovarial.
E.only alimentary and transmissive}

**36. Who is the causative agent of infectious bronchitis?**

A. coronavirus.
B.Togavirus
D.reovirus
E.paramyxovirus

**37. What type of virus causes equine influenza?**

A. Orthomyxoviride family, RNA virus belonging to the genus Influenza virus.
B.Togavirus
D.reovirus
E. Paramyxovirus

**38. What are the special serums used in the etiotropic treatment of parvovirus enteritis plague and infectious hepatitis?**

A. Inactivated vaccines.
B. Hyperimmune serum, immunoglobulins.
D. Live vaccines.
E. Gamma globulins

**39. What are the best results in the prevention of plague and infectious hepatitis?**

A.Reconvalissent blood serum.
B. Hyperimmune serum.
D.Interferon, interferonogen, kinoran, miksoferon.
E. ready antibodies

**40. What disease should be distinguished from smallpox?**

A. Contagious ecthyma, temiraiki, scabies.
B. salmonellosis, senurosis, rabies
D.Auyeski, listeriosis, leptospirosis, enterotoxemia.
Brucellosis, piroplasmidosis, salmonellosis.

**41. From which disease should Aueski's disease be distinguished?**

A. Rabies, trichophytosis, listeriosis.
B. Poisoning, inflammation of the joints, salmonellosis.

D. Enterotoxemia, hemorrhagic septicemia, laptospirosis, listeriosis.
E. Pneumonia, scrapes, anthrax

**42. Collection of diagnostics for infectious rhinotracheitis of large horned animals is prepared in which biofactories?**

In A.Privoljye biofactory.
B. In the biofactory of Kazakhstan.
D. In the biofactory of Kyrgyzstan.
At the E. Pokrov biofactory

**43. Parvovirus enteritis in dogs belongs to which family, what is its cryptogram?**

A.Parvovirus D / 1: 1.5-2.0 / 19-25: s / s: v / o.
B.Adenoviridaye
D.Gerpesviridaye.
E.Reoviridaye

**44. The latent period of rabies:**

A.1- year and older.
B.1-3 days;
D.1-13 kun ;;
E.1-23 kun;

**45. Anticoagulants are -?**

A. Substances that impair the activity of the blood coagulation system.
B. Substances that enter the body and cause an immune response.
D. systems with the ability to reproduce an organism or parts.
E. substances that retain their properties after special treatment.

**46. What is hemolysis?**

A. The breakdown of erythrocytes in the blood and the release of hemoglobin into the environment.
B. adhesion of red blood cells to the sediment.
D. Bleeding in the tissue as a result of damage.
E. Occurrence of red blood cells in animal secretions

**47. Incubation period-?**

A. The period from the time of infection to the appearance of clinical symptoms of the disease.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material

**48. Capsomers-?**

The form unit that forms the A. virion capsid is composed of several asymmetric protein molecules.
B. A component of a virion.
D. Fragment of the virus.
A fragment composed of E. nucleic acids

**49. Pathogenesis-?**

A. Outbreaks of the disease.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material

**50. What is a vesicle?**

A. Early morphological elements of skin rashes.
B. appearance of infectious exanthema, tumor.
D. smallpox, papule.
E. papular and pustular condition

**51. List the types of disinfection?**

Type A.2: prophylactic, mandatory.
B.3 is
different: prophylactic, mandatory, final.
D.3 is different: prophylactic, current, mandatory.
E. There are 4 types: prophylactic, current, final, mandatory

**52. What are the main clinical signs of proteinuria?**

A. Appears on the mucous membranes of the mouth, gums, palate and tongue for 1 week, between the udder and hooves for 2 weeks, the temperature of the animal rises. Salivation, loss of appetite, thirst, lameness are

observed. The hooves may fall off. Heart activity decreases sharply in milk and young calves.
B. sores appear on the mucous membranes of the mouth, gums, palate, and tongue, between the udder and hooves. In young calves the disease is mild.
D. sores appear in the mouth and tongue, the temperature of the animal does not rise. Lameness is observed due to the wound on the hooves. Passes easily in young calves.
E. The disease is mild in young calves

**53. What diseases should be distinguished from proteinuria?**

A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.
B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot, and necrobacteriosis.
D. From swine vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, hoof rot, and necrobacteriosis.
E. from hoof rot and necrobacteriosis

**54. List the species of animals that are susceptible to the rabies virus?**

A. all species of warm-blooded animals, rodents, bats, birds, humans.
B. pairs of ungulates and ungulates, rodents, humans.
D. all horned farm and wild animals, rodents, dogs, cats, humans.
E.it, cat

**55. What species of animals are the reservoirs of the rabies virus in nature ?**

A. all wild animals.
B.it, cat.
D. bat
E. pairs of ungulates and ungulates, rodents, humans.

**56. How is rabies diagnosed?**

A. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions, the results of biological tests in mice .
B. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions.
D. epizootiological data, clinical signs, microscopy of smears prepared from the brain.
E. based on the results of biological tests in mice

**57. How to dye smallpox?**

In the silvering method of A. Morozov.
In the B. Mixin method.
D.Romanovskiy Gimza.
E. Microscopy results

**58. How to use the drug in the diagnosis of rabies?**

In the method of A. Sellers.
In the silvering method of B. Morozov.
D. Mixin method.
E. Microscopy results

**59. Family and offspring of large horned animals parainfluenza virus?**

A.Myxoviridae, Paromixovirus.
B. Picornaviridae, Aphtovirus.
D. Myxoviridae, Ortomixovirus.
E. Poxviridae, Orthopoxvirus

**60. Family and generation of smallpox virus?**

A.Poxviridae, Orthopoxvirus.
B.Myxoviridae, Paromixovirus.
D.Myxoviridae, Ortomixovirus.
E. Picornaviridae, Aphtovirus

**61. What is the mortality rate among chickens in Newcastle disease?**

A.90%
B.50%
D.40%
E.10%

**62. Retrospective diagnosis of proteinuria?**

A.RIDR, BIFR.
B. NR, DPR.
D. GATR, IFR.
E. IFR, DPR

**63. Give an example of viral respiratory diseases of birds.**

A. Newcastle, Influenza, infectious laryngotracheitis, infectious bronchitis.
B. Smallpox, viral hepatitis, infectious bronchitis.
D. Viral hepatitis, infectious bronchitis, Newcastle.
E. Influenza, infectious laryngotracheitis, smallpox

**64. What is the name of the corpuscles formed in birds with laryngotracheitis?**

A.Zeyfred.
B.Bollinger.
D.Lentsa.
E.Babesh-Negri

**65. What is the name of the cells formed by the rabies virus in the cytoplasm of nerve cells?**

A. Babesh-Negri bodies.
B.Bollinger bodies.
D. Guarnieri bodies.
E. Zeyfred bodies

**66. What universal method of dyeing is used in the preparation of ointments from pathological material in rabies?**

A. Hemotoxillin with eosin.
B. Romanovsky-Gimza method.
In the method of D. Kozlovsky.
In the E.Sil-Nilsson method

**67. For biological examination of viral diseases, find the line with the correct method and pathological sign of infection of rabbits with Ayeski's disease.**

A. Intramuscular, subcutaneous, encephalitis, pruritus, death.
B. intracerebral, intramuscular, paralysis, death.
D. Forms a wound under the skin, inside the skin, at the site of delivery.
E. Intracerebral edema of the skin, head

**68. What is one of the important achievements of the chicken fetus?**

A. All the answers are correct.
B. High sensitivity to a wide range of viruses.
D. Protected by bark.
E. Not requiring care

**69. Who was the first to detect changes in cell structure as a result of the growth of viruses in the cell?**

A.Enders, 1949 y.
B.Fogt, 1950 y.
D.Dalbekko, 1951 y.
E.Xuang,! 952y.

**70. In virology 1 YUM50 - what does it mean in laboratory animals?**

A. causing a clinical sign or pathological changes.
B.letal amount.
D. The amount of cytopathic effect.
E. the resulting quantity

**71. From the pathological changes nodules, plaques are formed when the laboratory system is infected with the virus?**

AO grown cells.
B. chicken embryos.
D.laboratory animals.
E. tissues, patmaterial

**72. What is the name of the proteins produced by the body against parenteral administration of high-**

**molecular foreign substances to warm-blooded animals?**
A.Antibodies.
B.Antigens.
D. Hemagglutinins.
E. Anticoagulants
**73. The essence of the neutralization reaction?**
A. is added to a test tube of the virus suspension with the same amount of serum, and after some time the active virus is detected in the mixture.
B. Antibody meets a homologous antigen, surrounds its hemagglutination receptors and forms an antigen + antibody complex with it.
D. Antigen and antibodies diffuse in the gel to form a precipitation line.
E. Hemagglutination of antigens and antibodies of equal volume under the influence of erythrocytes over time
**74. What is the neutralization index?**
A. virus-neutralizing titer of antibodies in serum .
B. Testing for an unknown virus using clear serum.
D. antigenic similarity between viruses.
E. Antibody concentration in serum
**75. When the cultured cells are infected with the virus, where are the test tubes, mattresses secured with rubber stoppers for incubation?**
A.Termostat.
B.Anaeroststga.
D. To the freezer.
E. Liquid nitrogen
**76. For how many days is the nutrient medium of a virus-infected cell changed?**
A.7 kun.
B.3kun.
D.2 kun.
E.21 kun
**77. Name the parts that make up a virion.**
A.DNA or RNA.
B.Kapsula.
D.Crust.
E. Ribosome and mitochondria
**78. How are all viruses structured?**
A. nucleic acids and protein from the shell.
From B. nucleotide.
D.capsomerdan.
E.super capsid
**79. What is the process of multiplication of viruses in the cell?**
A. Reproduction.
B. Conjugation.
D. Rescue.
E. Capsomers
**80. In which of the following reactions the antibody is not involved?**
A. Hemagglutination reaction.
B. Hemagglutination inhibition reaction.
D. Neutralization reaction of hemagglutination.
E. Rickettsiae agglutination reaction.
**81. In animals, the Aueski disease virus is transmitted experimentally?**
A. Sheep, rabbit, chicken embryos
In suppressed cells, in chickens
D. In the rabbit, in the cultured cell
E. In all animals
**82. A method that accelerates the diagnosis of influenza?**
A.immunofluorescent method
B.direct hemagglutination
D.GATR
E.KBR
**83. What is the effect of a specific antibody on a virus?**
A. Neutralizes
B. Agglutinated
D. It is lowered into the sink
E. Adsorbs
**84. Vaccine against Marek's disease?**

A. Dry culture vaccine prepared from the herpes virus FS-126 strain of turkeys
Dry vaccine prepared from B.VNIIBP strain
D. Dry live culture vaccine
E. inactivated vaccine

**85. Characteristics of interferon?**
A. interferon is always formed from lymphocytes
B. interferon is formed from all cells of the body
D. interferon is formed when bacteria enter lymphocytes
E.interferon affects all bacteria

**86. The variability of the influenza virus depends on the change of which of their substances?**
A. amino acids and proteins
B. toxic substances
D. Lipoids
E. hemagglutinin and neuraminidase

**87. What immunity plays an important role in influenza, acute respiratory viral infections, polio?**
A.Gumoral
B.Cellular
D.humoral and cellular
E. local secretory immunity

**88. Depending on the prevalence of influenza, determine which type of infection belongs to the population?**
A. epidemic, pandemic
B. Endemic
D. endemic, epidemic
E.Sporadik

**89. What measures are taken against influenza?**
A. Influenza vaccine
B. Separation
D. use of antigrippin, remantadine, interferon
E. harden my body

**90. By what reaction is the virus detected from tissue culture infected with influenza virus?**
A. Hemagglutination
B. Hemadsorption
D. indirect gamegglutination
E.KBR reaction

**91. The method used in the rapid diagnosis of influenza?**
A. hemagglutination reaction
B. Hemadsorption
D. Neutralization
E.biological method

**92. At what time of the incubation period does the rabies virus begin to differentiate with the saliva of a rabies-infected dog?**
A. 10-12 days before the onset of the disease
B. 20-30 days before the onset of the disease
D. 40-60 days before the onset of the disease
E. 60-90 days before the onset of the disease

**93. What is the incubation period of rabies when biting and damaging the face and neck area during the day?**
A.15-20 kun
B.30-40 days
D.50-60 kun
E.3 more than a month

**94. Form of rabies virus:**
AOqsimon (pulya)
B.Sharsimon
D.Ipsimon
E. Sticky

**95. In which organs does rabies multiply after infection with a viral animal?**
A. in head and spinal nerve cells
B. in the pancreas
D. in the intestinal epithelium
E. In the subcutaneous tissue

**96. Indicate zoonotic infections**

A. Rabies, wounds, plague
Typhoid fever, part A, V,
D. tubercullosis, gonorrhea
E. rabies, tuberculosis

**97. How is the rabies vaccine given?**

A. between muscles
B. by mouth
D.Burniga
E. under the skin

**98. In which viral infection, the body of Babesh-Negri is found in the test material.**

A. * Rabies
B. viral hepatitis V.
D.SPID
E. Gripp

**99. The patient has a sign of fear of water. There is a strong strain on the muscles. What are the symptoms of this disease?**

A. Rabies
B.Koksholga
D. Botulism
E. gas gangrene

**100. What is the main source of the disease that plays a role in the circulation of the rabies virus in nature?**

A. wild animals
B. sick people
D. Arthropods
EO plants

**101. A vaccine used in special prophylaxis of proteinuria?**

AA, O, Asia - 1
B.Antitoxin
D. Inactivated live vaccine
E.Amantadin

**102. There are several types of protein virus**

A.7
B.5
D.3
E.2

**103. What is an infectious disease?**

A. An infectious disease caused by viruses and microorganisms that have evolved to be parasitic on animals.
B. Disease-causing viruses and microorganisms
D. Bleeding in the tissue as a result of damage.
E. Resistance of the organism to the virus and its toxins

**104. What is immunity?**

A. The body is not infected with an infection or any infectious substance
B. Reproduction, spread, toxicity of the virus
D. Specific resistance of the organism to infection, inflammation
E. Infection and spread of viruses in the body

**105. What is a vaccine?**

A. It is a special biological drug, prepared from pathogens. It is mainly used to prevent disease.
B.Antitela, antigen
D. Fragment of the virus.
E.Aglutinin, precipitate

**106. What serological tests are used to diagnose proteinuria?**

A.KBR
B.DPR
D.IFR
E.GATR

**107. Identify the family and offspring of the rabies virus.**

A.Rhabdoviridae and Lussavirus
B.Poxviridae and Orthopoxvirus
D. Myxoviridae and Paramyxovirus
E. Picornaviridae and Aphtovirus

**108. The latent period of proteinuria?**

A.1-3 kun
B.5-9 kun
D.7-8 kun
E.1 weeks

**109. Name the components of CBD in the bacteriological system**

A.Antigen, antibody, complement

B. Hemolysin, complement, saline
D. Physiological erythema, antigen, erythrocytes
E.Complement, hemolysin, antibody

**110. Name the components of CBD in the hemolytic system**

A.Complement, erythrocyte, hemolysin
B.Antigen, complement, physiological solution
D. Antibody, saline, hemolysin
E. Hemolysin, antigen, saline

**111. How many degrees is 1 atm in an autoclave?**

A.120-1210C
B.124-1260C
D.110-1120C
E.132-1330C

**112. What is included in the peripheral immune system**

A. Blood, lymph nodes, spleen
B. Thymus, spleen, liver
Dopka, stomach, liver
E. Gastric juice, red marrow

**113. Indicate the central immune system**

A.Timus, fabrisiyev bag, red marrow
B. Lymph nodes, red bone marrow
D. Divorce, blood, lungs
E. Spleen, kidneys, stomach

**114. Where is the pathological material obtained in equine rhinopneumonia?**

A. Nasal fluid, lungs, liver, Bronx from a piece of trachea
B. In the mucous membranes of the mouth, gums, palate and tongue
D. Blood, liver, spleen, lungs
E. From the brain

**115. List the diseases transmitted by insects?**

A. Infectious encephalomyelitis of horses, African plague, infectious anemia, canine encephalitis, infectious catarrhal fever of sheep, viral encephalomyelitis and ephemeral fever of cattle, transmissible gastroenteritis of pigs, African plague, ku-fever and all arbovirus diseases.
B. leptospirosis, measles, salmonellosis, African plague in horses, infectious anemia, infectious catarrhal fever in sheep, transmissible gastroenteritis in pigs, African plague, brucellosis, tuberculosis.
D. Infectious encephalomyelitis of horses with leptospirosis, measles, salmonellosis, brucellosis, tuberculosis.
E. salmonellosis, yellow fever, brucellosis, tuberculosis, infectious encephalomyelitis of horses

**116. List the diseases transmitted by rodents?**

A. Rabies, Aueski.
B. Protein
D. Vesicular stomatitis
E.Teshen

**117. In how many different ways does the pathogen enter the body?**

A.4 types: oral, respiratory, transmissible and contact.
B.5 types: oral, respiratory, transmissible, genital and contact.
D.3 type: mouth, breathing, contact.
E.2xil: mouth, breathing.

**118. What are the factors of transmission of the pathogen into the body?**

A. food contaminated with the pathogen, water, soil, air, building, pasture, animal products of forced slaughter, les and its skin, wool, items used in care, clothing of workers.
B. food contaminated with the pathogen, items used in care.
D. food, water, soil, building contaminated with the pathogen .
E. feed contaminated with the pathogen.

**119. What% of antibodies against Pg-3 virus are present in the blood of young people?**
A.95%
B.50%
D.40%
E.10%
**120. How to diagnose viral diseases?**
A. The diagnosis is made on the basis of epizootiological data, clinical, pathoanatomical, virological, serological examination and biopsy results.
B. Diagnosis is made based on bacteriological, virological, serological, biopsy and biopsy results
D. The diagnosis is made on the basis of epizootiological data, clinical, pathoanatomical, allergic examination results.
E. The diagnosis is made based on the results of clinical, pathological, allergic examinations.}
**121. What are the main clinical signs of proteinuria?**
A. occurs in the mucous membranes of the mouth, gums, palate and tongue 1 week, between the udder and hooves 2 weeks, the temperature of the animal rises. Salivation, loss of appetite, thirst, lameness are observed. The hooves may fall off. Heart activity decreases sharply in milk and young calves.
B. ulcers appear on the mucous membranes of the mouth, gums, palate , and between the tongue, udder, and hooves. In young calves the disease is mild.
D. ulcers appear in the mouth and tongue, the temperature of the animal does not rise. Lameness is observed due to the wound on the hooves. Passes easily in young calves.
E. The disease is mild in young calves
**122. How long is the latent period in leukemia?**
A. 60-750 days in practice, 2-6 years in practice.
B.12 oy.
D.6 oy.
E.2 oy.
**123. How does the virus get into the environment in Newcastle disease?**
A. sick and diseased pathogen with all secretions and excretions, breath and eggs through the mouth, nose, eyes and cloaca of the carrier bird.
B.only with secretions and excretions secreted by the mouth and cloaca of the sick bird.
D.only with the secretions and excretions secreted by the sick pathogen through the mouth and cloaca of the carrier bird.
E.only with the breath and eggs of a bird carrying a sick and diseased pathogen.
**124. What type of virus causes equine influenza?**
A. Rtomyxoviride family, RNA virus belonging to the genus Influenza virus.
B.togavirus
D.reovirus
E.paramyxovirus
**125. In what way are horses infected with the influenza virus?**
A. air-drop.
B.only alimentary
D.only transmissive
E.only through the mucous membranes of the genitals
**126. In what way is the rhinopneumonia virus transmitted to horses?**
A. air-drop, contact (congenital), alimentary.
B.only in an iatrogenic way.
D.only in a transmissible way.

E. by alimentary and iatrogenic means only

**127. What type of virus causes hepatitis in carnivores ?**

Adenolvirus with A.DNA
Herpesvirus with B.DNA
D.RNA-togavirus
E. RNA reovirus

**128. Who invented the method of vaccination against rabies?**

ALPaster
BRKox
D.Mechnikov
E.Ivanovskiy

**129. Identify viral diseases?**

A. Influenza, plague, proteinuria, leukemia, infectious anemia
B. Anthrax, black, yellow
D. Temiratki, rabies, manga
E.N'yukasl, brucellosis, pasteurellosis

**130. Who is the scientist who named the virus "poison" at the end of the last century?**

A.Beyering
B.Ivanovskiy
DLPaster
E.Jdanov

**131. What do you mean by the reproduction of viruses?**

A. The process of reproduction only within the cell
B. forms DNA or RNA
D. Produces protein for the virus in the cell
E. Selectively develops the cells of viruses

**132. What stage does the reproduction of viruses involve?**

A.7
B.2
D.5
E.4

**133. What serological methods are used to identify viruses?**

A.GAR, BGAR, GATR, AR
B.DPR, AR, GADR
D.IFR, IFA
E.NAU, NR, BGAR

**134. Who was the first to detect the transovaral transmission of the virus?**

AREMontgomeri
B.Ivanovskiy
D.Beyering
E.Jdanov

**135. What is the meaning of the word interferon?**

A.– reciprocal, - blow, damage
B. Occasionally recurrent
D. Recovery
EO unchangeable

**136. In what year was the transovaral transmission of the virus first detected?**

A.1917
B.1971
D.1895
E.1923

**137. What genetic information is contained in iridoviruses?**

A.DNK
B.RNK
D.DNA or RNA
E.Oqsil

**138. Capsomer?**

A. The shape unit that makes up a virion capsid, the asymmetric groups of virion composition, is made up of one or more asymmetric protein molecules. Part of the composition of the virion, the shell, protects its nucleic acid from the external environment
D. The mucous layer around the bacterial cell
E. The process of protective adaptation

**139. Nucleocapsid?**

A. A protein shell that combines the virion hereditary properties of nucleic acid
B. Protein shell

D. The shape unit that forms the virion capsid, the asymmetric groups of the virion, is composed of one or more asymmetric protein molecules.
Part of the composition of E. virion, the shell, protects its nucleic acid from the external environment

**140. Nucleoproteins?**

A. Simple proteins and complex proteins containing nucleic acid
B. A protein shell that combines the virion genetic properties of nucleic acid
D. The composition of the virion, the shell, protects its nucleic acid from the external environment
E. Proteins that can only survive and reproduce under certain conditions

**141. Family of oncoviruses?**

A.Retroviridae
B.Papovaviridae
D.Paramyxoviridae
E.Myxoviridae

**142. Family of Poxviruses?**

A.Poxviridae
B.Papovaviridae
D. Enteroviridae
E.Myxoviridae

**143. Prions?**

A. Pathogens of slow-growing infectious diseases
B. Incomplete virus particle
D. A protein that combines the virion hereditary properties of nucleic acid
E. Protects nucleic acid from the external environment

**144. What is the size of a prion in nm?**

A.17-27
B.20-27
D.10-19
E.5-15

**145. Who was the first to identify prions?**

ASPPrusner, 1984
BREMontgomeri, 1977
D.Ivanovskiy, 1988
E.Beyering, 1945

**146. Form of rhabdoviruses?**

A.Cylindrical, one end twisted
B. Icosahedron
D.sharsimon
E.Triangle

**147. Who is the causative agent of reoviruses?**

A.RNK - by Reoviridae
Adenolvirus with B.DNA
Herpesvirus with D.DNA
E.RNA-togavirus

**148. Respiratory viruses?**

A. A virus that causes disease in the respiratory system
B. Small and large viruses
D. Tissue death and decomposition in the body
E. A virus that breaks down under the influence of enzymes

**149. What viruses are included in respiratory viruses?**

A.Paramyxovirus, adeno-, rhino
B.Rheovirus, rotavirus
D.Picorna, - toga, paramyxo
E.Ortomikso, arena

**150. What percentage of ribosomes is composed of protein?**

A.40
B.20
D.10
E.15

**151. What percentage of ribosomes is made up of RNA?**

A.60
B.40
D.50
E.10

**152. Where are the viruses that store DNA?**

A.Nuclear
B.Sytoplasm
D. In the cell
E. Virus virionida

**153. Identify the family Togavirus?**
A.Togaviridae
B.Gerpesviridae
D.Adenoviridae
E.Reoviridae
**154. Togavirus size?**
A.20-70 nm
B.20-50 nm
D.10-15 nm
E.60 nm
**155. Togavirus form?**
A.Sferik
B.Sielindrsimon
D. Icosahedron
E.Sharsimon
**156. Transcription?**
A. The process of transmitting information from DNA to RNA
B. Tissue death and decomposition in the body
D. A virus that breaks down under the influence of enzymes
E. Polmerase, an internal protein molecule in viruses
**157. What is the meaning of the word broadcast?**
A. Distribution
B. Copy
D. See
E. Trembling
**158. What is the meaning of the word phagocytosis?**
A.Hujayra
B. Show
D. Hair
E.Yadro
**159. Eclipse period?**
A.2 - and 3 - the answer is correct
B. The period during which the virus enters the cell
D. A period of irreversible changes in a virus particle
E. The initial period of the disease
**160. How many days is the latent period of smallpox in MSHH?**
A.1-2 kun
B.6-9 kun
D.1-2 months
E. 4 hours
**161. Identify a class of virus classified?**
A.Retroviride
B. Picornaviride
D. Herpesviride
E. Adenoviride
**162. Vaccine against smallpox in goats?**
A.GOA formal glycerin vaccine
B.GOA formal vaccine
D. Dry culture virus vaccine
Vaccine prepared from E. NISXI strain
**163. Which vaccine is used against rhinotracheitis in cattle?**
A. All the answers are correct
B. Inactivated vaccine
D.TK - A VIEV V– 2 strains of dry vaccine
E. Associated dry culture vaccine
**164. What is the family of flaviviruses?**
A.Togaviridae
B.Adenoviridae
D.Reoviridae
E.Gerpesviridae
**165. Transcriptase?**
A. Polymerase, an internal protein molecule in viruses
B. The process of transmitting information from DNA to RNA
D. Tissue death and decomposition in the body
E. A virus that breaks down under the influence of enzymes
**166. Identify the rotavirus family?**
A.Reoviridae
B.Retroviridae
D.Gerpesviridae
E.Adenoviridae
**167. Where are the viruses that store DNA?**

A.Nuclear
B.Sytoplasm
D. In the cell
E. Virus virionida

**168. Where are RNA-storing viruses located?**

A. In the cytoplasm
B. In the cell
D.Nuclear
E. In the host molecule

**169. Indicate the methods used in the rapid diagnosis of viral diseases**

A.IFA (enzyme-linked immunosorbent assay)
B. immunofluorescence reaction
D.KBR (complement binding reaction)
E. virological method

**170. A method that accelerates the diagnosis of influenza?**

A. immunofluorescent method
B.direct hemagglutination
D.RPGA
E.KBR

**171. How does a specific antibody affect the virus?**

A. neutralizes
B. agglutinated
D. is lowered into the sink
E. adsorbs

**172. Specify a vaccine that is not used in the prevention of viral diseases.**

A. live attested vaccine
B.sub'edinitsali vaccine
D. corpuscular (virion) killed vaccine
E. a vaccine prepared by the generic method

**173. Which viral disease vaccine is used?**

A. influenza
B.chin chechak
D. interesting
E. poliomyelitis (sebin vaccine)

**174. Which viral disease vaccine is used live?**

A. herpes
B.paragripp (URVI)
D.kana encephalitis
E.water droplets

**175. Drugs used in the treatment and prevention of influenza.**

A.remantadin
B.cytotoxin
D.akrixin
E. anatoxin

**176. Which type of influenza virus does not affect remantadine?**

A. to all species
BA-type
DV type
ES-type

**177. Indicate the virus does not belong to the family of enteroviruses.**

A. poliomyelitis
B. Koksaki
D.hepatitis V
E.hepatitis A

**178. interfergon specific properties?**

A. interferon is always formed from lymphocytes
B. interferon is formed from all cells of the body
D. interferon is formed when bacteria enter lymphocytes
Interferon produced by E.virus only affects this virus

**179. How does a specific antibody affect the virus?**

A. neutralizes
B. agglutinated
D. is lowered into the sink
E. adsorbs

**180. Form of influenza virus:**

A.taekchasimon
B.batsillasimon
D.spherical (circular)

In a form similar to E.spermatozoa

**181. There are many types of influenza viruses. What are their differences?**

With the increase
B. with antigenic properties
D.with endurance
E. with biochemical properties

**182. The variability of the influenza virus depends on the variability of which of their substances?**

A. amino acids and proteins
B. toxic substances
D. lipoids
E. hemagglutinin and neuraminidase

**183. What immunity plays an important role in influenza, acute respiratory viral infections, polio?**

A.gumoral
B. cellular
D.humoral and cellular
E. local secretory immunity

**184. The average duration of the latent period of influenza is:**

A.6-8 kun
B.7-14 kun
D.4-5 kun
E.24 kun

**185. Which type of influenza virus does not affect remantadine?**

A. to all species
BA-type
DV type
ES-type

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E.hepatitis

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A.6-8 kun
B.7-14 kun

D.4-5 kun
E.24 kun

**194. Many features of the influenza virus are variable, which change makes it difficult to prepare a vaccine against this disease:**

A. pathogenicity
B. Increased resistance to environmental factors
D.morphology
E. virulence

**195. The infection among the population depending on the prevalence of influenza determine which type it belongs to?**

A.sporadik
B. endemic
D. endemic, epidemic
E.epidemic, pandemic

**196. What causes the flu virus to grow?**

A.GPA, GPB, GPJ and other artificial environments
B. from the amnion and allantois layers of the chicken embryo
D. on the heel of a guinea pig
E. not defined

**197. A drug used in special prophylaxis of influenza?**

A. live and killed vaccine against influenza
B. antibiotic and sulfanilamide drugs
D. antitoxin serum
E. antibacterial serum

**198. What measures will be taken against influenza?**

A. Influenza vaccine Use of antigrippin, remantadine, interferon
D. hardening of the organism
E. all-complex measures

**199. By what reaction is the virus detected from a culture culture infected with the influenza virus?**

A. hemagglutination
B. hemadsorption
D. indirect gamegglutination
E. CBR reaction

**200. The beloved of the flu virus, chicken embryo amnion and allantois rights whatsoever which is determined by means of the reaction?**

A. hemagglutination
B. hemadsorption
D. agglutination
E. precipitation

## TEST QUESTIONS FOR YAB (500)

**1. When did DIIvanovsky discover viruses?**

A.1892 y
B. 1881 y
D. 1890 y
E.1889 y

**2. In what order do the four phases of cell mitosis take place?**

A.Prophase, metophase, anaphase, telophase
B. Prophase, anaphase, metophase, telophase
D.Prophase, telophase, anaphase, metophase

E. Telophase, anaphase, metophase, prophase

**3. In infectious rhinotracheitis of large horned animals, where is the pathological material obtained within 7 days after the onset of the disease?**

A. Nasal discharge from the throat, conjunctiva, feces
B. From saliva, from the brain
D. Lymph nodes, lungs
E. From divorce, from the mouth

**4. In parainfluenza of large horned animals 3-5 days of illness, where is the pathological material obtained?**

A. From the nasal fluid, feces, lungs, lymph nodes, part of the trachea
B. From his left, from his blood
D. From injured skin
E. From the liver, from the spinal cord

**5. What does the change in color of the cell growth fluid indicate?**

A. From the RN change and death of the environment
B. From the separation of the cell from the mattress wall
D. Cell death and air ingress
E. From the falling contamination of bacteria

**6. Where is the pathological material obtained on the first day of the disease in transmissible gastroenteritis in pigs?**

A. Fecal, from the mucous membrane of the intestine
B. From blood, nasal fluid, saliva
D. From the composition of vesicles, pustules, aphthae
E. From the brain, conjunctiva, skin

**7. Which enzyme involved in viral RNA is involved in the specific RNA synthesis of virions?**

A.Transcriptase
B. Hyaluronidase
D. Neuraminidase
E. DNA-aza

**8. What does the second of the four symbols in the cryptogram mean?**

A. The type and size of nucleic acid
B. The number of spirals
D. The external structure of the virion
E. The symbol of the transmitter

**9. Where does the interference occur?**

A. In animals, in cultured cells, in chicken embryos
B. Mattress, test tube, on the item window
D. Hanks, Erla, Igla in solution
E. In live and killed vaccines

**10. What is the name of the bodies formed in infectious laryngotracheitis of birds?**

A. Zeyfred
B. Bollinger
D. Lentsa
E. Babesh-Negri

**11. From what substrate are vaccines against proteinuria of large horned animals prepared?**

A. From the epithelium of the tongue
From the suppressed cell
D. From organs and tissues
E. From a chicken embryo

**12. What are the ingredients needed for a complement binding reaction?**

A.Antigen, Antibody, Complement, Hemolysin, Erythrocyte
BOS, Asian, Sat-1 types
D. Hanks, Erla, 199, GLA, Igla
E.Trinsin, FBR, Erythrocyte, tannin.

**13. Who is the scientist who proposed cryptogarm in the classification of viruses?**

A. Gibss, 1966
B. Gaydushek, 1976
D. Zilber, 1968
E. Zhdanov, 1976

**14. Who is the scientist who says that virology is just as important for**

**biology as atomic physics is for classical physics?**
A. Nikolau
B. Joulian
D. Naruna
E. Teugita

**15. What is a dalton equal to?**
A. $1.67. 10^{-24}$
B. $1.50. 10^{-24}$
D. $1.76. 10^{-23}$
E. $1.52. 10^{-19}$

**16. What measures the size of viruses?**
A. $1NM = 10^{-9}$
B. $1MKM = 10^{-6}$
D. 1MM = 100 (MKM)
E. 1MKM = 100 (NM)

**17. Where can the cytopathogenic effects of viruses be seen?**
A. In cultured cells
B. In chicken embryos
D. In laboratory animals
E. In a suspension cell

**18. What antibiotics are added to the pathological material?**
A. Streptomycin, penicillin, nystatin
B. Penicillin, Bisillin-3
D. Kanamycin, erythromycin
E.Amantadin, ramantadin

**19. Which of these serological reactions is correct?**
A.NR, GATR, GADTR, KBR, DPR, IFR
B. NR, RP, RA, KBR, DPR, IFR
D. BTAR, RP, RA, KBR, GAR, IFR, NR
E. DPR, KBR, RA, NR, IFR, GATR

**20. What disease do paramyxoviruses cause?**
A. Influenza
B. Leukemia
D. Newcastle
E. Gastroentritis

**21. What diseases do coronaviruses cause?**
A. Bronchitis, gastroenteritis
B. Chechak, influenza
STATE, protein
E Exanthema, entima

**22. What diseases do retroviruses cause?**
A. Leukemia, sarcoma
B. Newcastle, parainfluenza
D. Rhinotracheitis, Auyeski
E. Catarrhal istma, yalat

**23. What diseases do rhabdoviruses cause?**
A. Vesicular stamatitis, rabies
B.Chechak, yalat
D. Exanthema, Rhinotracheitis
E. Newcastle, parainfluenza

**24. What diseases do papovaviruses cause?**
A. Polioma, papilloma
B. Rabies, stomatitis
D. Catarrhal isthmus, polioma
E. Newcastle, parainfluenza

**25. What disease do iridoviruses cause?**
A African plague
B. Rabies
D.Nyukasl
E.Chechak

**26. What happens if an animal does not die from a viral illness?**
A. Reconvalent, carrier, separator
B.Aerogenic carrier
D. Alimentary carrier
E. Respiratory carrier

**27. Where is the visible pathological anatomical change observed in Newcastle disease?**
A. In the glandular and muscular stomach
B. In the brain, in the spleen
D. In the lungs, in the liver
E. In the kidney, in the lymph node

**28. How many hours should the pathological material sent to the laboratory be delivered?**

A.2 hours
B. As soon as possible
D.4 in hours
E. within 12 hours

**29. What causes a rise in temperature in viral disease?**

A. To heal
To the department
D.Septineuritis
E. Virusemiya

**30. What are gnotobiont animals?**

A. Animals bred under sterile conditions
B. Animals of the same species
D. Animals of the same sex
E. Animals used in the laboratory

**31. What clinical signs are observed in humans and animals with herpes virus diseases?**

A. Symptoms of herpes
B. Symptoms of rabies
D. Flower symptoms
E.Allergy, Anaphylaxis

**32. What formula do we use to calculate the titer of a virus?**

A. Reed and Mench, Kerber
B.Student, fisher
D.Fisher, Kerber
E.Bradis, Reed, Ashmarin

**33. What is interferon?**

A. A cell-produced protein
B. Acquired immunity
D.Antiv immunity
E. Passive immunity

**34. What is homologous interference?**

A. The resistance of viruses of the same generation
B. Infection of chicken embryos
Infection of the fertilized cell
E. Reproduction of viruses of the same generation

**35. What is heterologous interference?**

A. Resistance of viruses of different generations
B. Reproduction of viruses of different generations
Infection of fertilized cells
E. Infection of the chicken fetus

**36. In which tissues do pantropic viruses multiply?**

A. In all tissues
B. In nerve tissue
D. In the tissues of the internal organs
E. In the respiratory organs

**37. What do you mean by viral tropism?**

A. Cells that facilitate the reproduction of viruses
B. Cells in which the virus is easy to infect
D. Cells in which the virus is easy to exit
E. Cells grown in vitro under artificial conditions

**38. Which compound is most often used in the preservation of viruses** ?

A.Glycerin, FBR
B.Zardob, FBR
D.FBR, blood
E.Lyugol, Formalin

**39. How does rabies occur in animals?**

It is sharp and hidden
B. Chronic
D. It is sharp
E. Hidden night

**40. How is the long-term storage of laboratory strains?**

A. Due to the passage
B. Due to conservation
D. Due to cooling
E. Due to heating

**41. What are diagnostics?**

A. Erythrocyte, antigen, serum
B. Vaccines, antigens
D. Hyperimmune serum
E. Hemolysin, erythrocyte, antigen

**42. Magnetic mixer, what is it used for?**
A. In the preparation of trypsinized cells
B. In tissue decontamination
D. In cell growth
E. When mixing a cell with a virus
**43. Which viruses have the ability to hemagglutinate?**
A. Newcastle, influenza, smallpox
B. Rabies, Auyeski, vesicular stomatitis
D.Oqsil, marek, Teshen
E. Gastroenteritis plague, bronchitis
**44. When does the level of pathogenicity of an infected virus increase?**
A. When infected with naturally inclined animals
B. In laboratory animals
D. In chicken embryos
In EO-grown cells
**45. When does the pathogenicity of an infected virus decrease?**
A. When infected in animals that are not susceptible to this virus
B. In laboratory animals
D. In chicken embryos
E. In naturally inclined animals
**46. Using which serological reaction to the leukemia virus find out**
A.DPR, IFR
B.KBR, IFR
D.GATR, GADTR
E.NR, GAR, RP
**47. What serological test is used to identify the rabies virus?**
A.DPR, IFR
B. KBR, GART
D. GADTR, NR
E. BGAR, GAR
**48. What should be the size of the box room built to work with viral material?**
A.Boxing 8m $^2$, boxing received 4m $^2$
B.Boxing 9m $^2$, boxing received 4m $^2$
D.Boxing 7m $^2$, boxing received 3m $^2$
E.Boxing 10m $^2$, boxing received 6m $^2$
**49. Identify the protective factors against the virus during the circulation of the virus in the body through the blood, ie secondary viremia?**
A.Antitelo, phagocytosis, complement
B. Skin, mucous membranes, fluid secreted by the glands
D. Specific inhibitors of the virus in the periphery
Non-specific inhibitors and antibodies to the virus
**50. Identify protective factors against the virus during the entry of the virus into the body?**
A. Skin, mucous membranes, fluid secreted by the glands
B.Interferon, interference
D. Specific inhibitors of the virus in the periphery
E.Antitelo, phagocytosis, complement
**51. What is the name of the process that takes place during the multiplication of the virus inside the cell?**
A.Eklips
B.Mitosis
D.Adsorption
E. Transcription
**52. In an incubator, what causes a 70% increase in humidity when growing a chicken embryo?**
A. The air chamber is enlarged
B. The fetus does not grow
D. The fetus dries up
E. Air exchange is disrupted
**53. What causes a 40% decrease in humidity in the incubator during the rearing of hens?**
A. The fetus does not grow
B. Air exchange is disrupted
D.Horionallantois thickens the membrane

E. An air chamber is formed

**54. How many ways to transmit the virus to a chicken fetus?**

A. In two ways
B. In three ways
D. In five ways
E..In many ways

**55. What solutions do we use to label laboratory animals?**

A.Brilliant green, from picric acid
B. From iodine and alcohol
D. Chlorine and ether
From a solution of E. glycerin and lugol

**56. Induced by viruses in livestock complexes**
**What are the causes of the disease?**

A. Lack of vaccines
B. Weakness of animals
D. Lack of movement, lack of timely access to sunlight and greenery
E. Infecting each other

**57. What are the forces acting on the adsorption of virions on the cell surface?**

A. Receptors and ionic forces
B. Primary transcription
D. Repeated transcription
E. Secondary transcription

**58. What makes a supercapidic shell in virions?**

A. From a virus or cell
B.Kapsomerdan
D. Genomidan
E.Peplomerdan

**59. How many days before the birth of pigs in viral gastroenteritis should be vaccinated?**

A.40 days left
B.4 months left
D.2 months left
E.3 months left

**60. What are the nutrient media used in in vitro cell culture?**

A.GLA, 199, Igla
B.Trinsin, igla, FBR
D.Versen, trypsin, igla
E. Phosphate buffer solutions

**61. What are the solutions used to separate the cell into separate parts?**

A.Tripsin, Versen
B.199, Igla, GLA
D.Tirode, FBR
E. Physiological solution, trypsin

**62. For what purpose is ice used in the process of cell division?**

To reduce the effect of A. trypsin
B. For cell conservation
D. To clot the blood in the cell
E. To keep the cell alive

**63. What percentage of the serum of which species of animal is used for cell division and reproduction?**

A. 5% of the bull
B. 10% of pigs
D.Sigirning10%
5% of EQ

**66. Inside the thermostat should the test tubes on which the cell is growing be placed on a sloping slope?**

A.15 °
B.180 °
D.90 °
E.45 °

**67. What are the advantages of a cultured cell over laboratory animals, chicken embryos?**

A. Cheapness can directly interfere with the infectious process
B. Strong susceptibility to the virus
D. Easy to find and prepare
E. Hyperimmune whey is convenient to prepare

**66. What are the advantages of the chicken embryo over laboratory animals?**

A. Cheapness, sterility and no need for extra cocktails

B.Virus susceptibility and ease of infection
D. Possibility of preparation of hyperimmune serum
E. Neutralization reaction is possible

**67. What causes the fetus to cool when opening a chicken embryo?**

A. To narrow blood vessels
B. For the preservation of patmaterial
D. For better separation of the fetus from the yolk sac
E. For rapid separation of XAP

**68. What serological test is used to differentiate between avian influenza and Newcastle disease virus?**

A.GATR
B.DPR
D.IFR
E.NR

**69. How many different functions does a diffuse precipitation reaction perform**
**focused?**

A. Four types
B. Many kinds
D. Same
E.Two types

**70. What is done in the absence of Babesh-Negri corpses in the pathological material sent in rabies?**

A. Infected mice and put DPR-
An act is written stating that there are no Babesh-Negri bodies
D. Infected with other species of animals
E.KBR-put

**71. What is the sign of antibodies in the immunofluorescence reaction?**

A. Rhodamine sulfochloride, with isothiocyanate
B.Methyl blue, with FS-1, SS-4 + SS-8
D. Fuchsin with ML-1, ML-2
With E. phenolrot

**72. Who is the scientist who studied the biological properties of "slow-growing viruses" on the example of the dry virus?**

A.Gaydushek, 1976
B.lyumberg, 1976
D.Jdanov, 1974
E.Zilber, 1968

**73. What conditions should be prepared for the transmission of HAP virus to the chicken fetus?**

A. When viewed on an ovoscope, it should be marked with a pencil
B. Perforated by the air chamber and the XAP
D. Store in a thermostat for 2-3 days
E. The hole should be covered with paraffin, keeping it vertical

**74. What solution should be cleaned before infecting a chicken fetus with the virus?**

A.Spirt, iodine
B.Lizol, lime
D. Creolin, formalin
E. Physiological solution

**75. In which laboratory systems can be detected OM $_{50}$ (lethal dose ) of viruses ?**

A. In laboratory animals
B. In chicken embryos
In fertilized cells
E. In primary-trisinized cells

**76. Which viruses have a cubic shape?**

A. Smallpox viruses, ectromelia
B. Tobacco mosaic disease
D. Mix viruses
E.Adeno viruses

**77.Where to get material on the first day of the disease to diagnose proteinuria?**

From the composition of A.Afta, from the injured skin
B. From the fluid secreted from the nose
D. From feces, liver, spleen
E. From the brain, lungs, spleen

**78. Where is the pathological material obtained in viral diarrhea of large horned animals?**
A. Blood, fecal, lymph nodes, lungs, liver, spleen
B. From the saliva, from the brain
D.Blood, from injured conjunctiva
E. From the kidneys, from the brain
**79. Where is the pathological material obtained in adenovirus infection of large horned animals?**
A. From nasal fluid, blood, feces, lungs, lymph nodes, bronchi and trachea
B. From the composition of vesicles, pustules, aphthae
D. Saliva, from injured skin, from brain
E. From the liver, from the spinal fluid, from the brain
**80. Where to get pathological material in contagious ecthyma of sheep and goats ?**
A. From the contents of the vesicle, pustule, aphthae
B. Left, from the blood
D. Injured skin, brain, spleen
E. Liver, spinal fluid, kidneys
**81. Which vaccines are used in transmissible gastroenteritis in pigs?**
A.Riyemz, № 5 VGNKI
B.Saponin, farmol vaccine
D. Polyvalent vaccine
E. Bivalent vaccine
**82. Where is the pathological material obtained from avian influenza?**
A. From the composition of nasal fluid, vesicles, aphthae, pustules
B. From injured skin, conjunctiva, kidneys
D. Saliva, blood, feces
E. Brain, lungs, liver, lymph nodes
**83. What is the name of the carcasses formed in the plague of carnivores?**
A.Lentsa
B. Guarniyeri
D. Zeyfred
E. Babesh-Negri
**84. What are poxviruses?**
A.DNA, 200-300, X, +, cytoplasm, inside the cell, + -
B. DNA, 70-120, X, +, cytoplasm, inside the cell, -
D. RNA, 100, X, +, cytoplasm, within cells, +
E. DNA, 30-50, 72, -, nucleus, cell, -
**85. What are picornaviruses?**
A.RNA, 20-30, 60-62, -, cytoplasm, inside the cell, -
B.RNA, 100, X, +, cytoplasm, within cells, +
D.RNA, 80-200, X, -, nucleus and cytopl, intracellular, +
E.RNA, 100-200, X, -, nucleus and cytoplasm, within, +
**86. In what way is the causative agent of parainfluenza-3 transmitted to large horned animals?**
A.Respirator
B.Transmissive
Not checked
E. Because of the bite
**87. In what way the pathogen of infectious laryngotracheitis is transmitted to birds?**
A.Respirator
B. Due to the bite
D.Transmissive
Not studied
**88. From what substrate are vaccines against smallpox in birds made?**
From a grown cell
B. From organs and tissues
D. From the brain of a mouse
E. From a virus with reduced activity
**89. Identify a family of classified viruses?**
A.Retroviride
B. Picornaviride
D. Herpesviride
E.Adenoviride

**90. Who is the scientist who studied the biological properties of slow-growing viruses on the example of dry virus?**
A.Gaydushek, 1976
B.Blumberg, 1976
D.Jdanov, 1974
E.Zilber, 1968
**91. What is meant by contamination of viruses?**
A. Decrease in infection
B. Non-communicable diseases
D. The formation of immunity
E. Antigen-antibody complexes
**92. What is convalescence?**
A. The period of recovery from the disease
B. The period of infection
D. Post-vaccination condition
The situation on the eve of EO
**93. Who is the scientist who paracrystally isolated the mosaic disease virus in tobacco?**
A.Stenli, 1935
B.Tvort, 1915
D.Shlessinger, 1934
E.Bavden, 1937
**94. What are picornaviruses?**
A.RNA, 20-30, 60-62, -, cytoplasm, papule, +
B.RNA, 100, X, +, cytoplasm, within cells, +
D.RNA, 80-20, X, -, nucleus and cytopl, pustule, +
E. RNA, 10-200, X, -, nucleus and cytoplasm, roseola-
**95. What are coronaviruses?**
A.RNA, 70-120, X, +, cytopl, small intestine, +
B.RNA, 100-200, X, -, nucleus and cytoplasm, within, +
D. RNA, 65-80, X, nucleus and cytopl, intracellular, +
E. RNA, 20-100, X, -, nucleus and cytopl, stomach, +
**95. What are orthomyxoviruses?**
A.RNA, 80-200, 2000, +, nucleus and cytopl, shell, +
B. RNA, 70-80, 92, -, cytopl, xuj.ichida, -
D. RNA, 20-100, X, -, cytopl and nucleus, external, +
E. RNA, 65-80, X, -, nucleus and cytoplasm, xuj.ichida, +
**97. What are paramyxoviruses?**
A. RNA, 100-200, X, -, nucleus and cytopl, xuj.old, +
B.RNA, 70-120, X, +, cytopl, xuj.ichida, +
D.RNA, 65-80, X, -, nucleus and cytopl, xuj.ichida, x
E.DNA, 200-300, X, +, cytopl, xuj.ichida, - or +
**98. Which of the stages in the reproduction of viruses in the cell is correct?**
A.Adsorption, introduction, deproteinization, protein synthesis, components
synthesis, formation, output
B. Adsorption, deproitenization, introduction, protein synthesis, formation,
output
D. Synthesis of proteins, synthesis of components, introduction, formation,
output, deproteinization
E. Introduction, adsorption, deproitenization, synthesis of proteins, components
synthesis, formation, emergence
**99. What vaccines and what substances are used for disinfection for the prevention of plague in dogs?**
A.EPM, KF-668, 2% -NaON, 2% - active chlorine, 3% -lysol emulsion
B.VGNKI, Riyemz, alkali, formaldehyde, chlorine, phenol

DV ,LA-Sota, Bor-74, VGNKI, N, 1% - phenol, formalin, cresol, 3% - NaON
E. VNIVIP, VNIIBP, soda solution №1: 10000, chlorine vapor, lactic acid, organic acids, essential oils

**100. What microorganisms are most often associated with the semi-acute and chronic forms of swine fever?**
A. Pasteurellosis, paratyphoid, yellow fever, enterococci
B. Tuberculosis, brucellosis, Actinomycosis, smallpox
D. Rhinotracheitis, laryngotracheitis, parainfluenza, leukemia, trichomoniasis
E. White tuberculosis, rabies, smallpox, necrobacteriosis

**101. What is viroroscopy?**
A. Finding virus entry bodies
B. Identification of microbes
D. Preparation of branded drug
E. Dye staining drug.

**102 . What are the methods of serological diagnostics?**
A.BGAR, KBR
B.SPT, Biological Method
D.Luminis-sensory method
E. Fluorochrome stained antibody method

**103. What method do we use to diagnose parainfluenza in large horned animals?**
A. Hemagglutination cessation, Hemadsorption cessation reaction
B. From a diffuse precipitation reaction
D. From the complement binding reaction
E. From the neutralization reaction.

**104. What is the name of the pathology of the tongue, hooves, snake in proteinuria?**
A.Aftalar
B. Plaques
D. Furuncle
E. Carbuncle

**105. Identify the family and offspring of the proteinuria virus .**
A. Picornaviridae, Aphtavirus
B. Picornaviridae, Enterovirus
D.Poxviridae, Orthopoxvirus
E. Picornaviridae, Rinovirus.

**106. What method is used in the diagnosis of rabies?**
A. IFR, detection of antigen using DPR, encountering Babesh Negri corpuscles and placing a biological sample.
B. using FAU, NR, GATR.
D. NR, using GATR, met Babesh Negri corpses and placed a biological sample.
E. Antigen detection using CBR, BGAR, IFR, DPR.

**107. How do we identify the entry bodies of viruses?**
A. Light, using an electron microscope.
B. Using serological reactions
D. Using a biological sample
E. Using preservatives.

**108. What methods are included in the method of irradiated antibodies?**
A. Luminescence, fluorescence, phosphorescence.
B. Binding of erythrocytes to antigens.
D. Determination of antigens by dyes
E. Dyeing antigens in simple and complex methods

**109. What are fluorochromes?**
A. Light-emitting colors
B. Staining of erythrocytes
D. Determination of antigens
E. Painting preparations.

**110 . What antibodies are involved in the method of irradiated antibodies?**
A. Antibodies stained with fluorochrome.
B. Erythrocyte adhesions.
D.Normal antibodies.
E. Antibodies attached to antibodies.

**111. What is the process of irradiated antibody method?**
A. Luminescence process.

B. X-ray process
D.Scanner process.
E. Process in biological microscope.

**112.How is the DPR reaction set.**

A. Gellik's glasses, on Petri plates.
B. In test tubes.
D. Using pipettes.
E. In biological objects.

**113.What is a virus antigen?**

A. Viral proteins.
B. Microbes.
D. Bacteria.
E. Antibodies.

**114.What is the DPR reaction based on?**

A. Antithelial and dissolved antigens diffuse in the gel and form a precipitation line.
B. Detection of the presence of active virus after a certain period of time by adding a virus suspension with the same amount of serum.
D. The ability of a certain amount of virus to agglutinate a washed erythrocyte suspension with 1%.
E. Diffusion of antibodies in the serum against the virus obtained in the animal body.

**115. What is the test object in the neutralization reaction?**

A. Laboratory animals.
B.Probir-kada execution
Putting D.DPR.
E. Vibration of viruses.

**116.How many ways to technically perform the neutralization reaction?**

A.Two types.
B. Same.
D.Three types.
E. Four types.

**117. What is the essence of the neutralization reaction?**

**A.** Detection of the presence of an active virus after a certain period of time by adding a virus suspension with the same amount of serum.
B. To determine the presence of an active virus after a certain period of time by adding a suspension of antibodies with the same amount of serum.
D. Detection of the presence of an active virus after a certain period of time by adding a vaccine suspension with the same amount of antibodies
E. Detection of the presence of active virus after a certain period of time by adding a vaccine suspension with the same volume of blood serum.

**118. In which part of the cell do viruses that store DNA form inserted cells?**

A. In the nucleus
B. in the cytoplasm
D. in mitochondria
E.vakuolada

**119.1 What is the amount of GAB?**

A. A certain amount of virus is able to agglutinate 1% washed erythrocyte suspension
B. Dilution coefficient.
D. Number of dilute tests.
E. Positive response to the diluted effect.

**121. Where is the virus-retaining material obtained when birds are infected with the influenza virus in chickens?**

A. Divorce, from the brain **.**
From the trachea
D. Heart, brain.
E.Egg, from the brain.

**121. List the stages of infectious disease** ?

A. latent period, appearance of clinical sign 1, manifestation, recovery period, excitability.

B. latent period, bright manifestation of the disease, period of recovery.
D. latent period, bright manifestation of the disease, exacerbation of the pathogen.
E. The formation of immunity after infection.

**122. What is the word disinfection?**

A. Loss of infection
B. Pollution of the external environment
D. Killing a pathogenic microorganism
E. Effects on the epizootic chain .

**123. What are vaccines made of?**

A. from the causative agent of the disease or some of its parts or elements, including its venom.
B.only from the pathogen.
D.only from certain elements of the pathogen, including its venom.
Ederatization, patient isolation and treatment.

**124. List the types of vaccine?**

A. live, inactivated, deposited, chemical and anatoxins.
B. live, inactivated, weakened, and anatoxins.
D. alive, inactivated, weakened, and deposited.
E. inactivated, depleted, and deposited

**125. What are the ways of administering the vaccine?**

A. subcutaneously, subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
B.
subcutaneously, intramuscularly, orally.

D. subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
E. by scratching the skin and through the mouth.

**126. What are the signs of reproduction of the virus in the body of laboratory animals?**

A. Clinical signs of the disease, pathoanatomical changes, death.
B. clinical signs, cytopathic effect.
D. pathopathological changes, critical bodies, fragmentation.
E. Clinical, pathological, allergic changes.

**127. How many types and serovariants of protein virus are there?**

A.7 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1 and more than 80 serovariants.
There are B.8 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1, Panazia-2 and more than 80 serovariants.
Type D.6: O, A, S, SAT-1, SAT-2, SAT-3 and more than 80 serovariants.
Type E.4: SAT-1, SAT-2, SAT-3 and more than 80 serovariants.

**128. What types of protein virus are found in Asia?**

Types AA, O and Asia-1.
Types BA, S, SAT-1.
Types DO, S, SAT-1, SAT-2, SAT-3.
Types E.SAT-1, SAT-2, SAT-3.

**129. List the species of animals prone to proteinuria?**

A. all species of ungulates and wild animals.
B. all species of pairs and ungulates are farm and wild animals.
D. all species of agricultural and wild animals.
E. Only wild animals.

**130. What diseases should be distinguished from proteinuria?**

A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.
B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot and necrobacteriosis.

D. from vesicular stomatitis of pigs, parainfluenza-3, infectious rhinotracheitis, hoof rot and necrobacteriosis.
E. from hoof rot and necrobacteriosis.

**131. Signs of viral replication in chicken embryos?**

A. death, pathological changes.
B. clinical signs, death.
D. cytoparic effect, clanic symptoms.
E. Clinical signs, critical bodies, virions.

**133 What are the phases of growth of cultured cells?**

A. adaptation, logarithmic growth, cell death due to aging.
B. cessation of cell division, death.
D. adaptation, reproduction, wear, transition to tissue.
E. adaptation, the emergence of a cytopathic effect in the cell, cell death

**133. How many types of smallpox virus are there and in which species do they cause disease in animals?**

A. bovine spongiform encephalopathy and smallpox vaccine virus - orthopoxvirus genus; natural smallpox virus of sheep and goats - genus Carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; Avipoxvirus is a genus of avian Pox virus.
Natural
bovine spongiform encephalopathy is a genus of orthopoxvirus; natural smallpox virus of sheep and goats - genus Carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; The natural smallpox virus of birds is a genus of avipoxvirus.
D. smallpox vaccine virus of cows - orthopoxvirus generation; natural smallpox virus of sheep and goats - genus Carpi-Poxvirus; The natural smallpox virus of pigs is a genus of suipoxvirus.
The natural smallpox virus of E. coli is a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; The natural avian Pox virus is a genus of avipoxvirus.

**134. What is the diagnosis of smallpox?**

A. The diagnosis is made on the basis of clinical signs, epizootiological data, immunological examination (IFR and IDR), microscopy results and biosynthesis of susceptible animals, cell cultures and chicken embryos .
B. diagnosis is made on the basis of clinical signs, epizootiological data, microscopy results .
D. The diagnosis is made on the basis of clinical signs, epizootiological data and biosynthesis of susceptible animals, chicken embryos .
E. Results of microscopy.

**135. What type of virus is the causative agent of parainfluenza ?**

A. paramyxovirus
B. gerpesvirus.
D.ortomixovirus.
E.rabdovirus.

**136.Which species of animals are infected with the parainfluenza pathogen ?**

A.only cattle.
B.only pork.
D.only a bird.
E. Cattle, pigs and poultry.

**137. Which animals are the source of the parainfluenza pathogen ?**

A. sick cattle.
B. pathogen- carrying pigs.
D. sick birds
E. sick birds and pigs

**138. What measures are based on the prevention of parainfluenza?**

A. special and non-special preventive measures.
B. special preventive measures.
D. to special preventive measures.
E. measures to increase animal resistance.

**139.What type of virus is the causative agent of swine fever ?**

A.togaviridi family, Pestivirus-RNA.
B.herpesvirus-DNA.
D.ortomyxovirus - RNA.
E.rabdovirus - RNA.

**140. In what ways the pathogen is isolated from the organism in pigs?**

A. with urine, faeces, nasal and eye fluids.
B. with fluids flowing from the genitals.
D. with mucous substances excreted through the respiratory system.
E.with saliva.

**141. How many days is the latent period in the plague of pigs?**

A.3-20 days.
B.22-25 kun
D.25-30 kun.
E.26-32 kun.

**142. What types of cultured cells are there?**

A. Primary trypsin-treated cells, subcultures, intertwined tissue cultures, diploid cell cultures.
B. Suspended cell culture, tissues.
D. cells, subcultures, tissues treated with primary trypsin.
E. Cells, subcultures, cell tissues treated with primary trypsin.

**143. Which bird species is prone to Newcastle disease?**

A. chicken, turkey, sesarka, tustovuq, peacock, dove, sparrow, hakka, parrot, hawk
B.only chicken, turkey, turkey.
D.only chicken, sesarka, tustovuq, kaftar, sparrow.
E.only chicken, turkey, peacock, hakka, parrot, hawk.

**144.Which birds are the source of Newcastle disease ?**

A. sick and pathogenic carrier birds.
B.only pathogen- carrying pigs.
D.only sick birds.
E.only sick birds and pigs.

**145. In Newcastle disease, how does the virus get into the environment?**

A. sick and diseased pathogen with all secretions and excretions, breath and eggs through the mouth, nose, eyes and cloaca of the carrier bird.
B.only with secretions and excretions secreted by the mouth and cloaca of the sick bird.
D.only with the secretions and excretions secreted by the sick pathogen through the mouth and cloaca of the carrier bird.
E. only with the breath and eggs of a bird carrying a sick and diseased pathogen.

**146. How many serovariant strains of avian influenza virus are there?**

There are 8 strains of A. influenza virus (A1-A8). To date, the virus has been found to contain 15 hemagglutinins and 9 neuraminidase serovariants.
There are 7 strains of B. influenza virus (A1-A7).
There are 6 strains of D. influenza virus (A1-A6).
There are 5 strains of E. influenza virus (A1-A5).

**147. According to which group of diseases belongs to the rate of spread of avian influenza virus?**

A.panzootic.
B.epizootic.
D.enzootic.
E.sporadik.

**148. What is the percentage of morbidity and mortality in avian influenza?**

A. morbidity is 80-100%, mortality is 10-90%.

B. morbidity 50-60%, mortality 5-10%.

D. morbidity 40-50%, mortality-3-8%.

E. sickness 30-40%, mortality-2-6%.

**149. In what ways does the avian influenza virus enter the body?**

A.alimentary, respiratory, transovarial (through the egg).

B.only alimentary.

D. respirator only.

E. transovarial only (through the egg).

**150. What diseases should be distinguished from influenza?**

From diseases of A. Newcastle, pasteurellosis, spirochetosis, infectious laryngotracheitis, infectious bronchitis.

B. from mycoplasmosis, infectious laryngotracheitis, bronchitis.

D. from infectious encephalomyelitis, infectious anemia, salmonellosis.

From E. colibacillosis, pullorosis, leukemia.

**151.Which virus causes Marek's disease?**

A. herpesvirus.

B.togavirus

D.reovirus

E.paramyxovirus

**152. In what ways the Marek virus enters the body?**

A. respiratory organs, alimentary, through the skin pat follicle, insect, mite, beetle, transovarial.

B.only alimentary, through the skin pat follicle, transovarial.

D.only through the respiratory organs and transovarial.

E. alimentary and transmissible only.

**153. What type of virus causes avian leukemia?**

A. oncornavirus.

B. gerpesvirus.

D.ortomixovirus.

E.paramyxovirus

**154. What species of birds are prone to avian leukemia?**

A. chicken, turkey, sesarka, duck, goose, hawk, dove, parrot, canary, quail and others.

B.only chicken, turkey, duck, turkey , dove.

D.only chicken, goose, cesarean, smoker, parrot.

E.only a goose, a cesarean, a white bird, a parrot.

**155. In what ways the avian leukemia virus enters an organism?**

A. through the respiratory organs, alimentary tract and transovarial.

B.only alimentary, through the skin pat follicle.

D.only transovarial.

E.only alimentary and transmissible.

**156.Who is the causative agent of infectious laryngotracheitis?**

A. herpesvirus.

B.togavirus

D.reovirus

E.paramyxovirus

**157. What are the signs of viral replication in cultured cells?**

A. Cytopathic effect, fragmentation, rounding, simple formation, GADR.

B. Cytopathic effect, fragmentation, clinical manifestations, death.

D. Cytopathic effect, fragmentation, rash formation, cell death.

E. Cytopathic effect, fragmentation, clinical signs, rounding, simple formation, GADR.

**158. Who is the causative agent of infectious bronchitis?**

A. coronavirus.

B.togavirus

D.reovirus

E.paramyxovirus.

**159. What type of virus causes horse flu?**

A. ortho-mixoviride family, RNA virus belonging to the genus Influenza virus.

B.togavirus

D.reovirus

E.paramyxovirus.

**160. What is the titer of the virus?**

A. the amount of virus stored in the material per unit volume.

B. Immunoglobulins in the material.

D. Weight of live vaccines.

E. Unit of action of gamma globulins.

**161. What is a conjugate?**

A. Antibodies marked with fluorochromes.

B. Hyperimmune serum.

D. Interferon, immunofluorescent.

E. ready antibodies.

**162. What disease should be distinguished from smallpox?**

A. Contagious ecthyma, temiraiki, scabies.

B. Brucellosis, piroplasmidosis, salmonellosis.

D.Auyeski, listeriosis, leptospirosis, enterotoxemia.

E.salmonellosis, senurosis, rabies.

**163. From which disease should Aujeszky's disease be distinguished?**

A. Enterotoxemia, hemorrhagic septicemia, laptospirosis, listeriosis.

B. Poisoning, inflammation of the joints, salmonellosis.

D. Rabies, trichophytosis, listeriosis.

E. Pneumonia, scrapes, anthrax.

**164. What antigens does the rabies virus contain?**

A. Glycoproteins, nucleoproteins.

B. Nucleocapsidli.

D.Superproteinli.

E. Glycocapsidli.

**165. How many reagents are used for the diagnosis of smallpox?**

A.3 pcs, Ruge, chemical, ammonia silver.

B.2 ta, Ruge, ammonia silver.

D.1 per ammonia silver.

E.4 pcs Ruge, chemical, carbolic acid, ammonia silver.

**166. What are the specific factors that constantly affect the immune system after the pathogen enters the body?**

A. specific macrophages, plasma cells, cells of the lymphoid system, antibodies.

B. antibodies, cells of the lymphoid system.

D. specific macrophages, antibodies-immunoglobulins.

E.antitelolar-immunoglobulins.

**167. List the types of immunity?**

A. antibacterial, antitoxic, antiviral, hereditary, acquired, active, passive, sterile, nosteril, humoral, cellular.

B. antibacterial, antiviral, hereditary, acquired, active, passive, humoral.

D. antibacterial, antitoxic, increased , active, passive, sterile, nosteril.

E.passive, sterile, nosteril.

**168. List the diseases that spread panzootic?**

A. proteinuria, avian influenza, bovine plague.

B. anthrax, black brucellosis, tuberculosis.

D. anthrax, brucellosis, leptospirosis.

E. anthrax, brucellosis.

**169. What are vaccines made of?**

A. from the causative agent of the disease or some of its parts or elements, including its venom.

B.only from the pathogen.

D.only from certain elements of the pathogen, including its venom.

E.deratization, patient isolation and treatment.

**170. List the types of vaccine?**

A. live, inactivated, deposited, chemical and anatoxins.
B. live, inactivated, weakened, and anatoxins.
D. alive, inactivated, weakened, and deposited.
E. inactivated, depleted, and deposited

**171. What are the ways of administration of the vaccine?**

A. subcutaneously, subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
B.
subcutaneously, intramuscularly, orally.

D. subcutaneously, intramuscularly, by scratching the skin, by mouth, aerosol.
E. by scratching the skin and through the mouth.

**172. List the types of disinfection?**

A.4 types: prophylactic, current, mandatory, final.
B.3 is different: prophylactic, mandatory, final.
D.3 is different: prophylactic, current, mandatory.
E.2 is different: prophylactic, mandatory.

**173. How many types of disinfection are there according to the methods of exposure?**

A.3 types: physical, chemical, biological.
B.4 types: mechanical cleaning, physical, chemical, biological.
D.5 types: physical, mechanical cleaning, drying, chemical, biological.
E.2xil: physical, mechanical cleaning.

**174. How many types of physical disinfection are there?**

A.5 types: mechanical cleaning, under the influence of light (sunlight, UFN, gamma light), ultrasound, drying, high temperature (boiling, hot steam, dry hot, fire burning, ironing, aqueous steam autoclave.
Type B.6: mechanical cleaning, exposure to light (sunlight, UFN, gamma light), ultrasound, drying, burning, high temperature (boiling, hot steam, dry hot, ironing), autoclaving.
Type D.4: mechanical cleaning, exposure to light (sunlight, UFN, gamma light), drying, high temperature (boiling, hot steam, dry hot, fire burning, ironing, aqueous steam autoclave).
Type E.2: mechanical cleaning, high temperature (boiling, hot steam, dry hot, fire burning, ironing, aqueous steam-autoclave).

**175. What are the different types of chemicals used in disinfection ?**

A.7 types: alkalis, acids, chlorinated substances, oxidizing agents (potassium permanganate, hydrogen peroxide) phenols, formalin, triethylene glycol.
Type B.6: alkalis, acids, chlorinated substances, oxidizing agents (potassium permanganate, hydrogen peroxide) phenols, formalin.
D.5 various alkalis, acids, chlorinated substances, phenols, formalin.
Type E.4: alkalis, acids, chlorinated substances.

**176. What are the main clinical signs of proteinuria?**

A. occurs in the mucous membranes of the mouth, gums, palate and tongue 1 week, between the udder and hooves 2 weeks, the temperature of the animal rises. Salivation, loss of appetite, thirst, lameness are observed. The hooves may fall off. Heart activity decreases sharply in milk and young calves.
B. ulcers appear on the mucous membranes of the mouth, gums, palate , and between the tongue, udder, and

hooves. In young calves the disease is mild.
D. ulcers appear in the mouth and tongue, the temperature of the animal does not rise. Lameness is observed due to the wound on the hooves. Passes easily in young calves.
In young calves the disease is mild

**177. What diseases should be distinguished from proteinuria?**

A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.
B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot and necrobacteriosis.
D. from vesicular stomatitis of pigs, parainfluenza-3, infectious rhinotracheitis, hoof rot and necrobacteriosis.
E. from hoof rot and necrobacteriosis.

**178. List the species of animals susceptible to rabies virus?**

A. all species of warm-blooded animals, rodents, bats, birds, humans.
B. pairs of ungulates and ungulates, rodents, humans.
D. all horned farm and wild animals, rodents, dogs, cats, humans.
E.it, cat

**179. What species of animals are the reservoir of rabies virus in nature ?**

A. all wild animals.
B.it, cat.
D. bat.

**180. How is rabies diagnosed?**

A. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions, the results of biological tests in mice .
B. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions.
D. epizootiological data, clinical signs, microscopy of smears prepared from the brain.
E. based on the results of biological tests in mice .

**181. What is the method of staining the drug in smallpox?**

In the silvering method of A. Morozov.
B. Mixin method.
D. Romanovskiy Gimza.
E. Microscopy results.

**182. What is the method of staining the drug in the diagnosis of rabies?**

In the method of A. Sellers.
In the silvering method of B. Morozov.
In the method of D. Mixin.
E. Results of microscopy

**183. Family and generation of parainfluenza virus of large horned animals?**

A.Myxoviridae, Paromixovirus.
B. Picornaviridae, Aphtovirus.
D.Myxoviridae, Ortomixovirus.
E.Poxviridae, Orthopoxvirus **.**

**184. Family and generation of smallpox virus?**

A.Poxviridae, Orthopoxvirus.
B.Myxoviridae, Paromixovirus.
D.Myxoviridae, Ortomixovirus.
E. Picornaviridae, Aphtovirus.

**185. What is the mortality rate of chickens in Newcastle disease?**

A.90%
B.50%
D.40%
E.10%

**186. Retrospective diagnosis of proteinuria?**

A.RIDR, BIFR.
B.NR, DPR.

D.GATR, IFR.
E.IFR, DPR.

**187. Identify an example of viral respiratory diseases of birds.**

A. Newcastle, Influenza, infectious laryngotracheitis, infectious bronchitis.
B. Smallpox, viral hepatitis, infectious bronchitis.
D. Viral hepatitis, infectious bronchitis, Newcastle.
E. Influenza, infectious laryngotracheitis, smallpox.

**188. What are input bodies?**

Characteristic morphological changes in a cell infected with A. virus.
B. latent period of the disease.
D. changes in the cell.
E. Some changes in tissues.

**189.Nucleoid bu-?**

Nucleic acid central part of A. virus, nucleus of bacteria.
B. antigen of pathogens in animals.
D. The formation of a new cell by division and reproduction.
A component of the E. virion.

**190. Allantois which cavity?**

A. Embryonic bladder.
B. The inner curtain that surrounds the cocoon.
D. Fetal body.
E. fluid around the fetus.

**191. What is an antibody?**

A. Protein-immune substances formed in the blood and tissues when antigens enter the body.
B. Substances that enter the body and cause an immune response.
D. systems with the ability to reproduce an organism or parts.
E. substances that retain their properties after special processing.

**192. Anticoagulants are -?**

A. Substances that impair the activity of the blood coagulation system.
B. Substances that enter the body and cause an immune response.
D. systems with the ability to reproduce an organism or parts.
E. substances that retain their properties after special treatment.

**193. What is hemolysis?**

A. The breakdown of erythrocytes in the blood and the release of hemoglobin into the environment.
B. adhesion of red blood cells to the sediment.
D. Bleeding in the tissue as a result of damage.
E. Occurrence of red blood cells in animal secretions.

**194. Incubation period-?**

A. The period from the time of infection to the time when the clinical symptoms of the disease appear.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material .

**195. Capsomers-?**

The form unit that forms the A. virion capsid is composed of several asymmetric protein molecules.
B. A component of a virion.
D. Fragment of the virus.
A fragment composed of E. nucleic acids.

**196.Pathogenesis-?**

A. Outbreaks of the disease.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material .

**197. What is proliferation?**

A. The formation of a new cell by dividing and multiplying.
B. The duration of action of the cell.
D. Cell death.

E. The period from the time of infection to the appearance of clinical symptoms of the disease.

**198. What is a vesicle?**

A. Early morphological elements of skin rashes.

B. appearance of infectious exanthema, tumor.

D. smallpox, papule.

E. papular and pustular condition.

**199. What is a passage?**

A. Infection of animals prone to microorganisms and viruses with pathogens.

B. Isolation of viruses.

D. Diagnosis of the disease.

E. Infection of allergens.

**200. What is the purpose of trypsin?**

A. In the separation of cells from tissues.

B. In cell nutrition.

D. As solvent substances.

E. When dividing a cell from a glass mattress.

**201. Who is the scientist who introduced the word antigen in virology?**

ALDoych.

B.Donne.

D.Duklo.

E.Dyurgem

**202. Who is the scientist who introduced the word antibiotic in medicine and veterinary medicine?**

ALAVissman.

BTXVeller.

DJAVillemen.

BVVoskressenskiy

**203. How many types and serovariants of protein virus are there?**

A.7 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1 and more than 80 serovariants.

There are B.8 types: O, A, S, SAT-1, SAT-2, SAT-3, Asia-1, Panazia-2 and more than 80 serovariants.

Type D.6: O, A, S, SAT-1, SAT-2, SAT-3 and more than 80 serovariants.

Type E.4: SAT-1, SAT-2, SAT-3 and more than 80 serovariants

**204. What types of protein virus are found in Asia?**

Types AA, O and Asia-1.

Types BA, S, SAT-1.

Types DO, S, SAT-1, SAT-2, SAT-3.

Types E.SAT-1, SAT-2, SAT-3}

**205. List the species of animals prone to proteinuria?**

A. all species of ungulates and wild animals.

B. all species of pairs and ungulates are farm and wild animals.

D. all species of agricultural and wild animals.

E. Only wild animals

**206. What diseases should be distinguished from proteinuria?**

A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.

B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot and necrobacteriosis.

D. from vesicular stomatitis of pigs, parainfluenza-3, infectious rhinotracheitis, hoof rot and necrobacteriosis.

E. from hoof rot and necrobacteriosis

**207. In what clinical forms of infectious rhinotracheitis is manifested?**

A. The disease takes the following forms: respiratory, vulvovaginitis (blistering rash), conjunctivitis and meningoencephalitis.

B. The disease takes the following forms: respiratory, vulvovaginitis (vesicular rash) and meningoencephalitic forms.

D. The disease takes the following forms: respiratory, vulvovaginitis (blistering rash), and conjunctivitis.

E. Air, food, water, seeds, inventory, vehicles, poultry are the carriers of the virus. Under natural conditions, the virus enters mainly through the genitals, mucous membranes of the eyes during respiration and exhalation

**208. What methods are used to diagnose YURT?**

A. is based on clinical signs, epizootiological data, pathological changes and, of course, the results of laboratory tests. For retrospective diagnosis, serum is serologically (IDR, NR, and BGAR) checked at the beginning of the disease and 2-3 weeks later. If the antibody titer increases 4 times , the diagnosis is considered definite.

B. based on clinical signs, epizootiological data and, of course, the results of laboratory tests. Blood serum at the beginning of the disease and after 2-3 weeks for a retrospective diagnosis1erologic (IDR, NR, and BGAR) are examined. If the antibody titer increases 10 times , the diagnosis is considered definite.

D. based on clinical signs, epizootiological data and, of course, the results of laboratory tests.

E. For retrospective diagnosis, serum is serologically (IDR, NR, and BGAR) checked at the beginning of the disease and 2-3 weeks later.

**209. How many types of smallpox virus are there and in which species do they cause disease in animals** ?

A. natural smallpox virus and smallpox vaccine virus in cows - orthopoxvirus generation; natural smallpox virus of sheep and goats - a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; Avipoxvirus is a genus of avian Pox virus.

B. natural smallpox virus of cows - orthopoxvirus genus; natural smallpox virus of sheep and goats - a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; The natural smallpox virus of birds is a genus of avipoxvirus.

D. smallpox vaccine virus of cows - orthopoxvirus generation; natural smallpox virus of sheep and goats - carpi-poksvirus generation; The natural smallpox virus of pigs is a genus of suipoxvirus.

The natural smallpox virus of E. coli is a genus of carpipoxvirus; natural smallpox virus of pigs - suipoxvirus generation; birds of natural smallpox virus - avipoksvirus avlodi.Uning 8 Greko, chicken base and canary pox viruses

**210. What is the diagnosis of smallpox?**

A. The diagnosis is made on the basis of clinical signs, epizootiological data, immunological examination (IFR and IDR), microscopy results and biosynthesis of susceptible animals, cell culture and chicken embryo .

B. The diagnosis is made on the basis of clinical signs, epizootiological data, microscopy results .

D. The diagnosis is made on the basis of clinical signs, epizootiological data and biosynthesis of susceptible animals, chicken embryos .

E. Results of microscopy

**211. What type of virus is the causative agent of parainfluenza ?**
A. paramyxovirus
B. gerpesvirus.
D.ortomixovirus.
E.Rabdovirus
**212. What species of animals are infected with the parainfluenza pathogen ?**
A.only cattle.
B.only pork.
D.only a bird.
E. Cattle, pigs and poultry
**213. Which animals are the source of the parainfluenza pathogen ?**
A. sick cattle.
B. pathogen- carrying pigs.
D. sick birds
E. sick birds and pigs
**214. What measures are based on the prevention of parainfluenza?**
A. special and non-special preventive measures.
B. special preventive measures.
D. to special preventive measures.
E. measures to increase animal resistance
**215. What type of virus is the causative agent of swine fever ?**
A.togaviridi family, Pestivirus-RNA.
B.herpesvirus-DNA.
D.ortomyxovirus - RNA.
E.rabdovirus - RNA
**216. In what ways the pathogen is isolated from the organism in pigs?**
A. with urine, faeces, nasal and eye fluids.
B. with fluids flowing from the genitals.
D. with mucous substances excreted through the respiratory system.
E.with saliva
**217. What is the word disinfection?**
A. Loss of infection
B. Pollution of the external environment
D. Killing a pathogenic microorganism
E. Effects on the epizootic chain
**218. How to diagnose infectious diseases?**
A. The diagnosis is made on the basis of epizootiological data, clinical, pathological, bacteriological, virological, serological, histological, allergic, hematological examination and biopsy results.
B. epizootiological data, clinical, bacteriological, virological, serological, diagnostic and bioclinical results.
D. The diagnosis is made on the basis of epizootiological data, clinical, pathoanatomical, allergic examination results.
E. The diagnosis is made based on the results of clinical, pathological, allergic examination
**219. How many days is the latent period in the plague of pigs?**
A.3-20 days.
B.22-25 kun
D.25-30 kun.
E.26-32 kun
**220. What measures are taken in the swine fever?**
A. quarantine measures.
B. restrictive measures.
D. quarantine and restrictive measures.
E. No quarantine and restrictive measures are taken, isolation and treatment of patients are carried out on the farm
**221. Which bird species is prone to Newcastle disease?**
A. chicken, turkey, sesarka, tustovuq, peacock, dove, sparrow, hakka, parrot, hawk
B.only chicken, turkey, turkey.
D.only chicken, sesarka, tustovuq, kaftar, sparrow.
E.only chicken, turkey, peacock, hakka, parrot, hawk

**222. Which birds are the source of the pathogen of Newcastle disease ?**
A. sick and pathogenic carrier birds.
B.only pathogen- carrying pigs.
D.only sick birds.
E.only sick birds and pigs
**223. How the virus is released into the environment in Newcastle disease?**
A. sick and diseased pathogen with all secretions and excretions, breath and eggs through the mouth, nose, eyes and cloaca of the carrier bird.
B.only with secretions and excretions secreted by the mouth and cloaca of the sick bird.
D.only with the secretions and excretions secreted by the sick pathogen through the mouth and cloaca of the carrier bird.
E.only with the breath and eggs of a bird carrying a sick and diseased pathogen
**224. How many serovariant strains of avian influenza virus are there?**
There are 8 strains of A. influenza virus (A1-A8). To date, the virus has been found to contain 15 hemagglutinins and 9 neuraminidase serovariants.
There are 7 strains of B. influenza virus (A1-A7).
There are 6 strains of D. influenza virus (A1-A6).
There are 5 strains of E. influenza virus (A1-A5)
**225. According to which group of diseases the avian influenza virus is spread?**
A.panzootic.
B.epizootic.
D.enzootic.
E.Sporadik
**226. What is the percentage of morbidity and mortality in avian influenza?**
A. morbidity is 80-100%, mortality is 10-90%.
B. morbidity 50-60%, mortality 5-10%.
D. morbidity 40-50%, mortality-3-8%.
E. sickness 30-40%, mortality-2-6%
**227. In what ways the avian influenza virus enters the body?**
A.alimentary, respiratory, transovarial (through the egg).
B.only alimentary.
D. respirator only.
E. transovarial only (through the egg)
**228. What diseases should be distinguished from influenza?**
From diseases of A. Newcastle, pasteurellosis, spirochetosis, infectious laryngotracheitis, infectious bronchitis.
B. from mycoplasmosis, infectious laryngotracheitis, bronchitis.
D. from infectious encephalomyelitis, infectious anemia, salmonellosis.
From E. colibacillosis, pullorosis, leukemia
**229. Which virus causes Marek's disease?**
A. herpesvirus.
B.Togavirus
D.reovirus
E.paramyxovirus
**230. In what ways does the Marek virus enter the body?**
A. respiratory organs, alimentary, through the skin pat follicle, insect, mite, beetle, transovarial.
B.only alimentary, through the skin pat follicle, transovarial.
D.only through the respiratory organs and transovarial.
E.only alimentary and transmissible
**231. What type of virus causes leukemia in birds?**
A. oncornavirus.
B. gerpesvirus.
D.ortomixovirus.
E.Paramyxovirus

**232. What kind of birds are susceptible to avian leukemia?**
A. chicken, turkey, sesarka, duck, goose, hawk, dove, parrot, canary, quail and others.
B.only chicken, turkey, duck, turkey , dove.
D.only chicken, goose, cesarean, smoker, parrot.
E.only a goose, a cesarean, a white bird, a parrot
**233. In what ways the avian leukemia virus enters an organism?**
A. through the respiratory organs, alimentary tract and transovarial.
B.only alimentary, through the skin pat follicle.
D.only transovarial.
E.only alimentary and transmissible
**234. Who is the causative agent of infectious laryngotracheitis?**
A. herpesvirus.
B.Togavirus
D.reovirus
E.paramyxovirus
**235. In what ways the virus of infectious laryngotracheitis enters the body?**
A. through respiratory organs, contact, and insects.
B.only alimentary, through the skin pat follicle.
D.only transmissible and transovarial.
E.only alimentary and transmissive}
**236. Who is the causative agent of infectious bronchitis?**
A. coronavirus.
B.Togavirus
D.reovirus
E.paramyxovirus
**237. What type of virus causes equine influenza in horses?**
A. Orthomyxoviride family, RNA virus belonging to the genus Influenza virus.
B.Togavirus
D.reovirus
E. Paramyxovirus
**238. What are the special serums used in the etiotropic treatment of parvovirus enteritis plague and infectious hepatitis?**
A. Inactivated vaccines.
B. Hyperimmune serum, immunoglobulins.
D. Live vaccines.
E. Gamma globulins
**239. What are the most effective means in the prevention of plague and infectious hepatitis?**
A.Reconvalissent blood serum.
B. Hyperimmune serum.
D.Interferon, interferonogen, kinoran, miksoferon.
E. ready antibodies
**240. What disease should be distinguished from smallpox?**
A. Contagious ecthyma, temiraiki, scabies.
B. salmonellosis, senurosis, rabies
D.Auyeski, listeriosis, leptospirosis, enterotoxemia.
Brucellosis, piroplasmidosis, salmonellosis.
**241. From which disease should Aueski's disease be distinguished?**
A. Rabies, trichophytosis, listeriosis.
B. Poisoning, inflammation of the joints, salmonellosis.
D. Enterotoxemia, hemorrhagic septicemia, laptospirosis, listeriosis.
E. Pneumonia, scrapes, anthrax
**242. Collection of diagnostics for infectious rhinotracheitis of large horned animals is prepared in which biofactories?**
In A.Privoljye biofactory.
B. In the biofactory of Kazakhstan.
D. In the biofactory of Kyrgyzstan.
At the E. Pokrov biofactory

**243. Parvovirus enteritis in dogs belongs to which family, what is its cryptogram?**
A.Parvovirus D / 1: 1.5-2.0 / 19-25: s / s: v / o.
B.Adenoviridaye
D.Gerpesviridaye.
E.Reoviridaye
**244. The latent period of rabies:**
A.1- year and older.
B.1-3 days;
D.1-13 kun ;;
E.1-23 kun;
**245. Anticoagulants are -?**
A. Substances that impair the activity of the blood coagulation system.
B. Substances that enter the body and cause an immune response.
D. systems with the ability to reproduce an organism or parts.
E. substances that retain their properties after special treatment.
**246. What is hemolysis?**
A. The breakdown of erythrocytes in the blood and the release of hemoglobin into the environment.
B. adhesion of red blood cells to the sediment.
D. Bleeding in the tissue as a result of damage.
E. Occurrence of red blood cells in animal secretions
**247. Incubation period-?**
A. The period from the time of infection to the appearance of clinical symptoms of the disease.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material
**248. Capsomers-?**
The form unit that forms the A. virion capsid is composed of several asymmetric protein molecules.
B. A component of a virion.
D. Fragment of the virus.
A fragment composed of E. nucleic acids
**249. Pathogenesis-?**
A. Outbreaks of the disease.
Development of B. viral disease.
D. Clinical signs of the disease.
E. latent infection in pathological material
**250. What is a vesicle?**
A. Early morphological elements of skin rashes.
B. appearance of infectious exanthema, tumor.
D. smallpox, papule.
E. papular and pustular condition
**251. List the types of disinfection?**
Type A.2: prophylactic, mandatory.
B.3 is
different: prophylactic, mandatory, final.
D.3 is different: prophylactic, current, mandatory.
E. There are 4 types: prophylactic, current, final, mandatory
**252. What are the main clinical signs of proteinuria?**
A. Appears on the mucous membranes of the mouth, gums, palate and tongue for 1 week, between the udder and hooves for 2 weeks, the temperature of the animal rises. Salivation, loss of appetite, thirst, lameness are observed. The hooves may fall off. Heart activity decreases sharply in milk and young calves.
B. sores appear on the mucous membranes of the mouth, gums, palate, and tongue, between the udder and hooves. In young calves the disease is mild.
D. sores appear in the mouth and tongue, the temperature of the animal does not rise. Lameness is

observed due to the wound on the hooves. Passes easily in young calves.
E. The disease is mild in young calves

**253. What diseases should be distinguished from proteinuria?**

A. from vesicular stomatitis, smallpox, viral diarrhea, dangerous catarrhal fever, and cattle plague.
B. from non-infectious vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, sheep catarrhal fever, hoof rot, and necrobacteriosis.
D. From swine vesicular stomatitis, parainfluenza-3, infectious rhinotracheitis, hoof rot, and necrobacteriosis.
E. from hoof rot and necrobacteriosis

**254. List the species of animals that are susceptible to the rabies virus?**

A. all species of warm-blooded animals, rodents, bats, birds, humans.
B. pairs of ungulates and ungulates, rodents, humans.
D. all horned farm and wild animals, rodents, dogs, cats, humans.
E.it, cat

**255. What species of animals are the reservoirs of the rabies virus in nature ?**

A. all wild animals.
B.it, cat.
D. bat
E. pairs of ungulates and ungulates, rodents, humans.

**256. How is rabies diagnosed?**

A. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions, the results of biological tests in mice .
B. on the basis of epizootiological data, clinical signs, microscopy of smears prepared from the brain, detection of viral antigen in IDR, NR and FAU reactions.
D. epizootiological data, clinical signs, microscopy of smears prepared from the brain.
E. based on the results of biological tests in mice

**257. How to dye smallpox?**

In the silvering method of A. Morozov.
In the B. Mixin method.
D.Romanovskiy Gimza.
E. Microscopy results

**258. How to use the drug in the diagnosis of rabies?**

In the method of A. Sellers.
In the silvering method of B. Morozov.
D. Mixin method.
E. Microscopy results

**259. Family and offspring of large horned animals parainfluenza virus?**

A.Myxoviridae, Paromixovirus.
B. Picornaviridae, Aphtovirus.
D. Myxoviridae, Ortomixovirus.
E. Poxviridae, Orthopoxvirus

**260. Family and generation of smallpox virus?**

A.Poxviridae, Orthopoxvirus.
B.Myxoviridae, Paromixovirus.
D.Myxoviridae, Ortomixovirus.
E. Picornaviridae, Aphtovirus

**261. What is the mortality rate among chickens in Newcastle disease?**

A.90%
B.50%
D.40%
E.10%

**262. Retrospective diagnosis of proteinuria?**

A.RIDR, BIFR.
B. NR, DPR.
D. GATR, IFR.
E. IFR, DPR

**263. Give an example of viral respiratory diseases of birds.**

A. Newcastle, Influenza, infectious laryngotracheitis, infectious bronchitis.
B. Smallpox, viral hepatitis, infectious bronchitis.
D. Viral hepatitis, infectious bronchitis, Newcastle.
E. Influenza, infectious laryngotracheitis, smallpox

**264. What is the name of the corpuscles formed in birds with laryngotracheitis?**

A.Zeyfred.
B.Bollinger.
D.Lentsa.
E.Babesh-Negri

**265. What is the name of the cells formed in the cytoplasm of nerve cells by the rabies virus?**

A. Babesh-Negri bodies.
B.Bollinger bodies.
D. Guarnieri bodies.
E. Zeyfred bodies

**266. What universal method of staining is used in the preparation of ointments for pathological material in rabies?**

A. Hemotoxillin with eosin.
B. Romanovsky-Gimza method.
In the method of D. Kozlovsky.
In the E.Sil-Nilsson method

**267. For biological examination of viral diseases, find the line with the correct method and pathological sign of infection of rabbits with Ayeski's disease.**

A. Intramuscular, subcutaneous, encephalitis, pruritus, death.
B. intracerebral, intramuscular, paralysis, death.
D. Forms a wound under the skin, inside the skin, at the site of delivery.
E. Intracerebral edema of the skin, head

**268. What is one of the important achievements of the chicken fetus?**

A. All the answers are correct.
B. High sensitivity to a wide range of viruses.
D. Protected by bark.
E. Not requiring care

**269. Who was the first to detect changes in cell structure as a result of the growth of viruses in the cell?**

A.Enders, 1949 y.
B.Fogt, 1950 y.
D.Dalbekko, 1951 y.
E.Xuang,! 952y.

**270. In virology 1 YUM50 - what does it mean in laboratory animals?**

A. causing a clinical sign or pathological changes.
B.letal amount.
D. The amount of cytopathic effect.
E. the resulting quantity

**271. Knots, plaques from pathological changes are formed when infecting which laboratory system with the virus?**

AO grown cells.
B. chicken embryos.
D.laboratory animals.
E. tissues, patmaterial

**272. What is the name of the proteins produced by the body against warm-blooded animals when parenteral administration of high-molecular foreign substances?**

A.Antibodies.
B.Antigens.
D. Hemagglutinins.
E. Anticoagulants

**273. The essence of the neutralization reaction?**

A. is added to a test tube of the virus suspension with the same amount of serum, and after some time the active virus is detected in the mixture.

B. Antibody meets a homologous antigen, surrounds its hemagglutination receptors and forms an antigen + antibody complex with it.
D. Antigen and antibodies diffuse in the gel to form a precipitation line.
E. Hemagglutination of antigens and antibodies of equal volume under the influence of erythrocytes over time

**274. What is the neutralization index?**
A. virus-neutralizing titer of antibodies in serum .
B. Testing for an unknown virus using clear serum.
D. antigenic similarity between viruses.
E. Antibody concentration in serum

**275. When the cultured cells are infected with the virus, where are the test tubes, mattresses secured with rubber stoppers for incubation?**
A.Termostat.
B.Anaeroststga.
D. To the freezer.
E. Liquid nitrogen

**276. For how many days the nutrient medium of a virus-infected cell is changed?**
A.7 kun.
B.3kun.
D.2 kun.
E.21 kun

**277. Name the parts that make up a virion.**
A.DNA or RNA.
B.Kapsula.
D.Crust.
E. Ribosome and mitochondria

**278. How are all viruses structured?**
A. nucleic acids and protein from the shell.
From B. nucleotide.
D.capsomerdan.
E.super capsid

**279. What is the process of replication of viruses in the cell?**
A. Reproduction.
B. Conjugation.
D. Rescue.
E. Capsomers

**280. In which of the following reactions the antibody is not involved?**
A. Hemagglutination reaction.
B. Hemagglutination inhibition reaction.
D. Neutralization reaction of hemagglutination.
E. Rickettsiae agglutination reaction.

**281. In animals, Aueski disease virus is transmitted experimentally?**
A. Sheep, rabbit, chicken embryos
In suppressed cells, in chickens
D. In the rabbit, in the cultured cell
E. In all animals

**282. A method that accelerates the diagnosis of influenza?**
A.immunofluorescent method
B.direct hemagglutination
D.GATR
E.KBR

**283. What is the effect of a specific antibody on a virus?**
A. Neutralizes
B. Agglutinated
D. It is lowered into the sink
E. Adsorbs

**284. Vaccine against Marek's disease?**
A. Dry culture vaccine prepared from the herpes virus FS-126 strain of turkeys
Dry vaccine prepared from B.VNIIBP strain
D. Dry live culture vaccine
E. inactivated vaccine

**285. Properties of interferon?**
A. interferon is always formed from lymphocytes

B. interferon is formed from all cells of the body
D. interferon is formed when bacteria enter lymphocytes
E.interferon affects all bacteria

**286. The variability of the influenza virus depends on the change of which of their substances?**
A. amino acids and proteins
B. toxic substances
D. Lipoids
E. hemagglutinin and neuraminidase

**287. What immunity plays an important role in influenza, acute respiratory viral infections, polio?**
A.Gumoral
B.Cellular
D.humoral and cellular
E. local secretory immunity

**288. Depending on the prevalence of influenza, determine which type of infection belongs to the population?**
A. epidemic, pandemic
B. Endemic
D. endemic, epidemic
E.Sporadik

**289. What measures are taken against influenza?**
A. Influenza vaccine
B. Separation
D. use of antigrippin, remantadine, interferon
E. harden my body

**290. By what reaction is the virus detected from tissue culture infected with influenza virus?**
A. Hemagglutination
B. Hemadsorption
D. indirect gamegglutination
E.KBR reaction

**291. The method used in the rapid diagnosis of influenza?**
A. hemagglutination reaction
B. Hemadsorption
D. Neutralization
E.biological method

**292. At what time of the incubation period does the rabies virus begin to differentiate with the saliva of a dog infected with rabies?**
A. 10-12 days before the onset of the disease
B. 20-30 days before the onset of the disease
D. 40-60 days before the onset of the disease
E. 60-90 days before the onset of the disease

**293. What is the incubation period of rabies when biting the face and neck area during the day?**
A.15-20 kun
B.30-40 days
D.50-60 kun
E.3 more than a month

**294. Form of rabies virus:**
AOqsimon (pulya)
B.Sharsimon
D.Ipsimon
E. Sticky

**295. In which organs does rabies multiply after infection with a viral animal?**
A. in head and spinal nerve cells
B. in the pancreas
D. in the intestinal epithelium
E. In the subcutaneous tissue

**296. Indicate zoonotic infections**
A. Rabies, wounds, plague
Typhoid fever, part A, V,
D. tubercullosis, gonorrhea
E. rabies, tuberculosis

**297. How is the rabies vaccine given?**
A. between muscles
B. by mouth
D.Burniga
E. under the skin

**298. In which viral infection, the body of Babesh-Negri is found in the test material.**

A. Rabies
B. viral hepatitis V.
D.SPID
E. Gripp

**299. The patient has a sign of fear of water. There is a strong strain on the muscles. What are the symptoms of this disease?**

A. Rabies
B.Koksholga
D. Botulism
E. gas gangrene

**300. What is the main source of the disease that plays a role in the circulation of the rabies virus in nature?**

A. wild animals
B. sick people
D. Arthropods
EO plants

**301. A vaccine used in special prophylaxis of proteinuria?**

AA, O, Asia - 1
B.Antitoxin
D. Inactivated live vaccine
E.Amantadin

**302. There are several types of protein virus**

A.7
B.5
D.3
E.2

**303. What is an infectious disease?**

A. An infectious disease caused by viruses and microorganisms that have evolved to be parasitic on animals.
B. Disease-causing viruses and microorganisms
D. Bleeding in the tissue as a result of damage.
E. Resistance of the organism to the virus and its toxins

**304. What is immunity?**

A. The body is not infected with an infection or any infectious substance
B. Reproduction, spread, toxicity of the virus
D. Specific resistance of the organism to infection, inflammation
E. Infection and spread of viruses in the body

**305. What is a vaccine?**

A. It is a special biological drug, prepared from pathogens. It is mainly used to prevent disease.
B.Antitela, antigen
D. Fragment of the virus.
E.Aglutinin, precipitate

**306. What serological tests are used to diagnose proteinuria?**

A.KBR
B.DPR
D.IFR
E.GATR

**307. Identify the family and generation of the rabies virus.**

A.Rhabdoviridae and Lussavirus
B.Poxviridae and Orthopoxvirus
D. Myxoviridae and Paramyxovirus
E. Picornaviridae and Aphtovirus

**308. The latent period of proteinuria?**

A.1-3 kun
B.5-9 kun
D.7-8 kun
E.1 weeks

**309. Name the components of CBR in the bacteriological system**

A.Antigen, antibody, complement
B. Hemolysin, complement, saline
D. Physiological erythema, antigen, erythrocytes
E.Complement, hemolysin, antibody

**310. Name the components of CBD in the hemolytic system**

A.Complement, erythrocyte, hemolysin
B.Antigen, complement, physiological solution
D. Antibody, saline, hemolysin
E. Hemolysin, antigen, saline

**311. How many degrees is 1 atm in an autoclave?**
A.120-1210C
B.124-1260C
D.110-1120C
E.132-1330C
**312. What is included in the peripheral immune system**
A. Blood, lymph nodes, spleen
B. Thymus, spleen, liver
Dopka, stomach, liver
E. Gastric juice, red marrow
**313. Indicate the central immune system**
A.Timus, fabrisiyev bag, red marrow
B. Lymph nodes, red bone marrow
D. Divorce, blood, lungs
E. Spleen, kidneys, stomach
**314. Where is the pathological material obtained in equine rhinopneumonia?**
A. Nasal fluid, lungs, liver, Bronx from a piece of trachea
B. In the mucous membranes of the mouth, gums, palate and tongue
D. Blood, liver, spleen, lungs
E. From the brain
**315. What are the diseases transmitted by insects?**
A. Infectious encephalomyelitis of horses, African plague, infectious anemia, canine encephalitis, infectious catarrhal fever of sheep, viral encephalomyelitis and ephemeral fever of cattle, transmissible gastroenteritis of pigs, African plague, ku-fever and all arbovirus diseases.
B. leptospirosis, measles, salmonellosis, African plague in horses, infectious anemia, infectious catarrhal fever in sheep, transmissible gastroenteritis in pigs, African plague, brucellosis, tuberculosis.
D. Infectious encephalomyelitis of horses with leptospirosis, measles, salmonellosis, brucellosis, tuberculosis.
E. salmonellosis, yellow fever, brucellosis, tuberculosis, infectious encephalomyelitis of horses
**316. List the diseases transmitted by rodents?**
A. Rabies, Aueski.
B. Protein
D. Vesicular stomatitis
E.Teshen
**317. In how many different ways does the pathogen enter the body?**
A.4 types: oral, respiratory, transmissible and contact.
B.5 types: oral, respiratory, transmissible, genital and contact.
D.3 type: mouth, breathing, contact.
E.2xil: mouth, breathing.
**318. What are the factors of transmission of the pathogen into the body?**
A. food contaminated with the pathogen, water, soil, air, building, pasture, animal products of forced slaughter, les and its skin, wool, items used in care, clothing of workers.
B. food contaminated with the pathogen, items used in care.
D. food, water,
soil, building contaminated with the pathogen .
E. feed contaminated with the pathogen.
**319. What% of antibodies to the Pg-3 virus are present in the blood of young people?**
A.95%
B.50%
D.40%
E.10%
**320. How to diagnose viral diseases?**
A. The diagnosis is made on the basis of epizootiological data, clinical, pathoanatomical, virological,

serological examination and biopsy results.
B. Diagnosis is made based on bacteriological, virological, serological, biopsy and biopsy results
D. The diagnosis is made on the basis of epizootiological data, clinical, pathoanatomical, allergic examination results.
E. The diagnosis is made based on the results of clinical, pathological, allergic examination.

**321. What are the main clinical signs of proteinuria?**

A. occurs in the mucous membranes of the mouth, gums, palate and tongue 1 week, between the udder and hooves 2 weeks, the temperature of the animal rises. Salivation, loss of appetite, thirst, lameness are observed. The hooves may fall off. Heart activity decreases sharply in milk and young calves.
B. ulcers appear on the mucous membranes of the mouth, gums, palate , and between the tongue, udder, and hooves. In young calves the disease is mild.
D. ulcers appear in the mouth and tongue, the temperature of the animal does not rise. Lameness is observed due to the wound on the hooves. Passes easily in young calves.
E. The disease is mild in young calves

**322. How long is the latent period in leukemia?**

A. 60-750 days in practice, 2-6 years in practice.
B.12 oy.
D.6 oy.
E.2 oy.

**323. How in Newcastle disease the virus is released into the environment?**

A. sick and diseased pathogen with all secretions and excretions, breath and eggs through the mouth, nose, eyes and cloaca of the carrier bird.
B.only with secretions and excretions secreted by the mouth and cloaca of the sick bird.
D.only with the secretions and excretions secreted by the sick pathogen through the mouth and cloaca of the carrier bird.
E.only with the breath and eggs of a bird carrying a sick and diseased pathogen.

**324. What type of virus causes equine influenza?**

A. Rtomyxoviride family, RNA virus belonging to the genus Influenza virus.
B.togavirus
D.reovirus
E.paramyxovirus

**325. In what way are horses infected with the influenza virus?**

A. air-drop.
B.only alimentary
D.only transmissive
E.only through the mucous membranes of the genitals

**326. In what way is the rhinopneumonia virus transmitted to horses?**

A. air-drop, contact (congenital), alimentary.
B.only in an iatrogenic way.
D.only in a transmissible way.
E. by alimentary and iatrogenic means only

**327. What type of virus causes hepatitis in carnivores ?**

Adenolvirus with A.DNA
Herpesvirus with B.DNA
D.RNA-togavirus
E. RNA reovirus

**328. Who invented the method of vaccination against rabies?**

ALPaster
BRKox

D.Mechnikov
E.Ivanovskiy

**329. Identify viral diseases?**

A. Influenza, plague, proteinuria, leukemia, infectious anemia
B. Anthrax, black, yellow
D. Temiratki, rabies, manga
E.N'yukasl, brucellosis, pasteurellosis

**330. Who is the scientist who named the virus "poison" at the end of the last century?**

A.Beyering
B.Ivanovskiy
DLPaster
E.Jdanov

**331. What do you mean by the reproduction of viruses?**

A. The process of reproduction only within the cell
B. forms DNA or RNA
D. Produces protein for the virus in the cell
E. Selectively develops the cells of viruses

**332. What stage does the reproduction of viruses involve?**

A.7
B.2
D.5
E.4

**333. What serological methods are used to identify viruses?**

A.GAR, BGAR, GATR, AR
B.DPR, AR, GADR
D.IFR, IFA
E.NAU, NR, BGAR

**334. Who was the first to detect the transovaral transmission of the virus?**

AREMontgomeri
B.Ivanovskiy
D.Beyering
E.Jdanov

**335. What is the meaning of the word interferon?**

A.– reciprocal, - blow, damage
B. Occasionally recurrent
D. Recovery
EO unchangeable

**336. In what year was the transovaral transmission of the virus first detected?**

A.1917
B.1971
D.1895
E.1923

**337. What genetic information is contained in iridoviruses?**

A.DNK
B.RNK
D.DNA or RNA
E.Oqsil

**338. Capsomer?**

A. The shape unit that makes up a virion capsid, the asymmetric groups of virion composition, is made up of one or more asymmetric protein molecules.
Part of the composition of the virion, the shell, protects its nucleic acid from the external environment
D. The mucous layer around the bacterial cell
E. The process of protective adaptation

**339. Nucleocapsid?**

A. A protein shell that combines the virion hereditary properties of nucleic acid
B. Protein shell
D. The shape unit that forms the virion capsid, the asymmetric groups of the virion, is composed of one or more asymmetric protein molecules.
Part of the composition of E. virion, the shell, protects its nucleic acid from the external environment

**340. Nucleoproteins?**

A. Simple proteins and complex proteins containing nucleic acid
B. A protein shell that combines the virion genetic properties of nucleic acid

D. The composition of the virion, the shell, protects its nucleic acid from the external environment
E. Proteins that can only survive and reproduce under certain conditions

**341. Family of oncoviruses?**
A.Retroviridae
B.Papovaviridae
D.Paramyxoviridae
E.Myxoviridae

**342. Family of poxviruses?**
A.Poxviridae
B.Papovaviridae
D. Enteroviridae
E.Myxoviridae

**343. Prions?**
A. Pathogens of slow-growing infectious diseases
B. Incomplete virus particle
D. A protein that combines the virion hereditary properties of nucleic acid
E. Protects nucleic acid from the external environment

**344. What is the size of a prion in nm?**
A.17-27
B.20-27
D.10-19
E.5-15

**345. Who first identified prions?**
ASPPrusner, 1984
BREMontgomeri, 1977
D.Ivanovskiy, 1988
E.Beyering, 1945

**346. Form of rhabdoviruses?**
A.Cylindrical, one end twisted
B. Icosahedron
D.sharsimon
E.Triangle

**347. Who is the causative agent of reoviruses?**
A.RNK - by Reoviridae
Adenolvirus with B.DNA
Herpesvirus with D.DNA
E.RNA-togavirus

**348. Respiratory viruses?**
A. A virus that causes disease in the respiratory system
B. Small and large viruses
D. Tissue death and decomposition in the body
E. A virus that breaks down under the influence of enzymes

**349. What viruses are included in respiratory viruses?**
A.Paramyxovirus, adeno-, rhino
B.Rheovirus, rotavirus
D.Picorna, - toga, paramyxo
E.Ortomikso, arena

**350. What percentage of ribosomes is composed of protein?**
A.40
B.20
D.10
E.15

**351. What percentage of ribosomes is made up of RNA?**
A.60
B.40
D.50
E.10

**352. Where are the viruses that store DNA?**
A.Nuclear
B.Sytoplasm
D. In the cell
E. Virus virionida

**353. Identify the family Togavirus?**
A.Togaviridae
B.Gerpesviridae
D.Adenoviridae
E.Reoviridae

**354. Togavirus size?**
A.20-70 nm
B.20-50 nm
D.10-15 nm
E.60 nm

**355. The form of togavirus?**
A.Sferik
B.Sielindrsimon

D. Icosahedron
E.Sharsimon

**356. Transcription?**

A. The process of transmitting information from DNA to RNA
B. Tissue death and decomposition in the body
D. A virus that breaks down under the influence of enzymes
E. Polmerase, an internal protein molecule in viruses

**357. What is the meaning of the word broadcast?**

A. Distribution
B. Copy
D. See
E. Trembling

**358. What is the meaning of the word phagocytosis?**

A.Hujayra
B. Show
D. Hair
E.Yadro

**359. Eclipse period?**

A.2 - and 3 - the answer is correct
B. The period during which the virus enters the cell
D. A period of irreversible changes in a virus particle
E. The initial period of the disease

**360. How many days is the latent period of smallpox in MSHH?**

A.1-2 kun
B.6-9 kun
D.1-2 months
E. 4 hours

**361. Identify a class of virus classified?**

A.Retroviride
B. Picornaviride
D. Herpesviride
E. Adenoviride

**362. Vaccine against smallpox in goats?**

A.GOA formal glycerin vaccine
B.GOA formal vaccine
D. Dry culture virus vaccine
Vaccine prepared from E. NISXI strain

**363. Which vaccine is used against rhinotracheitis in cattle?**

A. All the answers are correct
B. Inactivated vaccine
D.TK - A VIEV V– 2 strains of dry vaccine
EA Associated Dry Culture Vaccine

**364. What is the family of flaviviruses?**

A.Togaviridae
B.Adenoviridae
D.Reoviridae
E.Gerpesviridae

**365. Transcriptase?**

A. Polymerase, an internal protein molecule in viruses
B. The process of transmitting information from DNA to RNA
D. Tissue death and decomposition in the body
E. A virus that breaks down under the influence of enzymes

**366. Identify the rotavirus family?**

A.Reoviridae
B.Retroviridae
D.Gerpesviridae
E.Adenoviridae

**367. Where are the viruses that store DNA?**

A.Nuclear
B.Sytoplasm
D. In the cell
E. Virus virionida

**368. Where are RNA-storing viruses located?**

A. In the cytoplasm
B. In the cell
D.Nuclear
E. In the host molecule

**369. Indicate the methods used in the rapid diagnosis of viral diseases**

A. * IFA (enzyme-linked immunosorbent assay)
B. immunofluorescence reaction
D.KBR (complement binding reaction)
E. virological method

**370. A method that accelerates the diagnosis of influenza?**

A. immunofluorescent method
B.direct hemagglutination
D.RPGA
E.KBR

**371. How does a specific antibody affect the virus?**

A. neutralizes
B. agglutinated
D. is lowered into the sink
E. adsorbs

**372. Specify a vaccine that is not used in the prevention of viral diseases.**

A. live attested vaccine
B.sub'edinitsali vaccine
D. corpuscular (virion) killed vaccine
A vaccine prepared by the engineering method

**373. Which viral disease vaccine is used?**

A. influenza
B.chin chechak
D. interesting
E. poliomyelitis (sebin vaccine)

**374. Which viral disease vaccine is used live?**

A. herpes
B.paragripp (URVI)
D.kana encephalitis
E.water droplets

**375. Drugs used in the treatment and prevention of influenza.**

A.remantadin
B.cytotoxin
D.akrixin
E. anatoxin

**376. Which type of influenza virus does not affect remantadine?**

A. to all species
BA-type
DV type
ES-type

**377. Indicate the virus does not belong to the family of enteroviruses.**

A. poliomyelitis
B. Koksaki
D.hepatitis V
E.hepatitis A

**378. interfergon specific properties?**

A. interferon is always formed from lymphocytes
B. interferon is formed from all cells of the body
D. interferon is formed when bacteria enter lymphocytes
Interferon produced by E.virus only affects this virus

**379. How does a specific antibody affect the virus?**

A. neutralizes
B. agglutinated
D. is lowered into the sink
E. adsorbs

**380. Form of influenza virus:**

A.taekchasimon
B.batsillasimon
D.spherical (circular)
In a form similar to E.spermatozoa

**381. There are many types of influenza viruses. What are their differences?**

With the increase
B. with antigenic properties
D.with endurance
E. with biochemical properties

**382. The variability of the influenza virus depends on the variability of which of their substances?**

A. amino acids and proteins
B. toxic substances
D. lipoids

E. hemagglutinin and neuraminidase

**383. What immunity plays an important role in influenza, acute respiratory viral infections, polio?**

A.gumoral
B. cellular
D.humoral and cellular
E. local secretory immunity

**384. The average duration of the latent period of influenza is:**

A.6-8 kun
B.7-14 kun
D.4-5 kun
E.24 kun

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BA-type
DV type
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A.6-8 kun
B.7-14 kun
D.4-5 kun
E.24 kun

**394. Many features of the influenza virus are variable, which change makes it difficult to prepare a vaccine against this disease:**

A. pathogenicity
B. Increased resistance to environmental factors
D.morphology
E. virulence

**395. The infection among the population depending on the prevalence of influenza determine which type it belongs to?**

A.sporadik
B. endemic
D. endemic, epidemic
E.epidemic, pandemic

**396. What causes the flu virus to grow?**

A.GPA, GPB, GPJ and other artificial environments
B. from the amnion and allantois layers of the chicken embryo
D. on the heel of a guinea pig
E. not defined

**397. A drug used in special prophylaxis of influenza?**

A. live and killed vaccine against influenza
B. antibiotic and sulfanilamide drugs
D. antitoxin serum
E. antibacterial serum

**398. What measures will be taken against influenza?**

A. Influenza vaccine Use of antigrippin, remantadine, interferon
D. hardening of the organism
E. all-complex measures

**399. By what reaction is the virus detected from a culture culture infected with the influenza virus?**

A. hemagglutination
B. hemadsorption
D. indirect gamegglutination
E. CBR reaction

**400. The beloved of the flu virus, chicken embryo amnion and allantois rights whatsoever which is determined by means of the reaction?**

A. hemagglutination
B. hemadsorption
D. agglutination
E. precipitation

**401. How many days old chicken embryos are selected for primary trypsinized cell production?**

A.9-11 daily.
B. 5-10 days.
D. 6-9 days.
E. 6-11 days

**402. How many cells are taken from one 11-day-old chicken embryo?**

A.70-120mln.
B. 60-100mln.
D. 50-110mln.
E. 70-110mln

**403. Who are the scientists who have proved the formation of corpus luteum in rabies?**

AVBabesh, A.Negri.
BVBabesh, A.Neyser.
DABorrel, A.Negri.
EMBeyerinr, G.Nikolau

**404. What is n- and V-in the formula for calculating the titer of the virus?**

An is the arithmetic mean of the number of rashes or rashes on a mattress: V is the volume of infection.
B. n- volume of infected quantity V- . The arithmetic average number of rashes or rashes on a mattress:
D. n- dissolving and mixing of virus-containing material obtained for infection: V- amount of cultured cell
E. n- accurately measured virus size: V- accurately measured cell volume

**405. What does 1HO`M50 mean in virology?**
A.50% of the virus that kills a chicken embryo.
B. 50% of pathoanatomical changes in the fetus of infected chickens.
D. 50% of the amount of clinical signs in a virus-infected chicken fetus.
E. 50% of chickenpox in a virus-infected chicken fetus.
**406. What is the titer of 1 GAB virus?**
A.1: 32.
B. 1: 128.
D. 1:64.
E. 1: 256
**407. Mark the line that correctly illuminates the essence of the reaction to stop hemagglutination.**
A. Antibody meets a homologous antigen, surrounds its hemagglutination receptors and forms an antigen + antibody complex with it.
B. the presence of an active virus after a certain time in a test tube of the same amount of antibody and antigen suspension.
D. Hemagglutination of equal amounts of antigen and antibody under the influence of erythrocytes over time.
E. Diffusion of antigens and antibodies in the gel to form a precipitation line.
**408. What is the deposition of erythrocytes in the GATR?**
The absence of A. virus.
B. the presence of a virus.
D. virus deficiency.
E. the virus has dissolved
**409. What experiment is performed to determine the presence of active virus in the mixture in the neutralization reaction?**
A. Biological experiments on test objects.
B. Detection under an electron microscope.
D. In a serological reaction.
E. In diffuse precipitation
**410. What is the procedure for neutralization?**
Type A.2: with diluted whey and diluted virus.
B. Type 1: with diluted whey.
D. Type 1: with diluted virus.
E. 2 types: with dilute erythrocytes and diluted virus
**411. What does the result of infection of test objects in the neutralization reaction mean that the result is positive in each group?**
A. Virus affected.
B. The virus was not affected.
D. The virus has little effect.
E. The reaction is incorrect
**41 2. The main method of indicating the virus in cultured cells is to find the correct line.**
A. Cytopathic effect, rash formation, cellular inclusions.
B. Cytopathic effect, clinical signs, pathological changes.
D. On GADR positive, clinical detection of virus in IFR.
E. Visualization of the virus in IFR, detection of pathoanatomical signs and inclusions.
**413. What is a cytopathic effect?**
A. Any change caused by the multiplication of viruses in the cell
B. Adhesion of erythrocytes to the surface of a virus-infected cell.
D. Extracellular reproduction of viruses
E. Separation of intracellular viruses from the cell.
**414. What is a genetic carrier in viruses?**
A. Nucleic acids.
B. Plasmids.
D. Capsomers.
E. Polymers

**415. What is the state of damage caused by the interaction of pathogenic viruses with the body ?**
A.Infection
B. Pathogenicity
D. Immunity
E. Mutualism
**416. Who created the humoral theory of immunity?**
APErlix
BRKox
D. Mechnikov
E. Ivanovskiy
**417. Where is the pathological material obtained in parvovirus infection?**
A. Fecal, from the intestinal mucosa
B. Miya
D. Kidney
E. Divorce
**418. Where is the pathological material from infectious gastroenteritis of pigs obtained?**
A. Fecal, intestinal mucosa
B. From the blood
D. From nasal fluid
E. From the kidney
**419. Where is the pathological material from vesicular disease of pigs obtained?**
A. From the composition of vesicles, pustules and aphthae, from injured skin
B. Fecal, intestinal mucosa
D. From nasal fluid
E. Blood, nasal cavity, brain
**420. Is this a protein?**
A. Acute infectious disease, usually transmitted by a sick animal, caused by viruses
B. Acquired immunity
D. Cell-produced protein
E. Properties of exposure to toxic substances
**421. Ways of entry of a pathogen into an organism?**
A. The injured surface of the skin and mucous membranes from the gate of infection
B. Alimentary
D. Contact
E. In an evolutionary way
**422. Where is the pathological material from the disease of vesicular exanthema in pigs obtained?**
A. From the composition of vesicles, pustules and aphthae, from injured skin
B. Nasal fluid, injured skin, lungs,
D. A part of the bronchus trachea, spleen, blood, saliva
E. Brain, lungs, liver
**423. Where is the pathological material from the disease of contagious ecthyma in sheep and goats obtained?**
A. From the contents of the vesicle, pustule and aphthae, from the injured skin, from the injured conjunctiva
B. Nerve tissue
D. From internal organ tissue
E. From the respiratory organs
**424. Where is the pathological material from duck influenza obtained?**
A. From the nasal fluid, brain, lungs, liver, spleen
B. Blood, saliva
D. From injured skin, from injured conjunctiva
E. Kidney, lymph nodes
**425. Where is the pathological material from infectious laryngotracheitis of chickens obtained?**
A.Nose fluid, from injured conjunctiva, lungs
B. Blood, from injured skin
D. Fecal, saliva, blood
E. From spinal fluid

**426. Where is the pathological material from infectious bronchitis in chickens obtained?**
A. Liver, part of the Bronx trachea
B. Brain, spleen, blood, saliva
D. Fecal, in lungs, in liver
E. From the kidneys, lymph nodes, nasal fluid, blood
**427. Where to get pathological material from viral hepatitis of ducks?**
A. Blood, liver, spleen
B. Blood, saliva
D. From injured skin
E. From the lymph nodes
**428. Where is the pathological material from leukemia in birds obtained?**
A. Blood, liver, lymph nodes, spleen, kidneys
B. From the whole piece
D. Blood, kidneys
E. Fecal, lung, brain
**429. Where is the pathological material from Marek's disease obtained?**
A. Blood, liver, lymph nodes, spleen, kidneys, bronchi from a part of the trachea
B. Saliva, blood
D. Lymph nodes, from the kidneys
E. Lung, liver, spleen
**430. Where is the pathological material from Newcastle disease obtained?**
A. Nasal fluid, blood, fecal, injured conjunctiva, brain, lungs, spleen
B. Blood from a part of the bronchus trachea
D. Blood, liver, lymph nodes, spleen, kidneys
E. Blood, liver, spleen
**431. What serological test is used to detect the virus of parasitic influenza-3?**
A.IFR, GADTR, GATR
B. KBR, IFR
D. GATR, GADTR
E. NR, GAR, PR
**432. What serological test is used to identify the smallpox virus?**
A.FAU, DPR
B. KBR, GATR
D. GATR, NR
E. BGAR, GAR
**433. What are the invading bodies of smallpox virus formed in the cytoplasm of epithelial cells of birds?**
A.Bollinger
B. Babesh - Negri
D. Zeyfred
E. Lentsa
**434. What is the name of the mammary glands formed in smallpox in mammals?**
A.Bollinger
B. Lentsa
D. Guarnieri
E. Zeyfred
**435. What are the plague-producing carcasses of carnivores called?**
A.Lentsa
B. Zeyfred
D. Bollinger
E. Babesh - Negri
**436. Which vaccine is used to prevent Newcastle disease?**
A.La is a dry vaccine made from strains of Sota, H, B1
B. inactivated dry vaccine
D. inactivated liquid vaccine
E. All the answers are correct
**437. What is a virion?**
A. A virus body located outside the cell, which is structurally perfect, with a complete developmental process
B. A virus-induced cell
D. Infectious nucleic acid viral shell
E. A well-developed morphological form of viruses

**438. What is the size of virions usually?**
A.20-350 (400) nm
B. 50-60 nm
D. 2-80 nm
E. 10-15 nm
**439. Identify viral diseases?**
A. Influenza, plague, proteinuria, leukemia, infectious anemia
B. Anthrax, black, yellow
D. Temiratki, rabies, manga
E. Newcastle, brucellosis, pasteurellosis
**440. Who is the scientist who named the virus "poison" at the end of the last century?**
A.Beyering
B. Ivanovskiy
DLPaster
E. Jdanov
**441. What do you mean by reproduction of viruses?**
A. The process of reproduction only within the cell
B. Forms DNA or RNA
D. Produces protein for the virus in the cell
E. Selectively develops the cells of viruses
**442. What stage does the reproduction of viruses involve?**
A.7
B. 2
D.5
E.4
**443. What serological methods are used to identify viruses?**
A.GAR, BGAR, GATR, AR
B. DPR, AR, GADR
D. IFR, IFA
E. NAU, NR, BGAR
**444. Who was the first to detect the transovaral transmission of the virus?**
AREMontgomeri
B. Ivanovskiy
D. Beyering
E. Jdanov
**445. What is the meaning of the word interferon?**
A.– reciprocal, - blow, damage
B. Occasionally recurrent condition
D. Recovery
E. Unchanged
**446. In what year was the transovaral transmission of the virus first detected?**
A.1917
B. 1971
D. 1895
E. 1923
**447. What genetic information is contained in iridoviruses?**
A.DNK
B. RNA
D. DNA or RNA
E. Protein
**448. Capsomer?**
A. The shape unit that makes up a virion capsid, the asymmetric groups of virion composition, is made up of one or more asymmetric protein molecules.
B. The composition of the virion, the shell, protects its nucleic acid from the external environment
D. The mucous layer around the bacterial cell
E. The process of protective adaptation
**449. Nucleocapsid?**
A. A protein shell that combines the virion hereditary properties of nucleic acid
B. Protein shell
D. The shape unit that forms the virion capsid, the asymmetric groups of the virion composition, is composed of one and more asymmetric protein molecules
E. Part of the composition of the virion, the shell, protects its nucleic acid from the external environment
**450. Nucleoproteins?**

A. Simple proteins and complex proteins containing nucleic acid
B. A protein shell that combines the virion hereditary properties of a nucleic acid
D. Part of the composition of the virion, the shell, protects its nucleic acid from the external environment
E. Proteins that can only survive and reproduce under certain conditions

**451. Family of oncoviruses?**
A.Retroviridae
B. Papovaviridae
D. Paramyxoviridae
E. Myxoviridae

**452. Family of poxviruses?**
A.Poxviridae
B. Papovaviridae
D. Enteroviridae
E. Myxoviridae

**453. Prions?**
A. Pathogens of slow-growing infectious diseases
B. Incomplete virus particle
D. A protein that combines the virion hereditary properties of nucleic acid
E. Protects nucleic acid from the external environment

**454. What is the size of a prion in nm?**
A.17-27
B. 20-27
D. 10-19
E. 5-15

**455. Who first identified prions?**
ASPPrusner, 1984
BREMontgomeri, 1977
D. Ivanovskiy, 1988
E. Beyering, 1945

**456. Form of rhabdoviruses?**
A.Cylindrical, one end twisted
B. Ikosaedr
D. spherical
E. Triangle

**457. Who is the causative agent of reoviruses?**
A.RNK - by Reoviridae
B. adenolvirus with DNA
D. DNA-containing herpesvirus
E. RNA-togavirus

**458. Respiratory viruses?**
A. A virus that causes disease in the respiratory system
B. Small and large viruses
D. Tissue death and decomposition in the body
E. A virus that breaks down under the influence of enzymes

**459. Which viruses are included in respiratory viruses?**
A.Paramyxovirus, adeno-, rhino
B. Reovirus, rotavirus
D. Picorna, - toga, paramyxo
E. Orthomikso, arena

**460. What percentage of ribosomes is composed of protein?**
A.40
B. 20
D. 10
E. 15

**461. What percentage of ribosomes is made up of RNA?**
A.60
B. 40
D. 50
E. 10

**462. Where are the viruses that store DNA?**
A.Nuclear
B. In the cytoplasm
D. In the cell
E. Virus virionida

**463. Identify the family Togavirus?**
A.Togaviridae
B. Gerpesviridae
D. Adenoviridae
E. Reoviridae

**464. Togavirus size?**
A.20-70 nm

B. 20-50 nm
D. 10-15 nm
E. 60 nm

**465. The form of togavirus?**

A.Sferik
B. Sielindrsimon
D. Ikosaedr
E. Spherical

**466. Transcription?**

A. The process of transmitting information from DNA to RNA
B. Tissue death and decomposition in the body
D. A virus that breaks down under the influence of enzymes
E. Polmerase, an internal protein molecule in viruses

**467. What is the meaning of the word broadcast?**

A. Distribution
B. Copywriting
D. See
E. Trembling

**468. What is the meaning of the word phagocytosis?**

A.Hujayra
B. Show
D. Feathers
E. The nucleus

**469. Eclipse period?**

A.2 - and 3 - the answer is correct
B. The period in which the virus enters the cell
D. A period of irreversible changes in a virus particle
E. The initial period of the disease

**470. How many days is the latent period of smallpox in MSHH?**

A.1-2 kun
B. 6-9 days
D. 1-2 months
E. 4 hours

**471. Identify a family of classified viruses?**

A.Retroviride
B. Picornaviride
D. Herpesviride
E. Adenoviride

**472. Vaccine against smallpox in goats?**

A.GOA formal glycerin vaccine
B. GOA formal vaccine
D. Dry culture virus vaccine
E. Vaccine prepared from NISXI strain

**473. Which vaccine is used against rhinotracheitis in cattle?**

A. All the answers are correct
B. Inactivated vaccine
D. TK - A VIEV V– 2 strains of dry vaccine
E. Associated dry culture vaccine

**474. What is the family of flaviviruses?**

A.Togaviridae
B. Adenoviridae
D. Reoviridae
E. Gerpesviridae

**475. Transcriptase?**

A. Polymerase, an internal protein molecule in viruses
B. The process of transmitting information from DNA to RNA
D. Tissue death and decomposition in the body
E. A virus that breaks down under the influence of enzymes

**476. Identify the rotavirus family?**

A.Reoviridae
B. Retroviridae
D. Gerpesviridae
E. Adenoviridae

**477. Where are the viruses that store DNA?**

A.Nuclear
B. In the cytoplasm
D. In the cell
E. Virus virionida

**478. Where are RNA-storing viruses located?**

A. In the cytoplasm

B. In the cell
D. In the nucleus
E. In the host molecule

**479. Indicate the methods used in the rapid diagnosis of viral diseases**

A.IFA (enzyme-linked immunosorbent assay)
B. immunofluorescence reaction
D. CBR (complement binding reaction)
E. virological method

**480. A method that accelerates the diagnosis of influenza?**

A. immunofluorescent method
B. direct hemagglutination
D. RPGA
E. KBR

**481. How does a specific antibody affect the virus?**

A. neutralizes
B. agglutinates
D. is lowered into the sink
E. adsorbs

**482. Specify a vaccine that is not used in the prevention of viral diseases.**

A. live attested vaccine
B. subunit vaccine
D. corpuscular (virion) killed vaccine
E. a vaccine prepared by the generic method

**483. Which viral disease vaccine is used?**

A. influenza
B. chin flower
D. measles
E. polio (sebin vaccine)

**484. Which viral disease vaccine is used live?**

A. herpes
B. parainfluenza (URVI)
D. can encephalitis
E. watercress

**485. Drugs used in the treatment and prevention of influenza.**

A.remantadin
B. cytotoxin
D. acrixin
E. anatoxin

**486. Which type of influenza virus does not affect remantadine?**

A. to all species
B. A-type
D. V-type
E. S-type

**487. Indicate the virus does not belong to the family of enteroviruses.**

A. poliomyelitis
B. Coxsackie
D. hepatitis V
E. hepatitis A

**488. interfergon specific properties?**

A. interferon is always formed from lymphocytes
B. interferon is produced from all cells of the body
D. interferon is formed when bacteria enter the lymphocytes
E. interferon produced by the virus only affects this virus

**489. How does a specific antibody affect the virus?**

A. neutralizes
B. agglutinates
D. is lowered into the sink
E. adsorbs

**490. Form of influenza virus:**

A.taekchasimon
B. batsillasimon
D. spherical (circular)
E. in a sperm-like form

**491. There are many types of influenza viruses. What are their differences?**

With the increase
B. with antigenic properties

D. with durability
E. with biochemical properties

**492. The variability of the influenza virus depends on the variability of which of their substances?**

A. amino acids and proteins
B. toxic substances
D. lipoids
E. hemagglutinin and neuraminidase

**493. What immunity plays an important role in influenza, acute respiratory viral infections, polio?**

A.gumoral
B. cellular
D. humoral and cellular
E. local secretory immunity

**494. The average duration of the latent period of influenza is:**

A.6-8 kun
B. 7-14 days
D. 4-5 days
E. 24 days

**495. Many features of the influenza virus are variable, which change makes it difficult to prepare a vaccine against this disease:**

A. pathogenicity
B. Increased resistance to environmental factors
D. morphology
E. virulence

**496. The infection among the population depending on the prevalence of influenza determine which type it belongs to?**

A.sporadik
B. endemic
D. endemic, epidemic
E. epidemic, pandemic

**497. What causes the flu virus to grow?**

A.GPA, GPB, GPJ and other artificial environments
B. from the amnion and allantois layers of the chicken embryo
D. on the heel of a guinea pig
E. not identified

**498. A drug used in special prophylaxis of influenza?**

A. live and killed vaccine against influenza
B. antibiotics and sulfonamides
D. antitoxin serum
E. antibacterial serum

**499. What measures will be taken against influenza?**

A. Influenza vaccine
B. use of antigrippin, remantadine, interferon
D. hardening of the organism
E. all-complex measures

**500. By what reaction is the virus detected from a culture culture infected with the influenza virus?**

A. hemagglutination
B. hemadsorption
D. indirect gamegglutination
E. CBR reaction

# V. SCIENTIFIC ASSESSMENT CRITERIA

## Evaluation

Students' mastery of subjects is assessed on a 5-point scale.

**5 (excellent) rating:**

Conclusion and decision making;
Creative thinking;
Ability to observe independently;
To be able to apply the acquired knowledge in practice;
Understand the essence;
To know, to tell;
To have imagination;

**4 (good) rating:**

Ability to observe independently;
To be able to apply the acquired knowledge in practice;
Understand the essence;
To know, to tell;
To have imagination;

**3 (satisfactory) evaluation;**

Understand the essence;
To know, to tell;
To have imagination;

**2 (unsatisfactory) rating:**

Failure to master the program;
Not knowing the essence of science;
Lack of clear vision;
Inability to think independently.