Ministry of Education and Science of Ukraine

Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies Lviv

Department of Epizootology

EDUCATIONAL AND METHODOLOGICAL MANUAL FOR CONDUCTING LABORATORY CLASSES ON SPECIAL EPIZOOTOLOGY ON INFECTIOUS DISEASES COMMON TO SEVERAL SPECIES OF ANIMALS

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Рекомендовано Львівським національним університетом ветеринарної медицини та біотехнологій імені С. З. Ґжицького як навчально-методичний посібник для здобувачів другого (магістерського) рівня вищої освіти спеціальності 211 "Ветеринарна медицина"
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Представлений матеріал по 24 захворюваннях: сибірці, туберкульозу, бруцельозу, лептоспірозу, лістеріозу, правцю, пастерельозу, некробактеріозу, копитній гнилизні, ботулізмі, туляремії, сказу, хвороби Ауєскі, ящуру, віспі, хламідіозах (ензоотичний аборт овець, хламідіоз свиней, хламідіоз худоби), рикетсіозах (ку-гарячка, інфекційний гідроперикардит, інфекційний кератокон'юнктивіт), трихофітії, мікроспорії. Висвітлені питання діагностики, лікування, імунопрофілактики, загальної профілактики та заходи боротьби.

Для студентів закладів вищої освіти зі спеціальності 211 "Ветеринарна медицина". Може бути корисним слухачам післядипломної освіти та спеціалістам ветеринарної медицини.

Подяка за співпрацю завідувачу кафедри української та іноземних мов імені Якима Яреми ЛНУВМБ імені С. З. Ґжицького **Подоляку М.В.**

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Recommended by the Lviv National University of Veterinary Medicine and Biotechnology named after Stepan Gzhitskyi as a teaching and methodical manual for applicants of the second (master's) level of higher education in specialty 211 "Veterinary Medicine"
(Protocol of the Academic Council № 2 of 30 March 2023
Order № 55 of 31 March 2023)

Educational and methodological manual for conducting laboratory classes on special epizootology on infectious diseases common to several species of animals : educational and methodological manual. / In general editing by Prof. Ya. Kisery: translated by: Ya. Kisera, Yu. Martyniv, T. Matviishyn. Lviv: Spolom. 2023. 174 p.

The educational and methodological manual presents material on 24 diseases: anthrax, tuberculosis, brucellosis, leptospirosis, listeriosis, tetanus, pasteurellosis, necrobacteriosis, hoof-rot, botulism, tularemia, rabies, Aujeski's disease, foot-and-mouth disease, smallpox, chlamydia (enzootic abortion of sheep, chlamydia pigs, chlamydia of livestock), rickettsiosis (Q-fever, infectious hydropericarditis, infectious keratoconjunctivitis), trichophytosis, microsporia. Issues of diagnosis, treatment, immunoprophylaxis, general prevention and control measures are highlighted.

For students of institutions of higher education in specialty 211 "Veterinary Medicine". Can be useful for postgraduate students and veterinary medicine specialists.

Gratitude for the cooperation to the head of the Department of Ukrainian and Foreign Languages named after Yakym Yarema LNUVMB named after S.Z. Gzhytsky **Podoliak M.V.**

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Content

Anthrax

(diagnosis, specific prevention, control measures)

Anthrax (telii) — an acute infectious disease of all types of farm, domestic and wild animals, which is characterized by fever, septicemia, intoxication of the body, serous-hemorrhagic inflammation of the subcutaneous and subserous connective tissues and internal organs, the formation of edema and carbuncles. People also get anthrax.

Anthrax has been known since ancient times and was perceived as "God's punishment for sins", "activity of an evil spirit", etc. Described in ancient historical manuscripts of Greece and Rome. Currently, anthrax occurs in European countries and the USA in the form of sporadic cases and small epizootics.

In Ukraine, the situation with regard to anthrax is quite complicated, due to the presence of old, unfavorable burial grounds for animals, which creates a constant potential threat regarding the appearance of the disease among animals and people.

The fight against anthrax requires significant funds to carry out strict quarantine and restrictive and medical measures in the event of the disease, annual preventive vaccinations of all animals susceptible to it, organization of veterinary and sanitary measures in stationary centers.

The causative agent of the disease– Bacillus anthracis – nonmotile gram positive aerobic spore-forming bacillus. The vegetative form of the anthrax bacillus is well stained with methylene blue, Tsil's fuchsin or Peshkov's fuchsin, capsules - according to Romanovsky-Giemsa. In smears from the blood and organs of dead animals, anthrax bacilli are located singly, in pairs, or in short chains of 2-4 sticks with straight, sharply cut ends surrounded by a capsule (Fig. 1).

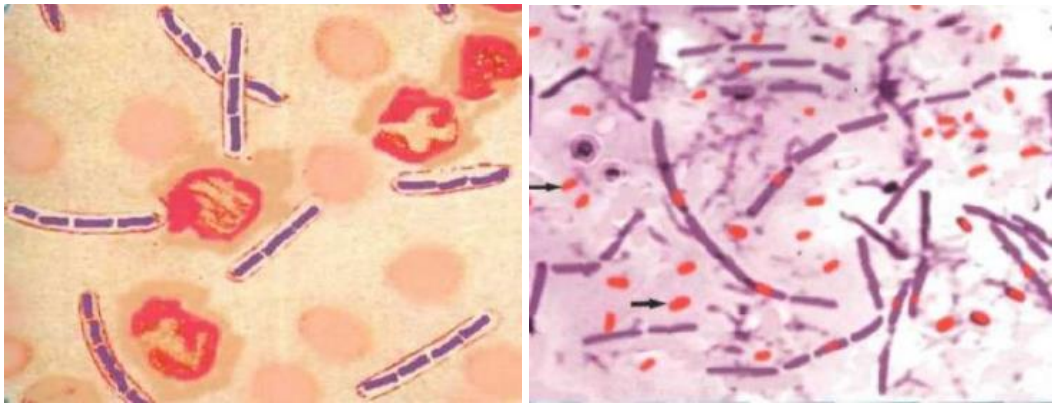


Fig. 1. The causative agent of anthrax in the pathological material. Microscopy.

In cultures on nutrient media, bacilli form long chains. A characteristic feature of the causative agent of anthrax is the ability to form spores. Spores have an oval or spherical shape, are formed in dissected corpses and in the external environment

under conditions of mandatory access to oxygen and a temperature of 15-42°C. Spores are not formed in the body of a sick animal and in an undissected corpse. Anthrax bacilli are well cultivated in aerobic conditions on ordinary nutrient media at 35-37°C. At temperatures below 12°C and above 43°C, the growth of bacilli stops. On agar in Petri cups, 16-24 hours after sowing the pathological material, grayish-white R-shaped colonies with characteristic outgrowths - "curls" on the periphery are formed, which became the reason to give the anthrax colonies the name "Medusa head" (Fig. 2).

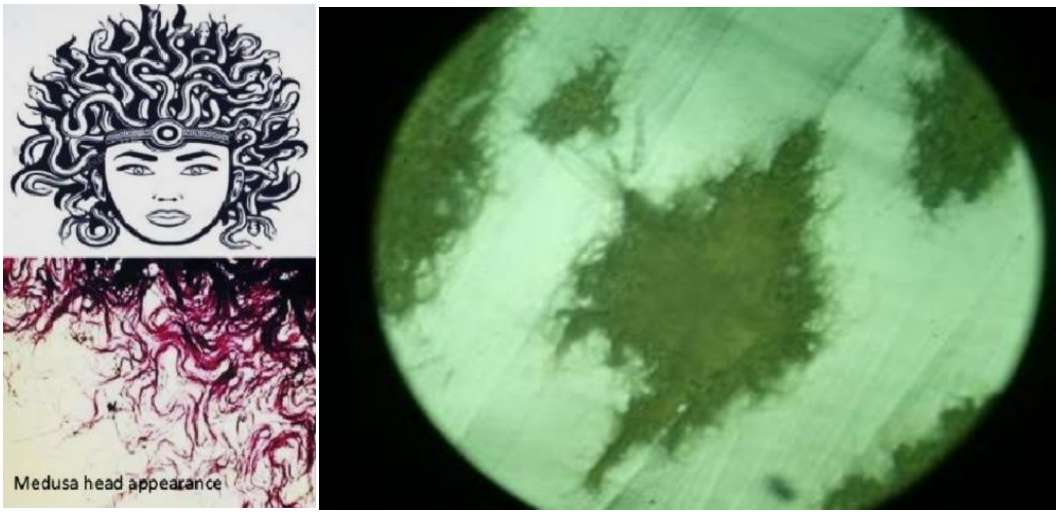


Fig. 2. Medusa head.

When grown on media with penicillin, the bacilli acquire the shape of a ball, and when assembled in a chain, they have the appearance of a "pearl necklace" (Fig. 3), which phenomenon is taken into account when making a diagnosis.

Fig. 3. The "pearl necklace" phenomenon.

In the broth, anthrax bacilli grow in the form of cotton flakes, which after a day settle to the bottom of the test tube. After 2-5 days, a whitish rod is formed on the gelatin after the injection, from which tender sprouts branch, longer and thicker in the upper layers of the medium compared to the lower ones, which resembles an upside-down Christmas tree. Anthrax bacilli do not form a zone of hemolysis on blood agar (Fig. 4).

a b

Fig. 4. Growth on: a) meat-peptone agar; b) gelatin.

The vegetative form of the anthrax bacillus is not resistant to the influence of various physical and chemical factors. Bacilli are inactivated after 1-3 days in an unopened corpse in the summer, after several hours in the case of rotting. In dried blood smears, bacilli remain virulent for up to 20 days, in water for up to 60 days. When heated to 55°C, the anthrax culture is destroyed in 40 minutes, up to 65°C in 5 minutes, up to 70°C in 2-4 minutes, up to 80°C in 1 minute. At minus 24°C, bacilli remain viable for 12 days. Solar radiation kills bacilli in a wet environment after 14 hours, in a dry environment - 8 hours. In contrast, the spores of the anthrax bacillus are extremely stable in the external environment, persisting in the soil for decades and in water for years; resistant to rotting and drying. Dry heat kills them at 140°C after only 3 hours, boiling - after 40-60 minutes, solar radiation - after 2-5 days. Spores are not destroyed when skins are tanned or dried and salted meat.

The diagnosis of anthrax is made by a complex method based on *the analysis of epizootological data, clinical signs of the disease, patho-anatomical changes* (in case of accidental autopsy), as well as the results of *laboratory tests.*

Epizootological data. Anthrax is more common in sheep, cattle, horses, and reindeer. Wild ruminants, wolves, foxes, tigers, lions, panthers, elephants are also susceptible to the disease. Pigs, buffaloes and camels are less sensitive. Dogs and

poultry are not susceptible to anthrax. Such laboratory animals like white mice, guinea pigs, rabbits and pigeons are infected and die.

The source of the causative agent of the infection is sick animals that secrete many anthrax bacilli into the external environment with bloody fluid, feces, urine, milk, and saliva. Especially dangerous are untimely and improperly removed dismembered corpses of animals that died from anthrax and their skin, wool, bristles, bones, horns, which lead to spore contamination of pastures, watering holes, soil, livestock yards and the formation of long-term foci of anthrax. Predatory animals and various birds can carry parts of an infected corpse over considerable distances and contribute to the spread of anthrax. Dogs are able to bring bones and remains of a corpse directly to the territory of households and farms. Dangerous foci of anthrax are old, forgotten burials of animals that died from anthrax, from where spores can be carried to the surface of the soil during spring floods and heavy rains. The cause of anthrax in winter can be hay collected from unfavorable meadows and pastures. Anthrax spores can be brought to the surface of the earth during reclamation, construction and other earthworks in the places of ancient burials of animals. Uncontaminated feed and fertilizers of animal origin, as well as wastewater from meat processing plants and tanneries, pose a significant danger. Blood-sucking insects can be carriers of the anthrax pathogen. Spontaneous infection of herbivores mostly occurs through the alimentary canal in case of eating feed contaminated with anthrax spores, drinking water contaminated with spores of the causative agent of the disease, during bites by infected stinging insects; much less often – when inhaling dust with anthrax spores. Pigs become infected by burrowing in the soil on pastures unfavorable for anthrax. Carnivores and predators become infected when they eat the carcasses of anthrax animals. After recovery, animals do not remain carriers of the bacillus, so sharing with healthy animals does not lead to their infection. Anthrax is characterized by stationarity of foci, which is caused by long-term preservation of spores in the ground, as well as spring-summer seasonality, which is associated with increased contact of animals with pastures contaminated with spores of the pathogen, as well as with blood-sucking and stinging insects. The probability of disease occurrence increases significantly in drought, when the lack of green fodder forces animals to eat dry plants along with soil that may contain spores. In winter, the disease occurs only in the case of feeding previously contaminated fodder (hay, straw) with anthrax spores.

Clinical signs and course of the disease. The incubation period lasts 1-3 days. The course of the disease is fulminant (superacute), acute, subacute and chronic. There are septic, carbuncle, intestinal, pulmonary and anginal forms of the disease.

The *superacute course* of the disease occurs in sheep and cattle. The animal falls ill suddenly, falls to the ground and quickly dies with signs of convulsions. If the disease is prolonged, there is a sharp increase in body temperature, acceleration of the

pulse and breathing, bluishness of the mucous membranes, shortness of breath. Bloody foam oozes from the nostrils and mouth, dark-colored blood from the anus (Fig. 5). The sick animal is excited, grinds it's teeth, makes mane movements, and then suddenly falls to the ground and dies with a seizure. The duration of the illness is from several minutes to several hours.

Fig. 5. Bleeding from the nose during anthrax.

The *acute course* of the disease is accompanied by an increase in body temperature to 41-42°C, severe chills, increased pulse and breathing, cyanosis of the mucous membranes of the mouth and nose, depression, thirst, anxiety, convulsive contractions of certain muscles. The animal lies down, refuses to take feed.

In cattle, rumination and lactation stop, intestines are distended, constipation or diarrhea is observed, stool is liquid with blood, urine is bloody. In the agony state, bloody foam is released from the nasal and oral cavities, and dark-colored blood from the rectum. The duration of the disease is 2-3 days. The animal dies with symptoms of asphyxia.

Horses have fever, bluishness of mucous membranes, shortness of breath, colic, muscle tremors. The urine becomes bloody, the stool is liquid, with an admixture of blood. In the agonal stage, convulsions, bloody discharge from natural openings, asphyxia, coma appear.

In sheep, the disease takes the form of septicemia.

The *subacute course* in cattle has the same signs as the acute course, but not clearly defined, which may disappear periodically. In addition, diffuse edema appears in various parts of the body. The disease lasts up to 5-8 days and always ends with the death of the animal.

The chronic course of the disease occurs in pigs and, unlike other species of animals, takes the form of sore throat and damage to the lymph nodes in the neck. Inflammation in the pharynx is accompanied by slight swelling, difficulty in

swallowing and breathing. The disease lasts 2-3 months. and is revealed only in case of forced slaughter of the animal and examination of the carcass.

The *septic form* of anthrax can develop immediately after infection of a very weak animal or after the penetration of a significant amount of a highly virulent pathogen into the body. The septic form causes the superacute course of the disease and the death of the animal within the first few hours. In most cases, the septic form appears at the end of the disease against the background of a sharp suppression of the body's protective forces, the development of septicemia and intoxication of the body.

The *carbuncle (skin, cutaneous) form* is accompanied by the appearance of hot, inflammatory swellings in the abdomen, scrotum, udder, under the jaws, which quickly increase in size and later become cold, hard, painless. The skin, starting from the center of the affected area, turns black, necrotizes with the formation of ulcers with uneven edges (Fig. 6). Tumors the size of a chicken egg can form on the mucous membrane of the palate, the inner surface of the lips, and on the tongue, from which a dark liquid oozes. The carbuncle form is often registered in horses, especially in forest areas.

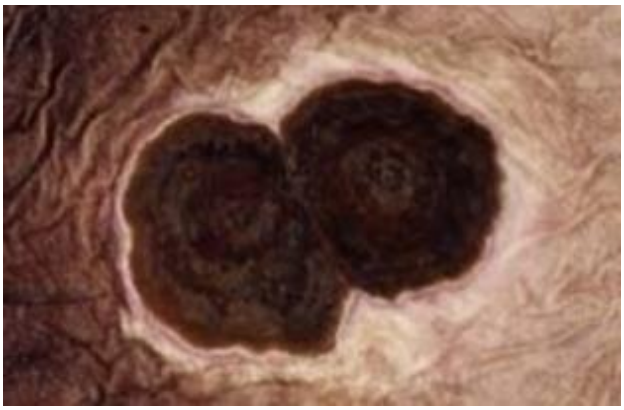


Fig. 6. Carbuncle (cutaneous) form of anthrax.

The *intestinal form* is characterized by high temperature and digestive tract dysfunction (colic, diarrhea, constipation).

The *pulmonary form* takes the form of pneumonia and acute pulmonary edema, and is rarely recorded.

The *anginal form* occurs in pigs, is accompanied by the phenomena of chronic pharyngitis, and often has no clinical manifestation.

Pathological changes. Autopsy of a corpse in case of suspicion of anthrax is strictly prohibited. In the case of an accidental autopsy, quite characteristic patho-anatomical changes are revealed, which are expressed the better, the slower the course of the disease was. The corpse is bloated, decomposing quickly. Corpse browning is not expressed or expressed very weakly (Fig. 7).

Fig. 7. Corpses of animals that died from anthrax.

A foamy bloody liquid is released from the natural openings. The blood is thick, tarry, black-red in color, does not flow. Gelatinous infiltrates and hemorrhages are found in the subcutaneous and muscle tissue, as well as in the area of the kidneys and mesentery. The muscles have a dark red color and a flabby consistency. In the abdominal and thoracic cavities, as well as in the pericardial sac, there is a significant amount of serous-hemorrhagic exudate. The spleen is sharply enlarged, flabby, gives large scrapings of a tar-like consistency. Lymph nodes are significantly enlarged, filled with dark red blood. The lungs, liver, and kidneys are swollen, enlarged, filled with dark blood, and punctate hemorrhages. The heart is full of uncoagulated blood, spot hemorrhages are found on the endocardium. The mucous membrane of the small intestine is swollen, hyperemic, covered with multiple hemorrhages, especially in the area of Peyer's patches and follicles. In pigs with the anginal form of the disease, patho-anatomical changes are manifested by gelatinous-hemorrhagic infiltration of the subcutaneous tissue in the area of the larynx and trachea, an increase in regional lymph nodes, which have a brick-red color on section, sometimes with small yellowish necrotic inclusions, and large diphtheritic layers in the tonsils.

Laboratory diagnostics. Blood smears taken from the superficial veins of the ear are sent to the laboratory for research immediately after the death of the animal, since the pathogen appears in the blood shortly before death and is quickly destroyed during the putrefactive decomposition of the corpse. It’s better to make smears of greater thickness on the slides, so that they can be used to inoculate nutrient media and infect laboratory animals. If necessary, for research, the ear is cut off from the side on which the corpse was lying, and pieces of skin 5 × 5 cm in size are cut off for the precipitation reaction. If necessary, wool, bristles, fur raw materials are sent to the laboratory. If anthrax is suspected during the autopsy (except for pigs), the autopsy is stopped and part of the spleen is sent for examination. Pharyngeal and submandibular lymph nodes, as well as areas of swollen connective tissue, are sent from pig carcasses to the laboratory.

Bacteriological diagnosis of pathological material includes microscopic studies, cultures on nutrient media, identification of isolated culture, infection of

laboratory animals. Under the microscope of Gram-stained smears of blood and pathological material from a fresh corpse, anthrax bacilli are found under the microscope in the form of characteristic thick, short, straight, as if cut off, isolated rods and short chains of 2-4 rods, which are surrounded by a capsule. Based on the results of the microscopic examination, a preliminary conclusion is immediately issued, which must be confirmed by a bacteriological examination. For this purpose, cultures are performed on meat-peptone agar in test tubes (provided that the pathological material is fresh and clean) or on meat-peptone agar in Petri cups, if the presence of extraneous microflora is detected during a preliminary microscopic examination. In the latter case, inoculation of pathological material on broth and gelatin is also impractical due to the complete lack of competitive capabilities of anthrax bacilli. Cultures on agar are grown for 18-24 hours, then examined with under a low magnification microscope. With the characteristic growth of anthrax bacilli, flat, gray, rough colonies with fringed curly processes are formed. Typical and questionable colonies are selected for identification and subsequent transfer to different nutrient media. The identification of the isolated anthrax bacillus is carried out on the basis of characteristic growth on nutrient media, specific morphology, capsule formation, phage lysability, the "pearl necklace" test, the absence of hemolytic activity, as well as the results of biological studies.

Infection of laboratory animals with pathological material must be carried out on the day of its arrival in the laboratory. For this, a 10% suspension of pathological material is injected subcutaneously into two white mice in a dose of 0.1-0.2 ml or two guinea pigs in a dose of 0.5-1 ml. The death of laboratory animals is observed in the first 3 days after infection, their blood from the heart and parenchymal organs are examined.

The study of skin raw materials and stale pathological material is carried out according to the precipitation reaction according to Ascoli (Fig. 8). The reaction is considered positive if a thin whitish ring of precipitation appears on the border of the two components. The diagnosis of anthrax is considered to be established in the case of isolation from the pathological material of a culture with properties characteristic of the causative agent of anthrax, and the death of at least one laboratory animal.

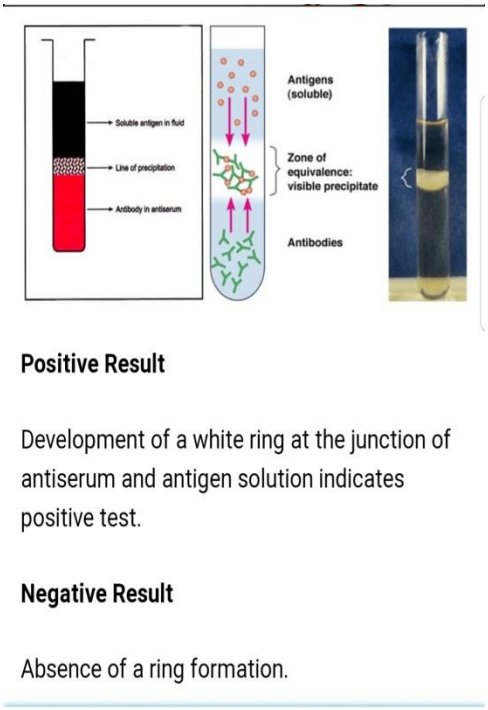


Fig. 8. Ascoli's reaction.

A positive diagnosis is also established in the absence of culture growth from pathological material in crops, but the death of at least one laboratory animal out of two infected and the release from its organs of a culture with properties characteristic of the causative agent of anthrax. A positive precipitation reaction during the examination of rotten pathological material is also a basis for establishing a diagnosis.

Differential diagnosis. Presupposes the need to distinguish anthrax from pasteurellosis, emkar, malignant edema, bradzot, enterotoxemia, babesiosis. In case of pasteurellosis, the main changes are observed in the lungs and are manifested in the form of croupous-hemorrhagic pneumonia with centers of necrosis. Dragle-like edema in the area of the larynx is not accompanied by hemorrhagic infiltration. Bacteriological studies revealed a gram-negative ovoid bacillus. With emkar and gas edema during palpation and percussion, there is crepitation of inflammatory swellings in the muscles and a ringing tympanic sound. The causative agents of these diseases are strict anaerobes. Bradzot and enterotoxemia are differentiated from anthrax on the basis of bacteriological and toxicological studies. Babesiosis is established by examining blood smears for the presence of blood parasites.

Treatment. It’s carried out with hyperimmune anti-anthrax serum or gammaglobulin in combination with antibiotics (penicillin, bicillin, streptomycin, chloramphenicol, biomycin). The serum is used subcutaneously in therapeutic doses: for adult cattle, horses, reindeer, buffaloes and camels – 100-200 ml; sheep, goats, pigs and calves - 50-100 ml. It’s not recommended to inject more than 20 ml of serum into the same place. In severe cases, the serum after preheating to 37-38°C is administered intravenously. If during the next 8-12 hours the body temperature does

not decrease, the serum is administered in a therapeutic dose again. With the carbuncle form, the serum is additionally injected under the skin at the location of the inflammatory edema. In cattle, the serum can be administered intraperitoneally in the area of the fasting fossa. Gammaglobulin is used in doses: for horses, camels, cattle and reindeer - 40-80 ml; sheep, goats, calves and pigs - 20-40 ml. In case of a severe course of the disease, gammaglobulin is heated to 37-38°C and administered intravenously. At the same time, intramuscular or subcutaneous administration of antibiotics is carried out: penicillin 500 thousand units per 100 kg of weight after 4 hours, three times a day; amoxicillin (15%) - 1 ml for every 15 kg of weight once a day for 3-5 days; kanamycin (25%) - once a day for 5-10 days in doses: cattle and horses - 2 ml per 100 kg of weight, calves and foals - 2 ml per 50 kg of weight, sheep, pigs - 2 ml per 50 kg of weight, dogs, cats - 0.1 ml per 1 kg of weight; tylosin (20%) - intramuscularly or subcutaneously once a day for 3-5 days in doses: for cattle - 3-5 ml per 100 kg of weight, for pigs - 1-2.5 ml per 50 kg of weight, dogs - 1 ml per 10 kg of weight. They are vaccinated 14 days after recovery.

Immunity. After a natural illness, animals develop long-lasting and stable immunity. Antianthrax vaccine is proposed for active immunization of animals against anthrax. Immunity is formed after 10 days and lasts for one year after the introduction of the vaccine. In Ukraine, a spore vaccine from strain 55 is also used for preventive and forced vaccinations of all types of farm animals against anthrax. Young children, except for foals, are vaccinated from the age of 3 months, foals - from the age of 9 months, revaccinated after 6 months. Adult animals are vaccinated once a year. The use of anthrax vaccines simultaneously with other biological or chemical drugs is prohibited. Forced vaccinations are carried out regardless of the presence of other infectious diseases in the household. It’s not allowed to vaccinate exhausted, clinically ill animals and animals with elevated body temperature, as well as females in the last month of pregnancy.

Prevention and control measures. They include: general veterinary and sanitary measures for the prevention of anthrax; measures in areas unfavorable for anthrax and in dangerous territory; measures in case of suspicion of anthrax in animals; organization and implementation of measures to eliminate anthrax; disinfection measures; removal of quarantine.

General veterinary and sanitary measures for the prevention of anthrax include works on fencing and maintenance of livestock cemeteries, old livestock burials, biothermal pits, decontamination of soil in places of burials of anthrax corpses; organization of permanent supervision of the sanitary condition of places where livestock are gathered, harvesting, processing and storage of products and raw materials of animal origin; strict observance of the rules of keeping and intra-farm slaughter of livestock for meat; banning the sale of meat and other slaughter products for human consumption and animal feed without the permission of a specialist in

veterinary medicine; strict compliance with existing provisions during agro-hydromelioration, exploration, construction and other earthworks.

Actions in areas unfavorable for anthrax and in dangerous territory. The basis of anti-epizootic measures in unfavorable centers is the implementation of a complex of veterinary and sanitary measures and preventive vaccinations of animals. Disadvantaged pastures, watering holes, places of all old and active cattle burial grounds, biothermal pits, individual places of ancient burials of animals are identified and taken into account. Control of works on their enclosure and maintenance in appropriate sanitary condition is carried out. Grazing of animals and the use of water sources are not allowed in the areas of old animal burials, in the locations of enterprises for harvesting, storage and processing of animal raw materials, as well as in areas of pastures where infection and death of animals for unknown reasons have occurred. Sanitary requirements regarding timely cleaning and disposal of corpses are strictly followed. Depending on the local conditions and the epizootic state of the unfavorable point, draining of swamps, swampy pastures and hayfields is organized. Agromelioration, hydromelioration, construction and other earthworks are carried out in agreement with the state inspectors of veterinary medicine. Livestock premises, cattle yards and corrals are kept in proper veterinary and sanitary condition, they are regularly disinfected, deratized and disinfested, and inventory and animal care items are disinfected. Permanent supervision of the movement of animals, the sanitary condition of places of their accumulation, procurement, storage of products and raw materials of animal origin is organized. Control is carried out over the strict implementation of veterinary and sanitary rules for keeping animals, domestic or backyard slaughter of animals for meat, sale of meat and other products, including from forcibly slaughtered animals. Public awareness work is regularly conducted among the population and animal husbandry workers about the danger of anthrax to humans, as well as about measures to prevent it. Vaccination of susceptible animals with anti-anthrax vaccines must be included in the plans of preventive measures. At the same time, in stationary unfavorable points, where 5 years have not yet passed since the last case of anthrax in animals, adult cattle, sheep, goats and horses are vaccinated twice a year with an interval of 6 months. - in the spring, before being turned out to pasture, and in the fall, before being transferred to stables. Fur animals are vaccinated once a year from the age of 3 months. In other disadvantaged areas, adult animals are vaccinated once a year, young cattle - after reaching the age of 3 months with revaccination after 6 months. Lambs are vaccinated at 3 months of age and revaccinated after 3 months; pigs - from the age of 6 months, once a year, only in farms with free-range or camp maintenance; deer and camels - from the age of 6 months once a year; horses - from the age of 9 months once a year. In farms located in the threatened territory, all animals arriving at the farm must be vaccinated and allowed into the general herd after quarantine no earlier than 14 days after

vaccination. In the case of buying animals for personal ownership, citizens are obliged to register the purchased animals in accordance with the established procedure and deliver them to a veterinary institution for examination and vaccination against anthrax. It's allowed to introduce newly arrived animals into the general herd no earlier than 14 days after vaccination.

Measures in case of suspicion of anthrax in animals. In case of sudden death or illness of an animal, accompanied by high temperature, the formation of hot tumors on the body that rapidly increase in size, and swelling in the area of the chest, neck, abdomen, the appearance of colic and bloody foamy stools during agony, this should be reported urgently regional institution of veterinary medicine. A specialist in veterinary medicine must immediately arrive at the site, conduct a clinical examination and thermometry of all livestock, organize the isolation and treatment of sick and suspected anthrax animals, collect pathological material from dead or forcibly slaughtered animals and urgently send it on purpose to the laboratory of veterinary medicine . In case of suspicion of anthrax, it is forbidden to dissect the corpse, the ear of the dead animal is sent for examination. If anthrax is suspected during an accidental autopsy or carcass dissection, the spleen and regional lymph nodes are taken for laboratory examination. The carcasses of fur animals are sent whole. In case of positive results of the microscopic examination, the laboratory of veterinary medicine immediately informs the chief state inspector and the veterinary service of the farm.

Organization and implementation of measures to eliminate anthrax.

Quarantine is established in the places where the disease occurs, the boundaries of the unhealthy point subject to quarantine and the danger zone are established. Under the condition of quarantine in the territory of the unfavorable point, it is prohibited to introduce, import, withdraw and export outside its borders animals of all kinds; procurement and export of products and raw materials of animal origin; rearrangement of animals in the household; use of milk from sick animals; slaughter for meat; dissection of corpses and removal of skins from dead animals; performing surgical operations (except urgent); entry to a dysfunctional farm (farm) by outsiders; entry into the territory of transport not related to the maintenance of this farm (holding); joint drinking of animals from ponds and other bodies of water; trade in animals and livestock products within the danger zone; holding within these limits fairs, exhibitions and other events related to the gathering of people and animals. In order to carry out anti-epizootic measures against anthrax in a timely manner, the sanitary-epidemiological service is immediately notified. For the care of sick animals, a separate service is established, which is provided with overalls. The veterinarian, after examining all the animals in the affected area, divides them into two groups. The first group includes sick and suspected anthrax animals that have clinical signs of the disease. The second group includes animals suspected of being infected with

anthrax, that is, the rest of the animals that do not show signs of anthrax, but which are in the herd (flock, yard) where the disease has been established. Animals of the first group are treated and vaccinated 14 days after clinical recovery. Carcasses, dung, bedding, and fodder residues are neutralized by burning. Burying corpses is strictly prohibited. Premises and places where animals with anthrax are kept are thoroughly disinfected. The animals of the second group are vaccinated. If anthrax is detected during slaughter at meat plants and other slaughter enterprises, the veterinary medicine doctor of the shop (slaughter station) immediately stops the work of the primary processing shop, and then carries out all the measures provided for by the current Rules of veterinary inspection of slaughter animals and veterinary and sanitary examination of meat and meat products.

Disinfection measures. For disinfection of the premises in which animals with anthrax were kept, solutions of chlorinated lime with a content of 5% active chlorine, 4% formaldehyde solution and 10% caustic soda solution are used. Disinfection of premises is carried out in the absence of animals, after thorough mechanical cleaning of all surfaces and equipment, burning of production waste, as well as manure. The next disinfection of the unhealthy premises is carried out every time after the isolation of a new sick animal and is repeated every 10 days until the final disinfection and lifting of quarantine. In addition, every day during the morning cleaning, the passages in the dysfunctional animal yard are disinfected, for which disinfectants are used that are odorless and non-irritating. In the machine where the sick or dead animal was kept, the wooden floor and partitions are removed and burned. The earth is thoroughly burned, filled with a solution of chlorinated lime with a content of 5% active chlorine at the rate of 10 l/m^2, dug to a depth of at least 25 cm, mixed with dry chlorinated lime with a content of at least 25% active chlorine at the rate of 3 parts earth and 1 part of chlorinated lime, moistened with water and buried in a cattle cemetery. Manure, bedding and feed residues are moistened with a 10% hot solution of caustic soda, and then burned. The manure in the manure collector is mixed with dry chlorinated lime, which contains at least 25% active chlorine, at the rate of 1 kg of lime for every 20 liters of manure. Disinfection in the isolator is carried out daily with a 10% solution of caustic soda. Overalls, buckets, brushes and other equipment are disinfected by immersion in a 2% activated chloramine solution, 4% formaldehyde solution for 4 hours or by boiling in a 2% soda ash solution for at least 90 minutes. In places where cattle are kept during moving and when animals are kept, among which diseases have been detected, thorough mechanical cleaning and disinfection of the surface of the earth is carried out with a 10% solution of caustic soda or a 4% solution of formaldehyde, a 5% clarified solution of chlorinated lime.

Removal of quarantine. Quarantine remove 15 days after the last case of death or recovery of a sick animal, provided that the animals have no reaction to

vaccination and complete implementation of the entire set of veterinary and sanitary measures.

Questions and tasks for control.

1. The causative agent of anthrax and it’s characteristics.
2. Forms of clinical manifestation of anthrax in different species of animals.
3. Clinical signs of anthrax.
4. Laboratory diagnosis of anthrax.
5. Differential diagnosis of anthrax.
6. Treatment of anthrax.
7. Means of specific prevention of anthrax.
8. Measures to prevent anthrax
9. Actions in areas unfavorable for anthrax and in dangerous territory.
10. Measures in case of suspicion of anthrax in animals.
11. Organization and implementation of measures to eliminate anthrax.

Tuberculosis

(diagnostics, preventive and health measures when the disease occurs).

Tuberculosis –a chronic disease of domestic and wild animals and poultry, which is characterized by the formation of small specific avascular nodules (tubercles) in various organs, prone to cheesy decay and calcification. People also get tuberculosis.

The causative agent of tuberculosis. Belongs to the genus Mycobacterium, which includes 5 types of pathogenic mycobacteria: Myc. Tuberculosis is the causative agent of human tuberculosis; Myc. Bovis is the causative agent of bovine tuberculosis; Myc. Avium is the causative agent of bird tuberculosis; Myc. Murium is the causative agent of tuberculosis in mice; Myc. Poikilotermum is the causative agent of cold-blooded tuberculosis. The species belonging to the causative agent of tuberculosis is determined on the basis of cultural-morphological properties and virulence for different animals and human. Guinea pigs are sensitive to mycobacteria of human and bovine species, which cause generalized tuberculosis in them, resistant to avian species. Rabbits are susceptible to mycobacteria of bovine and avian species, which cause generalized tuberculosis or tuberculous sepsis in them, resistant to the human species (possible local damage). Rabbits, as well as horses, dogs, pigs, cats, goats, sheep, poultry, fur animals, and cattle are sensitive to the causative agent of human mycobacteria. Along with pronounced specific pathogenicity, various types of mycobacteria can cause diseases in other species of animals, as well as in human. Bovine mycobacteria can be the causative agents of human disease, as well as all farm animals and fur animals. Birds are not sensitive to mycobacteria of both species. In addition to birds, avian mycobacteria can cause diseases in pigs, horses, dogs, sheep and goats. Infection of cattle with avian species is accompanied by localization of the process in the lungs and udder. People can become infected from poultry while caring for it, as well as when eating raw eggs.

According to the morphological and cultural properties, mycobacteria of different species are almost indistinguishable from each other and are straight or slightly bent immobile gram-positive granular rods with rounded ends, size. Acid-, alcohol-, and alkali-resistant due to the presence of fat-wax substances in the cell. Mycobacteria do not form spores and capsules. They are dyed according to the Tziel-Nielsen method in a bright red color (other bacteria are blue) (Fig. 1).

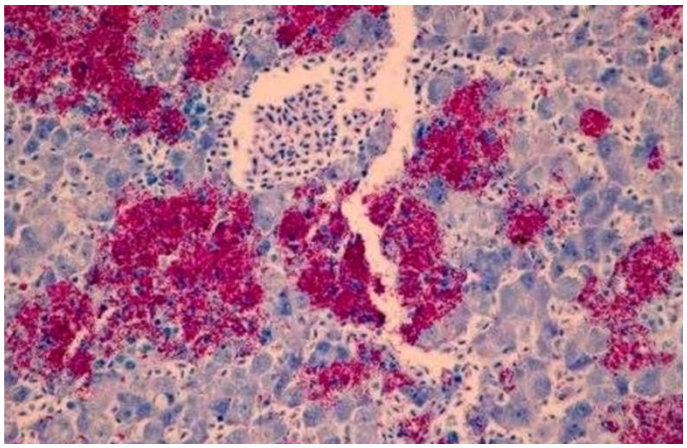


Fig. 1. Mycobacterium bovis.
Staining according to Ziel-Nielsen.

Mycobacterias tuberculosis are cultivated in aerobic conditions on the selective nutrient mediums of Petragnani, Gelberg, glycerol MPA (meat peptone agar) and MPB (meat peptone broth), Levenstein-Jensen medium. Mycobacteria grow very slowly: the human species takes 20-30 days, the bovine species takes 20-60 days, and the avian species takes 11-15 days. On solid nutrient media, mycobacteria grow in the form of fragile, small or large, single shiny or matte colonies, sometimes continuous clusters, and also in the form of a wrinkled plaque of white or white-yellow color. Due to the content of lipids, mycobacteries are very resistant to the action of physical and chemical factors: in the soil - more than 2 years; manure, bedding - up to 1.5 years; feces - up to 1 year; river water - up to 10 months; on pasture - up to 1 year; in frozen meat - up to 1 year; salted meat - 45-60 days; fresh milk in the cold - 9-10 days; butter and cheese in the cold - 10 months. Direct sunlight inactivates mycobacteria after 4-5 hours. Heating milk to 55°C destroys mycobacteria in 4 hours, to 85°C in 30 minutes, to 100°C in 3-5 minutes. Under the action of a 5% solution of carbolic acid, the inactivation of the causative agent of tuberculosis occurs after 24 hours, an alkaline 3% solution of formaldehyde - 1 hour. Mycobacteria tuberculosis are relatively quickly inactivated under the action of chlorine-containing preparations. Along with pathogenic mycobacteria, non-pathogenic, so-called atypical, mycobacteria are isolated from the body of people, cattle and objects of the external environment, which do not cause tuberculosis diseases, but cause sensitization of the body and a positive reaction to tuberculin. Atypical mycobacteria are difficult to differentiate from true tuberculosis mycobacteria, which makes it very difficult to establish a diagnosis in cattle disease.

The diagnosis of tuberculosis is made by a complex method based on the analysis of epizootological data, clinical signs, patho-anatomical changes, using basic and auxiliary diagnostic methods.

Epizootological data. From domestic animals, cattle are the most sensitive, then pigs, horses; from birds, chickens and pheasants get sick more often. The main

source of the causative agent is animals and poultry suffering from tuberculosis, less often - sick people. The causative agent is excreted from the body with sputum, feces, milk, less often with urine and semen. Air, fodder, water, bedding and other objects contaminated with secretions of sick animals are factors of pathogen transmission. Susceptible animals are infected with tuberculosis through the respiratory tract and digestive tract (Fig. 2). Depending on the epizootic state of the economy regarding tuberculosis, settlements and administrative territories are divided into prosperous and disadvantaged. Farms where animals with tuberculosis have been found, as well as districts and regions with such farms, are considered unhealthy. The degree of economic distress is determined by the level of spread of the disease: limited - when less than 25% of sick animals in the herd are detected during the year, and significant - when more than 25% of animals are infected with tuberculosis.

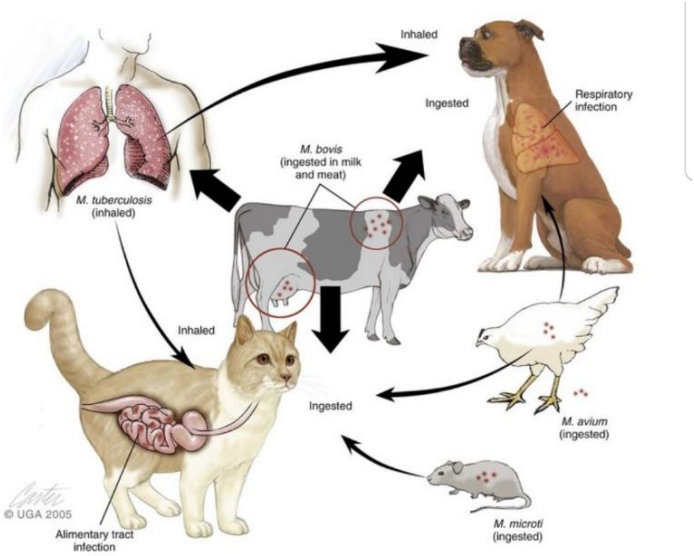


Fig. 2. Transmission of the pathogen in the environment.

Pathogenesis. At the site of penetration of tuberculous mycobacteria, a primary focus is formed in the lungs, pharynx, tonsils, and alimentary canal. At the same time, the regional lymph nodes are damaged and thus the complete primary complex is formed. In that case, if tubercular mycobacteria do not linger at the point of entry into the body, but immediately enter the lymph nodes, an incomplete primary complex is formed. In the primary complex, the causative agent is localized with the help of specific inflammatory foci - tuberculous nodules (tubercles). The inflammatory reaction in the formation of tubercular nodules has an exudative or productive character. During exudative inflammation, which is observed in bovine tuberculosis, epithelioid and giant cells are grouped around mycobacteria, which are surrounded by a dense ring of lymphocytes, as a result of which specific nodules (tubercles) are formed. Fibrinous exudate sweats out between the cells of the formed nodule. As a result of the death of cells that do not receive nutrition in avascular nodules, as well as under the action of the pathogen's toxins, a necrotic cheesy mass is formed in the

center of the tubercles, which later becomes calcified. In the productive form of inflammation, which is observed in horses and pigs when infected with the causative agent of avian tuberculosis, the growth of epithelioid, giant, and lymphoid cells occurs without cheesy degeneration and caseous necrosis. The tuberculosis process, depending on the virulence of the causative agent and the degree of resistance of the organism, can be benign or take on a malignant course. During the benign course of tuberculosis, the calcified primary center undergoes encapsulation and the further development of the infectious process stops. In the case of a sharp decrease in the body's resistance, the process of encapsulation of the pathogen in the primary cell does not occur. As a result, the tuberculosis nodule melts and mycobacteria escape into healthy tissue. This leads to the formation of small nodules (miliary tuberculosis) on large areas of the affected organ, which sometimes combine into tuberculous cells. Over time, large tuberculous foci and caverns filled with purulent-mucous mass are formed, from where mycobacteria spread throughout the body by lymphogenous and hematogenous routes, leading to the generalization of the process and the formation of tuberculous foci in various organs.

Clinical signs and course of the disease. The incubation period lasts 2-6 weeks. There is a distinction between active (open) tuberculosis, when the causative agent of the disease is released from the body into the external environment with bronchial mucus, milk and feces, and latent tuberculosis, when mycobacteria are not released from the body of a sick animal.

In cattle, the course of the disease is chronic (latent), less often – subacute. Tuberculosis usually does not have pronounced clinical signs, and lesions are most often detected during a post-mortem examination of organs. Depending on the localization of the pathological process, pulmonary, intestinal, and generalized forms of the disease are distinguished, as well as damage to the udder, uterus, and serous membranes. Most often, the pulmonary form of tuberculosis is registered, which is clinically manifested by intermittent fever, cough, at the beginning of the disease - dry, short, strong, and with a long disease - frequent, weak, silent, painful. In severe cases, with significant damage to the lungs, sharp changes in breathing, moaning, decreased appetite and productivity are observed. During auscultation, weakening of vesicular breathing, dry or moist rales are revealed. An increase, lumpiness, hardening, painlessness of the nasopharyngeal, submandibular, mediastinal and peribronchial lymph nodes are revealed. As the disease progresses, the appetite worsens, the mucous membranes become pale, the eyes are sunken, the chewing rhythm is disturbed, and the scar periodically swells. At the end of the disease, breathing becomes frequent, accompanied by wheezing and moaning, discharge from the nose is ichorous in nature, the animal dies in a state of slow agony. With the intestinal form of tuberculosis, rapid exhaustion of the animal, general weakness, chronic diarrhea is observed, which is sometimes accompanied by the release of bloody feces with an unpleasant smell (Fig. 3).

Fig. 3. Intestinal form of tuberculosis.

uring a rectal examination, enlarged mesenteric and portal lymph nodes are revealed. Tuberculous lesions of the uterus and ovaries are rare, accompanied by abortions and infertility. Orchitis, dropsy of the membranes of the testicles develops in bullies when the genitals are affected. Tuberculosis of the mammary gland is characterized by a significant increase in the lymph nodes above the udder, hardening of one of the two quarters of the udder, and later the entire gland, multiple small nodules that are detected during palpation. Due to the fact that the secretion of milk, despite the tubercular process, remains unchanged for a long time, and the affected parts of the udder are painless, diseases of the mammary gland and the release of mycobacteria with milk can go unrecognized for a long time. Tuberculosis of the serous coverings of the thoracic and abdominal cavities, the so-called "pearl disease", is clinically almost unrecognizable. With the generalized form of tuberculosis, the increase, compaction and immobility of all or most of the superficial lymph nodes is determined. It should be borne in mind that with all forms of tuberculosis, the causative agent of the disease is always excreted with milk.

In pigs, the course of tuberculosis is mostly asymptomatic, only an increase in pharyngeal and cervical lymph nodes is detected. With clinically pronounced tuberculosis, a dry, infrequent cough, difficulty breathing, exhaustion, and damage to the lymph nodes are observed. In the case of damage to the intestines, there is diarrhea, which is replaced by constipation, dryness and paleness of the skin.

Horses get sick rarely, mainly in farms that are unfavorable for bovine tuberculosis. Gradual weight loss, rapid fatigue during work, sometimes cough, difficulty breathing, increase in submandibular, pharyngeal and cervical lymph nodes are noted. Lung damage is manifested by signs of pneumonia. When the intestines are affected, mild colic is sometimes observed.

In sheep and goats, the tuberculous process is localized in places of penetration of the causative agent and proceeds with damage to regional lymph nodes. Sometimes there is an early generalization of the process with the formation of

tubercular nodules in various organs. The clinical picture is not typical. Progressive weight loss, general weakness, diarrhea are revealed. In goats, severe damage to the udder, the formation of large, dense lumpy tumors in it is sometimes detected.

There are almost no characteristic clinical signs in birds. There is weight loss while maintaining appetite, lethargy, inactivity, reduced weight-bearing capacity, pectoral muscle atrophy, pallor of the crest and earlobes. In the case of generalization of the process, damage to the intestines, atrophy of the chest muscles, persistent, exhausting diarrhea, which leads to death, are revealed.

In dogs at the beginning of the disease clinical signs are uncharacteristic. Subfebrile temperature, weight loss, lethargy, changeable appetite are noted. Later, signs of damage to the lungs and intestines appear. Sometimes synovitis, deforming osteoarthritis, and diffuse osteoperiostitis develop.

Pathological changes. In bovine tuberculosis, specific lesions are found in the lungs, bronchial and mediastinal lymph nodes. The affected areas of the lungs are hard, have a red-gray color, and are riddled with small grayish-yellow nodules of various shapes and sizes. When cutting the lungs, cheesy-regenerated and calcified cells are found, as well as purulent foci (caverns), surrounded by a dense connective tissue capsule (Figs. 4, 5).

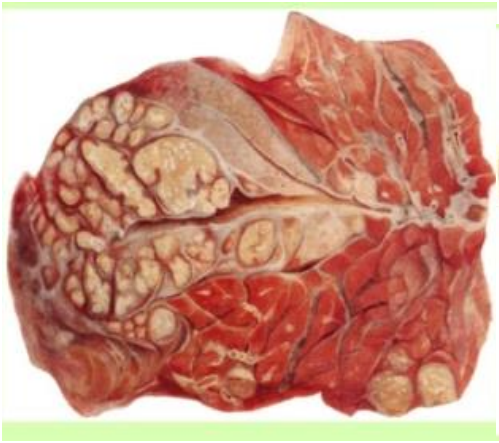


Fig. 4. Pneumonia in cattle.

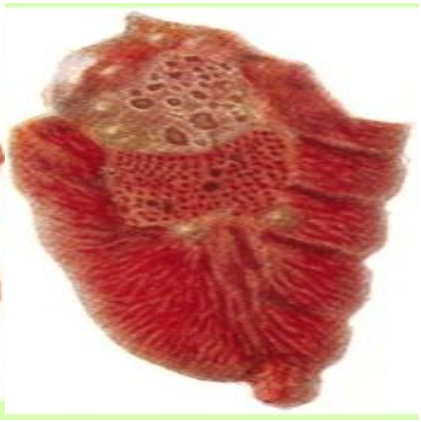


Fig. 5. Lungs of duck with tuberculosis.

Nodules are also found in parenchymal organs (Figs. 6, 7, 8).

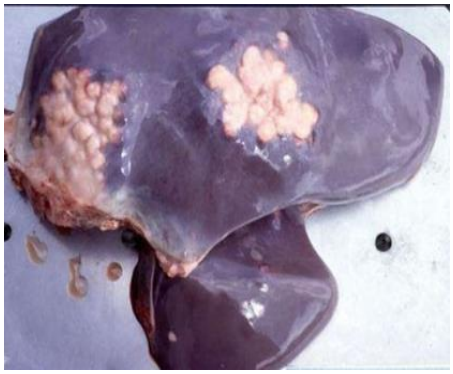


Fig. 6. Liver.

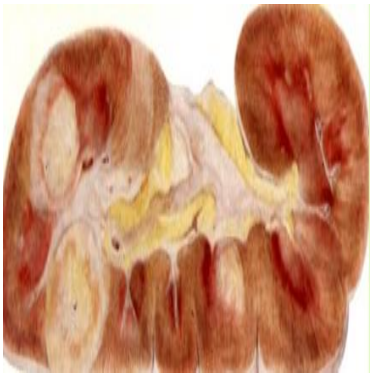


Fig. 7.Kidney.

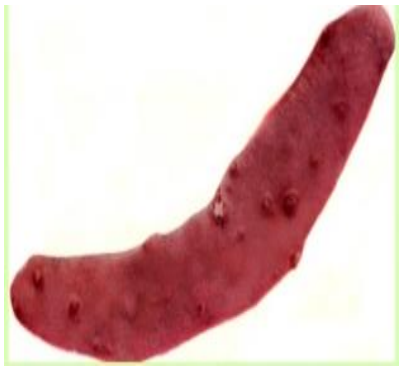


Fig. 8. Spleen.

Bronchial and mediastinal lymph nodes are hilly, sharply increased in size, hard, contain cheesy or purulent foci, which crack when cut due to their degeneration and calcification (Fig. 9).

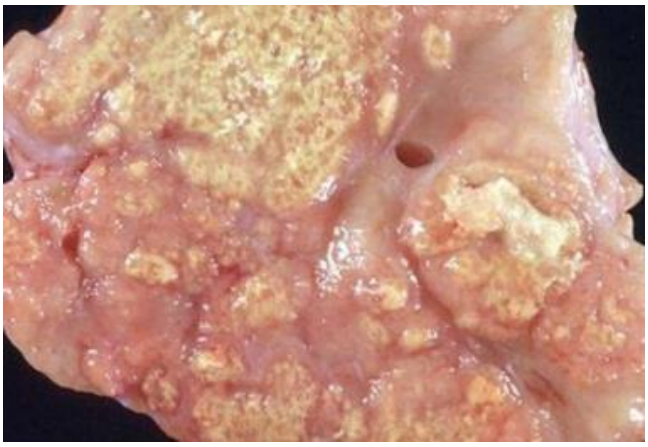


Fig. 9. Lymph nodes in tuberculosis.

With "pearl disease", small, round, dense, grayish-red growths are observed on the serous coverings of the abdominal and chest cavities, which are calcified and hang in clusters on the connective tissue, resembling cauliflower. Grayish-yellow nodules and ulcers are found in the mucous membrane of the posterior third of the small intestines, in the ileum and cecum, solitary follicles and Peyer's patches (Fig. 10).

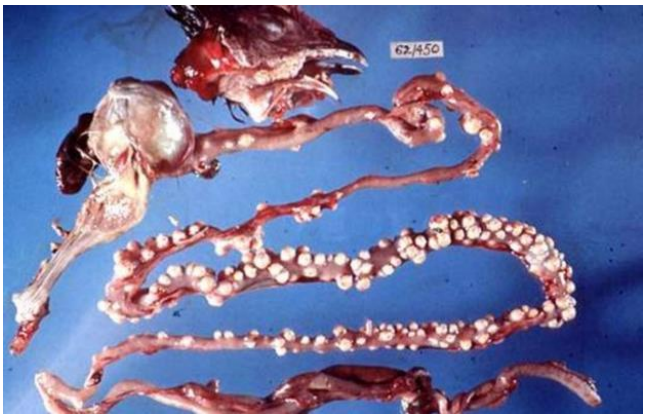


Fig. 10. Tuberculous lesions of the intestine of poultry.

In case of tuberculosis of the udder, there is a significant growth of connective tissue, the affected parts of the udder are enlarged in volume, hard, contain many nodules, which are very crunchy when cut. In pigs, tuberculous lesions are found in the submandibular and mesenteric lymph nodes, sometimes in the lungs and liver. Miliary tuberculosis is more common in horses. Tuberculosis lesions are localized in the lungs, bronchial and mediastinal lymph nodes, spleen, liver, much less often - in other organs, and do not have caseous changes. In sheep, nodules are limited in the places of penetration of the pathogen, there is rarely a generalization of the process. In goats, lumpy or caseous mastitis is detected. In chickens, tuberculosis lesions are

often found in the liver, spleen, and bone marrow, less often in the intestines and ovaries, and in geese and ducks, in the lungs.

Diagnostics. Basic and auxiliary diagnostic methods. The main methods of diagnosis include: intravital method - clinical examination of animals, one-time intradermal tuberculin test or ophthalmoprobe for horses and postmortem (post-slaughter) method - patho-anatomical and bacteriological examination. Auxiliary diagnostic methods include: a simultaneous allergy test, an intravenous tuberculin test, serological tests (testing the reaction, binding of complement), as well as two intradermal and ocular tuberculin tests, a histological method. At the beginning of the disease, clinical and pathomorphological research methods are of limited value. More reliable in the initial stage of the disease are allergic, patho-histological and bacteriological research methods. In recent decades, a problem has arisen with the differentiation of positive tuberculin reactions in animals sensitized by atypical mycobacteria, which are not related to tuberculosis disease. In such cases, a simultaneous allergy test is carried out, in which the animals are simultaneously examined with tuberculin and a complex allergen of mycobacteria (CAM). Based on the differences in the intensity of the manifestation of an allergic reaction to each of these two drugs, a conclusion is drawn about the condition of the studied group of animals. A reliably high intensity of the reaction to tuberculin indicates the infection of animals with tuberculosis. Conversely, with a significantly more pronounced allergic reaction to CAM, it's believed that there is sensitization of the animal body by atypical mycobacteria. To establish the final diagnosis, a control pick up of animals positively reacting to tuberculin and laboratory studies of the pathological material taken from them are carried out. Allergic diagnosis of tuberculosis in cattle involves carrying out planned one-time diagnostic studies in healthy farms with epizootic (epidemic) indicators, as well as before selling animals for breeding or production purposes. In order to find out the epizootic status of tuberculosis in prosperous farms in disadvantaged regions, cattle are examined for tuberculosis en masse, starting from the age of 2 months, twice a year.

After the rehabilitation of all farms in the district, during the first four years, all livestock, starting from the age of two months, are examined once a year, and breeding stock - twice a year. In the case of a tuberculosis-free state of the district for four years or more, all livestock, starting from the age of two months, are examined once a year. If the herd has been safe for more than 10 years, control can be carried out at meat processing plants based on the results of the slaughter examination. In all breeding farms, regardless of the duration of well-being, the mother herd (cows, steers, heifers) and all young animals, starting from the age of 2 months, are examined once a year. Animals must be examined for tuberculosis during the quarantine period when they are sold to other farms or when they are imported to complete their own herd. In all farms that supply milk to children and medical

institutions, sanatoriums or directly to the trade network, the productive herd is examined twice a year. In prosperous farms, regardless of the forms of ownership, where the epizootic situation is studied, cows that react to tuberculin are isolated, and their milk is disinfected by boiling and used to feed animals of the fattening group or processed into ghee.

Pigs must be examined during the quarantine period when they are introduced or transferred to other farms, and in breeding farms, all breeding herds are examined once a year. Poultry in breeding farms are examined once a year, only the mother flock at the age of 6 months. Horses, goats, sheep, dogs and fur animals are examined depending on the epizootic condition. For allergic diagnosis, the following are used: in mammals (except pigs and monkeys) - dry purified tuberculin - purified protein derivative for mammals or alt-tuberculin for mammals; in pigs - dry purified tuberculin for poultry and (at the same time) dry purified tuberculin for mammals; in poultry - dry purified tuberculin for poultry; in monkeys - dry purified tuberculin for mammals. Tuberculin is enter intradermally, once, in a dose of 0.1 ml to all animals. Cattle, buffalo, zebu, and deer are injected with tuberculin in the middle third of the neck; pigs - in the area of the outer surface of the auricle at a distance of 2 cm from its base: on one side of the auricle, tuberculin for mammals is inoculated, on the other side - tuberculin for poultry. Goats, sheep, dogs, monkeys, fur animals (except minks) are injected with tuberculin intrapalpebrally in the upper eyelid; chickens - in the beard, geese and ducks - in the submaxillary fold. In horses, ocular tuberculinization is carried out twice with an interval of 5-6 days. Accounting and evaluation of allergic reactions in cattle, buffaloes, zebu, camels is carried out after 72 hours, in goats, sheep, pigs, dogs, monkeys, fur animals - after 48 hours, in poultry - after 30-36 hours after administration of tuberculin. In horses, the reaction is evaluated after the first administration of tuberculin after 6, 9, 12 and 24 hours, after the second administration of tuberculin - after 3, 6, 9 and 12 hours. The reaction is considered positive if in cattle, buffaloes, zebu, camels, deer there is diffuse swelling without clear borders, pasty consistency, increased sensitivity to touch and thickening of the skin fold by 3 mm or more at the site of tuberculin injection; in goats, sheep, pigs, dogs, monkeys, fur animals and birds - in case of edema at the site of tuberculin injection; in mink - with swelling of the eyelids. In horses, the reaction is considered positive if a mucous-purulent or purulent secretion flows from the inner corner of the eye, hyperemia and swelling of the conjunctiva are observed. The reaction is considered negative in the absence of inflammatory phenomena at the site of tuberculin injection.

Pathological-anatomical studies are carried out when the primary diagnosis is established in previously prosperous farms, where animals reacting to tuberculin were found during planned studies. In typical cases, pathological changes in tuberculosis are detected primarily in the lungs, regional lymph nodes, various parenchymal organs, as well as in the bone marrow and bones.

Laboratory diagnostics. Milk from each cow (150-200 ml), as well as sputum, feces, and urine are sent to the laboratory for intravital bacteriological diagnosis. In case of suspicion of tuberculosis of the intestines, feces samples containing mucus and blood veins taken from the rectum are sent to the laboratory. Paired lymph nodes (pharyngeal, submandibular, bronchial, mediastinal, ileal), as well as parts of organs with pathological changes, are sent from fresh corpses or from animals killed for diagnostic purposes, which reacted positively to tuberculin. Carcasses of poultry and small animals are delivered whole and fresh. For serological research, 2-3 ml of blood serum from those suspected of tuberculosis in cattle and pigs are sent to the laboratory. The material selected for research is delivered fresh or preserved in a 30% sterile aqueous solution of glycerin, and for histological examination - in a 10% aqueous solution of neutral 40% formalin. In the laboratory, the pathological material is washed from the preservative with physiological solution, pieces of 0.5-1 cm^3 (at least 12 g each) are cut from the affected organs and separately from the lymph nodes, which are cleaned of accompanying microflora according to the method of Gon or Alikaeva and concentrated by flotation. Before flotation, the pathological material is prepared accordingly. Feces are ground with distilled water, filtered through a gauze filter, the filtrate is used for research; urine is centrifuged for 30 minutes at 3,000 rpm, sediment is used for research. Sputum, mucus, pus is diluted 3-6 times with a 0.5-2% solution of caustic soda. Samples of pathological material prepared in this way are subjected to flotation in order to concentrate mycobacteria. Smears for microscopic examination are prepared from the flotation ring. After adding the same volume of 3-6% sulfuric (sulphuric) acid solution to the flotation ring and settling for 10 minutes, it's cultured on Petragnani, Levenstein-Jensen, Gelberg elective media for the isolation of mycobacteria. The growth of mycobacteria is detected after 10-30 days, often later (up to 3 months). To indicate the causative agent of tuberculosis in pathological material, to determine its type and establish virulence, biological studies are carried out. The biosample is placed on 3-5 guinea pigs weighing 300-350 g each, 3-5 rabbits weighing at least 2 kg each, 3-5 chickens at least 5 months old. After special preparation, the pathological material is injected 1-2 ml into the marginal ear vein of rabbits, subcutaneously in the groin area of guinea pigs, and into the subpterygoid vein of chickens. Infected animals are monitored for 3 months. 30 days after infection, a tuberculin test is performed. If a positive allergic reaction is established, the experimental animal is slaughtered, the pathological material is examined by bacteriological method.

Differential diagnosis. Presupposes the need to rule out paratuberculosis in cattle - according to autopsy, bacteriological and allergic studies; leukemia - by the absence of tubercular nodular lesions in the lungs and parenchymal organs, as well as by the results of allergic and serological tests. Sputum in horses is excluded based on the results of an allergic reaction and a complement binding reaction; infectious

anemia - according to hematological examination and autopsy.

Treatment. Animals with tuberculosis are not treated, they are slaughtered at meat processing plants.

Immunity. In case of tuberculosis, it's not sterile. There is not vaccine for the specific prevention of tuberculosis in farm animals. The mink is immunized with BCG vaccine, which is used in human medicine. Puppies are vaccinated from the age of 20-30 days in dysfunctional animal farms. Immunity lasts for 6-8 months.

Prevention and control measures. They provide for the protection of livestock farms from tuberculosis, the timely identification of animals suffering from tuberculosis and their submission to slaughter; veterinary and sanitary measures in farms affected by tuberculosis; implementation of anti-tuberculosis health measures; protection of people from tuberculosis. Protection of livestock farms from tuberculosis is carried out by means of strict control over the importation of animals from other farms, their movement within the boundaries of the farm, procurement and sale of livestock products. Farms and private farms are stocked only with healthy, tuberculosis-tested animals from farms free of infectious diseases. In tuberculosis-free farms, it's necessary to ensure standard conditions for keeping, feeding and using farm animals, as well as isolated breeding of young animals. In the summer period, cattle should be taken to summer camps in a timely manner, their contact on pastures and watering holes with cattle of other farms and private owners should not be allowed. It's necessary to regularly carry out repairs, disinfection and deratization of livestock premises, systematically remove and disinfect manure, carry out veterinary and sanitary control over the use of milk and other livestock products for feeding animals. Only persons who have passed a medical examination and have permission to work on animal farms due to their state of health are allowed to serve animals. Without the permission of veterinary specialists, it is not allowed to import animals from other farms for stocking or for production purposes. Imported animals are transferred to the general herd only after the end of preventive quarantine and receiving negative results of allergy tests.

Measures in case of tuberculosis in farm animals. According to the submission of the chief veterinary doctor of the district and the decision of the local self-government bodies, the farm, settlement or individual yard is declared unhealthy for tuberculosis, quarantine restrictions are introduced, and a complex of organizational, economic and special veterinary and sanitary measures aimed at the elimination of tuberculosis is approved and implemented. Under the terms of the quarantine restrictions, the entry of outsiders and vehicles into the premises and the territory of the farm is prohibited; removal of animals from a dysfunctional farm (yard) without the permission of the chief veterinarian; sale of animals, fodder, holding of fairs, markets, exhibitions, excursions in a disadvantaged area; the use of animals suffering from tuberculosis for the purpose of obtaining milk and offspring from them for

reproduction of the herd; sale to the public for raising and fattening animals from dysfunctional farms; joint grazing, drinking and other contacts of sick animals with tuberculosis-free livestock; export to milk processing enterprises, in retail trade, use in the economy for food purposes and for animal feed of uncontaminated milk from cows from disadvantaged farms; the use for animal feeding of uncooked meat and other meat products obtained after the slaughter of animals with tuberculosis; the use of manure, bedding, and feed residues from livestock affected by tuberculosis without prior disinfection. Animals with tuberculosis are transported to the meat processing plant for slaughter in a specially equipped vehicle under the supervision of a veterinary specialist.

Sanitation of cattle from tuberculosis is carried out by various methods depending on the level of spread of the disease among animals, the duration of the unfavorable state of the livestock farm and the specialization of production. In case of a limited spread of the disease (degree of damage up to 25% of the livestock), the farm (herd) can be improved with the help of systematic allergy studies, removal of sick animals from the herd and their slaughter at meat processing enterprises. Cattle from the age of 2 months are examined once every 45-60 days using an intradermal test. Animals that react to tuberculin or have clinical signs of tuberculosis are immediately removed from the herd, branded with the letter "T" on the skin of the cheeks, isolated and slaughtered no later than 15 days later. In the event that no animals reacting to tuberculin are detected on a cattle farm of a dysfunctional economy during a planned survey twice in a row, this farm (brigade) is placed on a 6-month preventive control. During this period, animals are examined for tuberculosis twice, with an interval of 3 months, by allergic and clinical methods. If the animals did not react to tuberculin and no clinical signs of the disease were detected, then after carrying out a complex of health-improving measures, the farm is considered cured of tuberculosis. If tuberculin-reactive animals are detected during the first or second diagnostic control, all of them are subjected to diagnostic slaughter. Provided that they do not have tubercular lesions and receive negative results of bacteriological examination of material taken from slaughtered animals, the farm is considered cured of tuberculosis. If pathological anatomical changes are detected or the causative agent of tuberculosis is isolated from the sampled material, the whole group of animals is considered unhealthy and the rehabilitation is continued. Calves born from conditionally healthy cows are raised in isolation. Calves obtained from cows that have been diagnosed with tuberculosis within 90 days after calving are slaughtered within 15 days. In case of a significant spread of the disease in an unhealthy farm (degree of damage 25% or more), as well as a long-term (more than 3 years) unhealthy state of the farm and the discovery of a significant number of animals that react to tuberculin, the farm is rehabilitated by the method of completely replacing unhealthy livestock with healthy ones animals raised in tuberculosis-free farms. The

method of complete replacement of livestock is used to cure individual farms from tuberculosis, if tuberculosis was not registered there before, as well as in cattle fattening farms. When recuperating by the replacement method, all the livestock of a dysfunctional farm are considered sick, allergic studies are stopped in it, and all cattle are taken to a meat processing plant for slaughter. Mechanical cleaning, sanitary repairs, deratization and final disinfection are carried out in livestock premises and farm territory freed from livestock. For disinfection of livestock premises, pens, equipment, inventory, use a 5% clarified solution of chlorinated lime, a 10% solution of neutral calcium hypochlorite with an active chlorine content of at least 5%; 1% aqueous solution of glutaraldehyde; alkaline solution of formaldehyde with a formaldehyde content of 3% and caustic soda - 3%; 20% mixture of freshly slaked lime. For aerosol disinfection, a 40% solution of formaldehyde is used at the rate of 40 ml/m3 with exposure for 48 hours. To disinfect the soil surface, use an alkaline solution of formaldehyde at the rate of 10 l/m2, chlorinated lime at the rate of 5 kg per 1 m2 of area. Manure is disinfected by a biothermal method or burned.

Questions and tasks for control.

1. Epizootological features, etiology, course and forms of clinical manifestation of animal tuberculosis of various species.
2. Who and by what methods carries out epizootological control of the well-being of farms in relation to tuberculosis?
3. Name the methods and means of specific diagnosis of tuberculosis in animals of different species.
4. What to do if several animals reacting positively to tuberculin are found during a routine diagnostic examination?
5. When is the diagnosis of tuberculosis considered established?
6. In what cases is a simultaneous allergy test performed? Implementation methodology and interpretation of its results.
7. What restrictive measures are carried out in points that are unfavorable for animal tuberculosis?
8. Who declares the farm to be dysfunctional and on the basis of which documents?
9. Draw up schemes of health measures in herds of cattle, pigs, sheep, goats, fur animals and poultry that are unfavorable for tuberculosis.
10. What measures should be taken when tuberculosis is detected in private yards of citizens?

Brucellosis

(diagnosis and control measures)

Brucellosis – a chronic infectious disease of all types of farm and wild mammals, characterized by abortions with delayed litter, disorder of reproductive capacity of animals, endometritis, orchitis, bursitis, hygromas and arthritis. People also get brucellosis.

Brucellosis is found in many countries of the world, causes significant economic losses due to disruption of breeding work, reproductive capacity of animals, long quarantine and complexity of veterinary, sanitary and economic measures to eliminate the disease.

The causative agent of the disease is Brucella, belonging to the genus Brucella and represented by six species: Brucella Abortus - causes disease in cattle, as well as camels, buffaloes, yaks, horses; Brucella Suis – pigs, reindeer; Brucella Melitensis - goats, sheep, buffaloes; Brucella Canis - dogs; Brucella Ovis - sheep; Brucella Neotomae - rats. The migration of Brucella Melitensis from goats and sheep to cattle and pigs, and Brucella Suis - from pigs to goats and sheep. In human, brucellosis infection is caused by three types of pathogen, more often Brucella Melitensis, less often - Brucella Abortus and Brucella Suis According to morphological properties, Brucella of different species and variants are identical and are polymorphic coco- or rod-shaped, immobile gram-negative bacteria. They do not form spores, some strains form a capsule. They are well dyed with all aniline dyes. During the microscopic examination of smears, Brucella are colored red, other microorganisms and the background of the drug are green (Fig. 1). Cultivated in aerobic conditions at 37°C, on special media - liver-glucose-glycerol broth and agar, serum media. Potato agar, medium with gentian violet, and Krol's medium are also used.

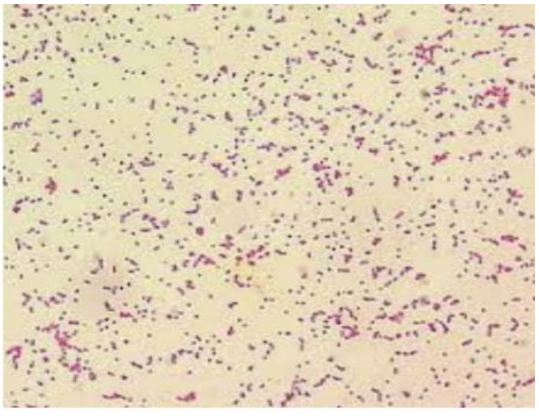


Fig. 1. Microscopy of a smear stained according to Kozlovsky.

Of the laboratory animals, guinea pigs are the most sensitive to brucella, white mice are less sensitive. Brucella are relatively resistant to physical and chemical

factors. Direct sunlight destroys them only after 4-5 hours. They remain viable in soil, manure, water, fodder for up to 4 months, in manure, urine - 4-5 days, in summer on pasture - 40 days, in cow feces in winter and autumn - 160 days, on people's clothes - 14 days, on wool and sheep skins - 1.5-4 months, in cheeses, butter, cheese, salted skins - 25-70 days, in salted meat - up to 3 months, in sour milk - 1-4 days, in chilled milk - 6 -8 days. Brucellas are quickly destroyed during rotting and instantly - during boiling. They are inactivated at 60°C after 30 min, at 70°C - after 5-10 min, under the action of 1-3% creolin emulsion, 1-2% solution of phenol, formaldehyde - after 1 h, 5% freshly slaked lime - after 1- 3 hours.

The diagnosis is made by a complex method on the basis of epizootological data, clinical signs, patho-anatomical changes, as well as bacteriological, serological and allergic (in sheep and pigs) studies.

Epizootological data. Cattle, sheep, goats, pigs, reindeer are most susceptible to brucellosis, horses, camels, carnivores are less susceptible. Antelopes, moose, wild boars, foxes, and rodents get sick from wild animals.

The source of the causative agent of infection is sick animals, especially during the period of abortion, when brucellas are excreted in large quantities with the fetus, fetal membranes and waters and secretions from the genital organs, periodically with milk (in sheep - 2-3 years, in cows - 7-9 years), with urine and feces (in goats with urine and vaginal secretions - up to 3 years). In case of disease of the genital organs, bulls, as well as rams and boars secrete Brucella with sperm. The factors of transmission of the causative agent of infection can be contaminated by secretions of sick animals, feed, water, feeders, manure, care items, clothes and hands of service personnel (Fig. 2).

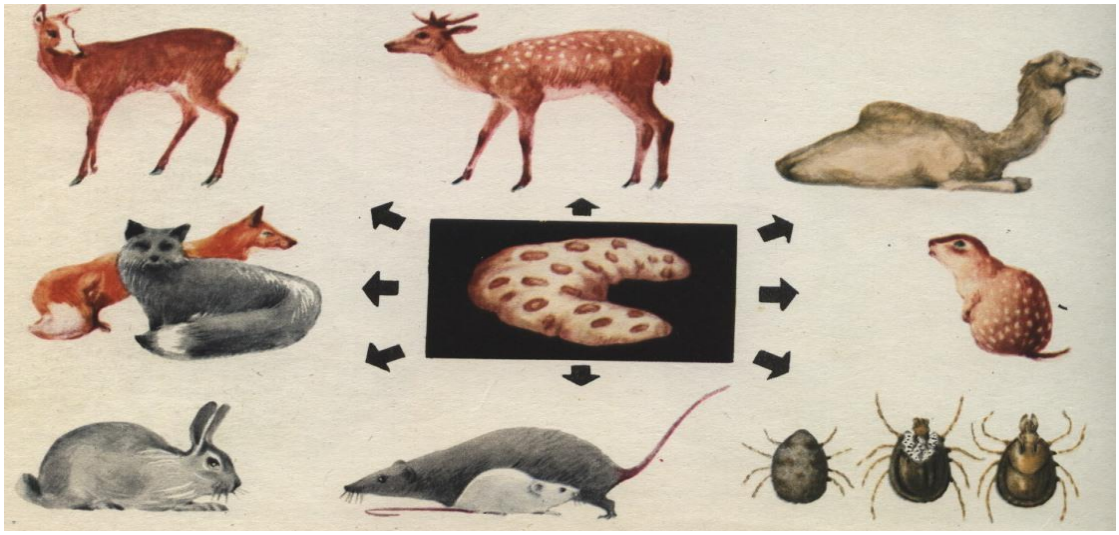


Fig.2 Factors of transmission of the infectious agent.

In a healthy herd, the disease can appear after the introduction of new animals - hidden carriers of brucellosis, as well as in the case of joint grazing and watering of healthy and infected animals, feeding of young animals with insufficiently disinfected

milk from farms that are unfavorable for brucellosis. The possibility of introduction of the causative agent of infection by dogs (especially in sheep farming), rodents, stinging insects, mites (ticks) is not excluded. The causative agent of the disease enters the body of animals mainly through food, as well as through the skin, including intact skin, through the mucous membranes, conjunctiva of the eyes. In sheep and pigs, the sexual route of transmission of the causative agent of the disease prevails. In cattle, sheep, goats, and pigs, brucellosis has the character of epizootics, in other species of animals it appears sporadically. Brucellosis of large and small cattle is characterized by a long (years) latent course of infection. The acute course of the disease is observed only in the case of the initial appearance of infection in the herd or the introduction of new sexually mature animals into a dysfunctional herd. The main indicator of the occurrence of brucellosis in a healthy herd is abortions in the second half of pregnancy, first in individual animals, and then mass - in 50-90% of mothers. In the future, the number of abortions decreases sharply and, if the herd is not replenished with new sexually mature animals, after 2-3 years abortions may stop altogether. Depending on the epizootic state of the animal population, a farm, economy or settlement is considered to be unfavorable or favorable for brucellosis. Beneficial animals are defined as those within which no diseased animal was detected during the examination for brucellosis. In the event of an outbreak of the disease, the farm is declared unfavorable for brucellosis, and for the period of recovery, the danger zone and the limits of possible migration of the pathogen are determined.

Pathogenesis. Three phases are distinguished in the development of brucellosis infection: primary latency (regional infection), generalization of the process, and secondary latency. The phase of regional infection is characterized by the penetration of the causative agent into the body of susceptible animals, its reproduction in regional lymph nodes, followed by its introduction into parenchymatous organs through lymphatic and blood vessels and the development of reticuloendotheliosis phenomena. Clinical signs of the disease do not yet appear during this period, but infected animals are carriers of bacteria and can excrete brucelli with urine and feces. Serological reactions to brucellosis during this period are negative, since the accumulation of specific antibodies has not yet reached the diagnostic level. The generalization phase of the process develops under the influence of various adverse conditions of keeping and feeding animals, as well as during pregnancy. It’s characterized by bacteremia, generalization of the pathological process, the formation of specific brucellosis granulomas in the affected organs and tissues, and the development of a characteristic clinical picture of the disease. In the case of penetration and reproduction of brucella in the mucous membranes of the uterus, amniotic membranes and the fetus, inflammatory processes develop, which leads to impaired nutrition of the fetus, it’s death and abortion. Inflammatory necrotic phenomena can develop in other organs and tissues, causing orchitis, bursitis,

abscesses. During this period, it's possible to isolate a Brucella culture in cultures from parenchymal organs, as well as to detect specific serum antibodies. The phase of secondary latency is characterized by the clinical recovery of the animal, long-term bacteremia, clearly expressed allergic reorganization of the organism.

Clinical signs and course of the disease. The incubation period lasts -4 weeks, after which specific agglutinins and, later, complement-binding antibodies appear in the blood of infected animals. In many infected animals, brucellosis is asymptomatic and latent. Such animals, which are the source of the causative agent of the disease, can be identified only with the help of serological or allergic studies. In cattle, the course of the disease is latent. The main clinical sign of brucellosis is abortion at 5-8 months of gestation, delayed placenta, purulent endometritis, which cause barrenness and infertility (Fig. 3).

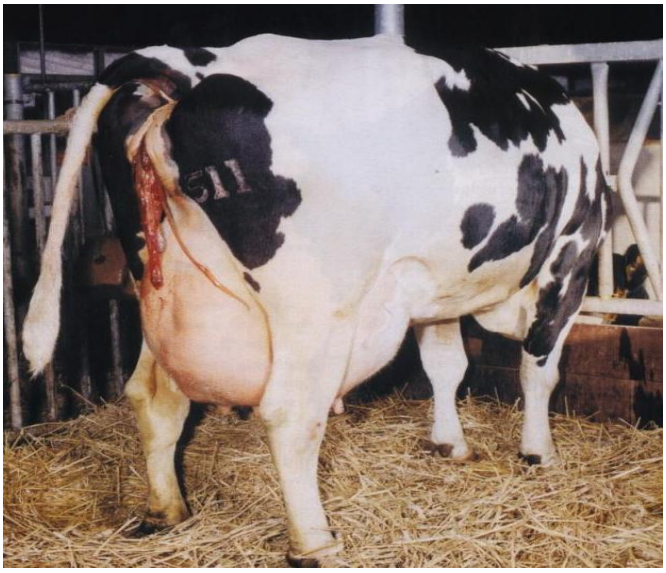


Fig. 3. Placenta retention.

Repeat abortions are rare. Characteristic signs of brucellosis are hygromas, serous bursitis of the front limbs, abscesses of the hind limbs (Figs. 4, 5). Orchitis and epididymitis can be observed in bulls. In sheep and goats, abortions are observed at 3-5 months of age, rarely earlier. In rams, the testicles and their appendages are often affected. In sows, abortions occur at 4-12 weeks of gestation, often without delay in litter. Repeated abortions are possible. In boars, the testicles and their appendages are affected. The disease can be complicated by damage to joints, bones, the formation of abscesses in the subcutaneous tissue, muscles, and even in parenchymal organs. Horses are characterized by bursitis in the withers and nape, necrosis of cartilages, spinous processes, formation of fistulas. Abortions are rare. Abortions are observed in camels at 6-7 months of pregnancy. In dogs and cats, the course of brucellosis is asymptomatic, infection is detected only with the help of serological and bacteriological studies.

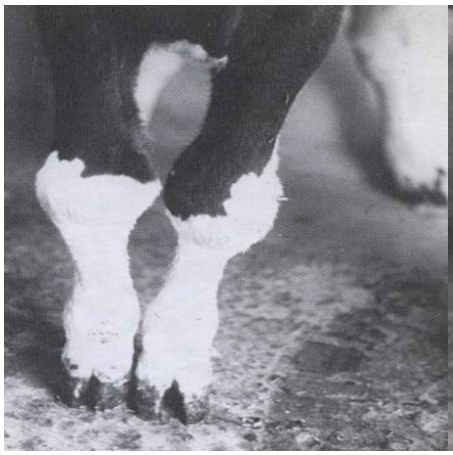


Fig. 4. Bursitis serous.

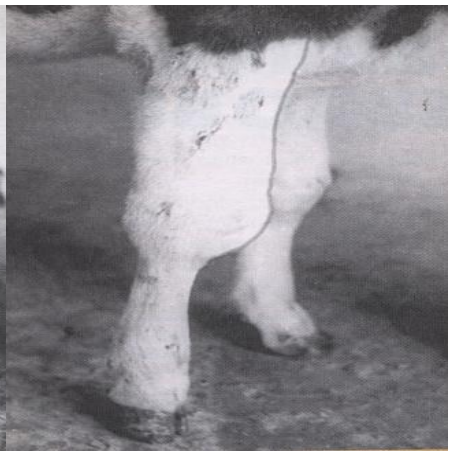


Fig. 5. Arthritis.

Pathological changes. Brucellosis in cows is primarily observed after abortion. Fruit membranes and cotyledons are largely infiltrated, thickened, permeated with hemorrhages, often covered with flakes of fibrin and pus. Ovarian cysts, mastitis, bursitis, joint damage are detected in cows, purulent-necrotic lesions of testicles and appendages in bulls. Mummification of fetuses, multiple small granulomas in the uterus, and abscesses in the subcutaneous tissue occur in pigs. Horses are characterized by purulent-necrotic processes in the nape and withers, possible endometritis, salpingitis, oophoritis, pyometritis. Autopsies of aborted fetuses reveal infiltration of the subcutaneous tissue, swelling and thickening of the umbilical cord, hemorrhages on the serous and mucous membranes, hyperplasia of the lymph nodes and spleen, and small foci of necrosis in the liver.

Laboratory studies. Bacteriological examination for brucellosis. Aborted fetuses with fetal membranes, amniotic fluid or fetal stomach with contents, pieces of liver and spleen, contents of hygroma (burses) of affected joints, and milk samples are sent to the laboratory. Blood serum and milk are sent for serological testing for brucellosis according to the ring reaction. Testicles with appendages from clinically ill or serologically positive rams after diagnostic slaughter or castration, as well as aborted fetuses with fetal membranes, cervico-vaginal secretions from ewes in the first 5 days after abortion are bacteriologically examined for infectious epididymitis of rams. The pathological material is taken in compliance with the rules of personal safety (must wear gloves), in a clean, liquid-proof container, sent to the courier.

Bacteriological studies include microscopy of smears from pathological material, isolation and identification of the culture of the pathogen, bioassay on guinea pigs. During the microscopic examination of smears stained by Kozlovsky, Brucella is observed in the form of small polymorphic rods and cocci of bright red color on the green background of the drug or gram-negative coccobacilli in the case of Gram staining. To isolate the culture of Brucella, pathological material is inoculated on selective nutrient media and incubated for 30 days. Identification of the selected culture is carried out on the basis of morphological and cultural-biochemical

properties, as well as by means of an agglutination reaction with brucellosis monospecific sera and tests to determine the species belonging to the causative agent of the disease. Isolation of Brucella culture from pathological material is a reliable proof of the etiology of the disease. The bioassay is carried out on guinea pigs, which are injected subcutaneously with pathological material in a volume of 1-2 ml. After 10, 20 and 30 days, their blood serum, diluted 1:10-1:80, is examined using the agglutination reaction. The bioassay is considered positive if specific agglutinins are detected in serum dilutions of 1:10 and above. Guinea pigs that are positive for agglutination reaction are slaughtered, organs and lymph nodes are cultured on nutrient media. With a negative agglutination reaction, the animals are killed 6-8 weeks after infection, the pathological material taken from them is cultured and cultured for 30 days. The results of the test for brucellosis are considered positive if the culture of the pathogen or a positive agglutination reaction is isolated in a dilution of 1:10 or higher in the serum of an infected guinea pig, even if no brucella culture was isolated from the original pathological material. The term of bacteriological research - up to 1 month, biological - up to 2 months.

Serological and allergic studies. To test for brucellosis in cattle, yaks, zebu and buffaloes, the Rose Bengal test (RBP), the agglutination reaction (RA), the prolonged complement binding reaction (RTK), the complement binding reaction (RK), the ring reaction with milk (KR), as well as brucellosis allergen; sheep, goats, deer use serological (RBP, RZK, RTZK) and allergic methods; pigs - serological (RZK, RTZK, RA, RBP) and allergic methods; horses - serological method (RA, RBP, RZK); camels - serological method (RBP, RA, RZK); dogs and other animals - serological method (RA, RZK).

During planned preventive serological tests for brucellosis of breeding bulls, cows, heifers, heifers over one year old, buffaloes, breeding rams, ewes, breeding boars and primary sows, they are examined once a year for RBP. In case of detection of positive indicators for RBP, the diagnosis is clarified by additional studies of RZK (RTZK) and RA. Animals of all species are subject to a mandatory comprehensive examination for brucellosis according to the RPB (RA) and RZK (RTZK) during the 30-day preventive quarantine period when they are removed or introduced into the farm, regardless of the form of ownership, as well as in the case of their sale and purchase. In the zone of possible introduction of brucellosis, routine serological examinations of the breeding stock are carried out according to RBP (RA) twice a year - in spring and autumn. In the case of detection of positively reacting animals, repeated examination for brucellosis of the entire group of animals is carried out after 15-20 days by serological methods (RBP, RA, RTZK) and allergic. Cows (heifers), buffaloes, camels are examined regardless of the period of pregnancy; ewes and sows - 1-2 months after farrowing. In case of detection of clinical signs of bovine brucellosis (abortions, stillbirths, orchitis, arthritis), sick animals are isolated and

must be examined twice for RBP (RA) and RZK (RTZK) with an interval of 15-20 days and an allergy test. Horses are examined serologically for RBP and RZK for brucellosis in case of clinical signs of the disease (bursitis, suppuration of the withers, tendovaginitis, arthritis), as well as in case of contact with unhealthy livestock of other species of animals in a brucellosis center. Wild animals (elk, wild boar, roe deer) are examined for brucellosis serologically according to RBP and RZK and bacteriologically after selective diagnostic licensed shooting. In animal husbandry, control of brucellosis is carried out on the basis of bacteriological studies of aborted fetuses. Planned serological research and clinical examination for infectious epididymitis of breeding rams is carried out once a year before the mating campaign, as well as before the formation of flocks for driving away for grazing and after their return, as well as during preventive quarantine in case of sale of breeding rams (lambs) and ewes. (ditch) or inter-economic exchange. RTZK with Brucella-containing antigen or RID is used for research. The diagnosis of brucellosis is considered established if a culture of brucella is isolated from pathological material or positive results of a bioassay on guinea pigs are obtained; positive serological and allergic reactions were found in animals with clinical signs of brucellosis; an increase in antibody titers for RA and RZK was found in repeated samples of sera taken at intervals of 15-20 days, as well as with a positive allergic reaction and an increase in the total number of positively reacting animals. The diagnosis of infectious epididymitis of sheep is considered established if the culture of the causative agent of the disease is isolated - Br. Ovis or a positive RTZK or RID with Brucella-containing antigen was detected.

The allergic method of diagnosing brucellosis is most often used in sheep, goats and pigs. As an allergen, brucellin is used to diagnose brucellosis in sheep and goats by the palpebral test method, and in pigs by the intradermal test method. Research of animals for brucellosis using brucellin is allowed to be carried out only by specialists of veterinary medicine. The reaction to the introduction of brucellin in sheep and goats is evaluated once in 42-48 hours, in pigs - twice in 24 hours. and 48 hours by inspection, and when it is unclear by palpation of the injection site. When swelling is detected at the injection site, the reaction is considered positive. In case of a vaguely expressed reaction, palpate the place of injection of the drug and compare it with the skin of the other eye (or another subcaudal fold), and in pigs with the skin of the other ear. If even a small difference is detected, the reaction is considered positive. In the absence of the indicated signs of reaction, the test result is considered negative. Animals reacting to brucellin are marked, removed from the herd and isolated.

Differential diagnosis. Presupposes the need to rule out trichomoniasis, chlamydia and campylobacteriosis in cattle; in pigs - salmonellosis, leptospirosis; in sheep and goats – listeriosis, campylobacteriosis, chlamydia. For this purpose,

cultures are carried out on nutrient media to isolate the culture of the corresponding pathogen from aborted fetuses, as well as serological studies to determine the presence of specific antibodies in the blood of infected mothers.

Treatment. It's not performed for brucellosis. In brucellosis-prone farms and in the threat zone, animals that react positively during serological and allergy tests are considered sick and slaughtered.

Immunity. In case of brucellosis, it's non-sterile. A number of vaccines have been proposed for active immunization against brucellosis. And, it's the live dry vaccine from strain Br. Abortus 19, which in disadvantaged farms helps stop the further spread of the infection in the herd, prevent abortions, and obtain healthy young from vaccinated animals.

The disadvantage of this vaccine is the long-term preservation of anti-brucellosis post-vaccination antibodies in the blood of vaccinated animals, which prevents the detection of patients, the differentiation of post-vaccination serological indicators from infectious ones, and the determination of the degree of brucellosis herd disadvantage. In unfavorable and brucellosis-threatening farms, a vaccine from the weakly agglutinogenic strain Br. is also recommended for vaccinating cows. abortus 82, and for immunization of sheep and goats – dry live vaccine from strain Br. melitensis Rev-1.

Prevention and control measures. They should be aimed at protecting the territory of the country from the introduction of the causative agent of brucellosis from disadvantaged countries, and in the event of an outbreak of the disease in the herd, at it's elimination and carrying out measures to improve the health of animals from brucellosis and protect people from infection with brucellosis.

In order to prevent the introduction of the causative agent of brucellosis into the country, it's not allowed to import cattle, sheep, goats, pigs or sperm, zygotes, embryos from brucellosis-prone farms, as well as animals vaccinated with anti-brucellosis vaccines. Imported breeding animals are kept after quarantine separately from their herd for at least 12 months, until successful calving (farrowing), as well as negative results of serological tests.

When a brucellosis disease is detected, individual farms, and settlements are declared to be unproblematic in relation to brucellosis, veterinary restrictions are immediately introduced in them, upon submission of the chief inspector of state veterinary medicine and by order of the self-governing body, and a plan of anti-brucellosis health measures is developed.

According to the restriction, it's forbidden to bring or take out animals susceptible to brucellosis from the farm, except for taking them to a meat processing plant; regrouping of animals without the knowledge of the chief veterinarian of the farm; procurement of fodder in the quarantine area for export to other farms; conducting fairs, auctions, animal exhibitions; the use of sick animals that react

positively to brucellosis, or animals suspected of having the disease and their offspring for reproduction of the herd; sale to the population of animals from a dysfunctional farm for breeding and fattening; grazing or herding livestock affected by brucellosis. Animals of all species, which react positively to brucellosis or which have clinical signs of the disease, are immediately isolated and handed over to the meat processing plant. Aborted fruits and placenta are covered with chlorinated lime and disposed of in a cattle cemetery or burned. Pastures on which there were unhealthy livestock or hay collected from such lands may be used no earlier than after 3 months in the same household. Milking and slaughtering of animals suffering from brucellosis is prohibited on a dysfunctional farm. It's forbidden to use meat and slaughter products in an uninfected form from animals from brucellosis-negative farms and those that are serologically reactive in healthy farms, in particular for feeding animals and poultry. Cows with clinical signs of brucellosis should not be milked. Milk from cows that react positively to brucellosis is disinfected by boiling for 30 minutes and used for feeding animals within the farm. Milk, cream, offal obtained from animals of the unfavorable group, which react negatively to brucellosis, are disinfected in the farm by pasteurization at 70°C for 30 minutes. or at 85-90°C for 20 min. or boiling. The use of non-contaminated milk and dairy products from unhealthy livestock for feeding animals is prohibited. Current disinfection is regularly carried out in livestock premises, as well as in adjacent territories (before the lifting of quarantine restrictions, also final disinfection), disinsection and deratization. For disinfection, use a 20% solution of freshly slaked lime or a clarified solution of perchloric lime with at least 2% active chlorine, a hot 2% solution of caustic alkali, a hot 5% solution of soda ash, a 2% solution of formaldehyde, a 3% solution of a caustic soda-potash mixture. For aerosol disinfection of hermetically closed premises in the absence of animals and people, a 2% aqueous solution of formaldehyde is used. The surface of the soil of the walking yards is treated with a 3% formaldehyde solution. Manure, bedding and feed residues from animal feeding on dysfunctional farms are destroyed or disinfected by biological, chemical or physical methods. Economic use of manure is allowed no earlier than after 24 months after biothermal disinfection. An animal farm, household, settlement is recognized as cured of brucellosis after slaughtering all sick and susceptible animals together with offspring from these animals and after carrying out the entire set of organizational, economic, sanitary, anti-epidemic and veterinary measures.

Questions and tasks for control.

1. Etiological structure and epizootological features of brucellosis in animals of various species.

2. Name the main methods of intravital disease diagnosis by animal species.

3. What causes suspicion of brucellosis and how to act in such cases in order to establish a reliable diagnosis?

4. From which diseases and on the basis of which data should differential diagnosis of brucellosis be carried out?

5. On the basis of which results of laboratory studies, the diagnosis of brucellosis is considered established in animals of various types of vaccinated and non-vaccinated livestock?

6. What is prohibited under the terms of restrictions for brucellosis?

7. What are the methods of improving farms and what determines their choice in practical conditions?

8. What is the procedure for using milk and dairy products from farms affected by brucellosis?

9. List biological preparations that are used for specific diagnosis and immunoprophylaxis of animal brucellosis.

10. Draw up schemes for the rehabilitation of farms affected by brucellosis in cattle, sheep (goats), buffaloes, yaks, zebu, camels, pigs and fur animals.

11. How are animals cured of brucellosis in private households?

12. What are the measures to prevent brucellosis at meat industry enterprises?

Leptospirosis

(diagnostics, immunoprophylaxis, control measures)

Leptospirosis – a naturally centered occurring disease of agricultural, domestic, industrial and wild animals, which is manifested in typical cases by fever, jaundice, hemoglobinuria, necrosis of mucous membranes and skin, in pigs - mass abortions, birth and death of non-viable young. Human is susceptible to leptospirosis.

The causative agent of the disease is pathogenic leptospires, which according to their antigenic properties are divided into 23 serological groups, which include 202 serovars. In cattle, diseases are most often caused by L. haebdomadis, pomona, icterohaemorrhagiae, grippotyphosa, mitis (tarassovi); in pigs - L. pomona, mitis; in small cattle - L., mitis, pomona, haebdomadis; in horses - L. pomona, grippotyphosa, mitis; in dogs – L. canicola. Morphologically and culturally, leptospires of different serotypes are identical, and in the "dark field" of the microscope they look like delicate, thin, silvery-white spiral rods and threads with thickenings at the ends, with active various movements (Fig. 1).

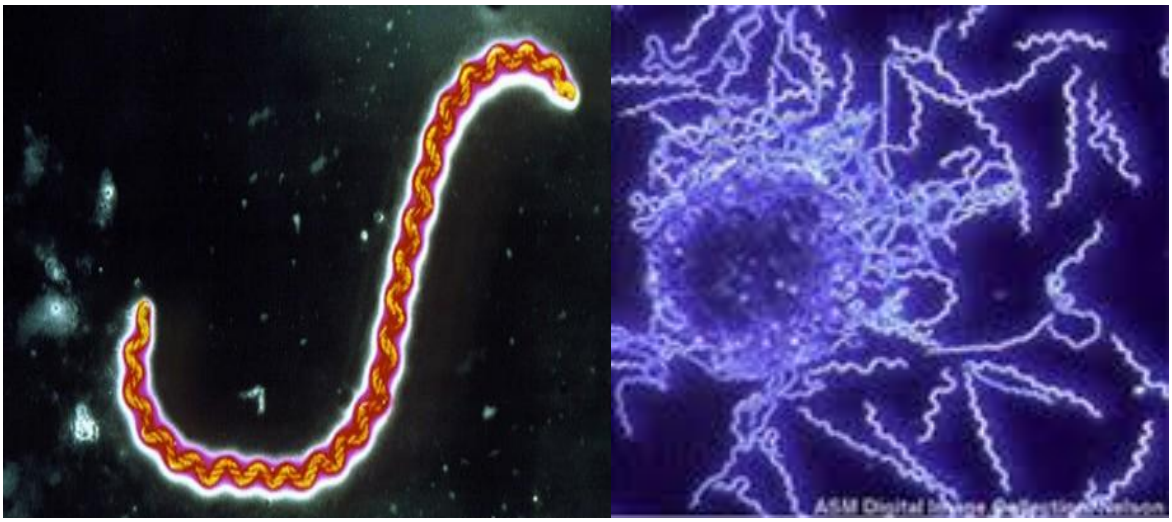


Fig. 1. The structure of pathogenic leptospires.

Leptospires are cultivated at a temperature of 26-28°C, pH=7.2-7.4 on selective liquid media of Ulengut, Terskyi, Lyubashenko, Ferworth-Wolf, which contain 5-10% rabbit or lamb serum. Cultures grow slowly, for 7-10 days, sometimes longer (Fig. 2).

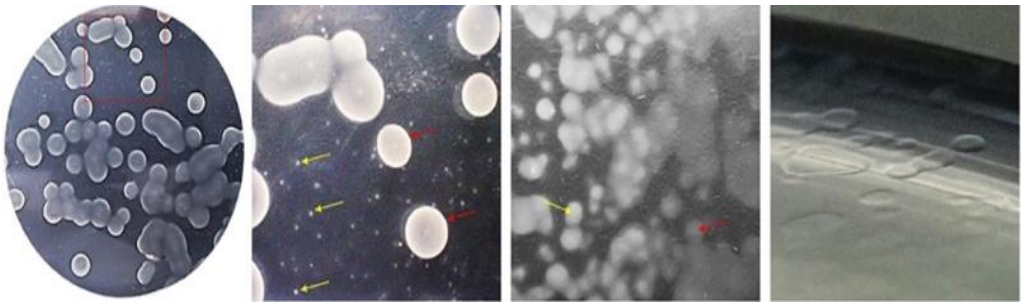


Fig. 2. Leptospira colonies on nutrient media.

Typical identification of leptospires is carried out using specific serums by the microagglutination reaction (MAR). Golden gophers, 3-4 week old guinea pigs, 8-10 day old rabbits, and puppies are susceptible to experimental infection. Leptospires are typical hydrobionts, so they can survive in river and lake water for up to 200 days, in sewage water for up to 10 days, in moist soil with a neutral and slightly alkaline reaction from 43 to 279 days. Very sensitive to drying - in dry soil they lose the ability to move after 30 minutes, die after 2-12 hours. Under the influence of solar radiation, leptospires are inactivated after 2 hours, when heated to 56°C - 30 minutes, to 76-96°C - instantly. They withstand low temperatures well, they can be stored frozen for up to 30 days. It's stored in the urine of farm animals and rodents for 4-7 hours, in milk - 8-24 hours, in frozen sperm - 1-3 years, in manure - 24 hours.

The diagnosis is made by a complex method based on the analysis of epizootological data, clinical signs, patho-anatomical changes and the results of laboratory tests.

Epizootological data. Cattle, buffaloes, pigs, horses, sheep, goats, deer, dogs, camels, cats, rodents, fur animals, insectivores, and marsupials are susceptible to leptospirosis. Pigs and cattle are most often affected. In young animals, the course of the disease is more severe and the mortality rate is higher compared to adult animals. The reservoir of pathogenic leptospires in nature is small wild mammals - leptospirosis (field mice, gray and other types of rats, marsupials, insectivores), predatory animals that constantly live in a certain area and form natural foci of infection. In anthropurgical centers, infected agricultural and domestic animals and synanthropic rodents become the reservoir of the pathogen. The source of the causative agent of infection is clinically and asymptomatic animals, as well as sick leptospirosis, which excrete the causative agent with urine for a long time: rodents - for life, pigs - up to 2 years, sheep - up to 9 months, cattle - up to 20 months, dogs - up to 3 years, cats - up to 119 days, foxes - up to 514 days. Leptospires are excreted from the body mainly with urine, possibly also with feces, milk, semen, secretions from the genital organs, with an aborted fetus. Infection occurs through the water of stagnant reservoirs and marshy meadows, contaminated with secretions of sick and sick leptospirosis animals (Fig. 3), through feed and litter contaminated with leptospires, when eating infected corpses of rodents (pigs, dogs, cats, foxes) and unharmed slaughter products of sick animals (farm animals).

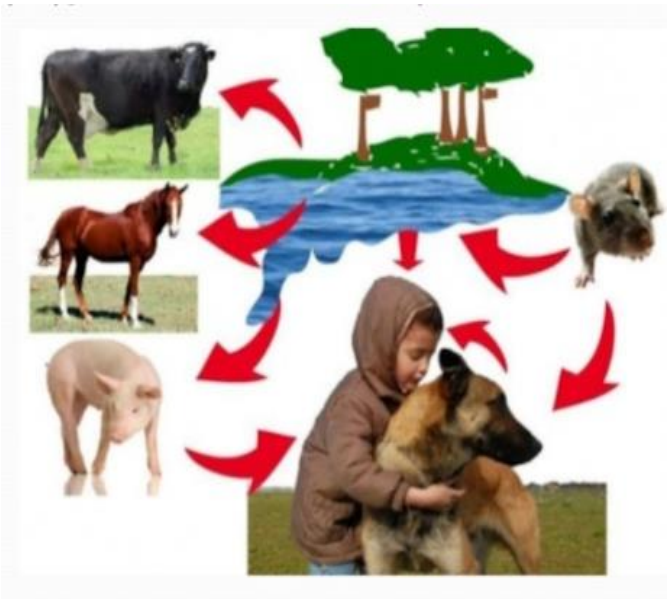


Fig. 3. Ways of infection.

The possibility of transmission of the causative agent of the disease by sexual means and in utero has been proven. Outbreaks of leptospirosis among cattle and horses are observed mainly in the summer-autumn grazing period, in pigs there is no seasonality. When the infection first occurs, animals of different age groups fall ill, the disease covers from 20 to 60% of susceptible animals, leading to the death of a large part of non-immune young animals. In stationary dysfunctional farms, an asymptomatic course of infection prevails with long-term leptospirosis, the presence of specific antibodies in the blood, periodic outbreaks of infection with the appearance of new non-immune animals.

Clinical signs and course of the disease. The incubation period lasts from 3 to 20 days. The course of the disease is acute, subacute and chronic. In large and small cattle, sometimes a fulminant disease is observed, in pigs - often an asymptomatic course of the disease. In cattle, sheep, goats, buffaloes, deer, the rapid course of the disease is manifested by a sudden increase in body temperature to 40.0-41.5°C, severe depression, sharp hyperemia of the conjunctiva, frequent shallow breathing, thread-like pulse (90-100 beats per minute), jaundice of the skin and mucous membranes, sometimes diarrhea, hemoglobinuria. After 12-24 hours, the animal dies from asphyxiation. Lethality in case of a lightning stroke can reach 100%. Acute course in cattle is characterized by fever (40.0-41.5°C) for 6-8 days, cessation of chewing. Well-expressed jaundice of the skin and mucous membranes. With the appearance of jaundice and hemoglobinuria, the body temperature decreases. Diarrhea appears, which is replaced by constipation and persistent atony of the intestines. Small necrotic areas and ulcers appear in the area of the nose mirror and lips, on the gums, cheeks, tongue, sometimes on the teats of the udder and labia. Abortions, births of dead or non-viable calves are observed in calving cows 1-3 weeks after infection. Milk production decreases sharply, it becomes slimy, acquires

a yellow tint. Sometimes conjunctivitis, mucous-purulent discharge from the nose are noted. Breathing in sick animals is shallow, accelerated. The duration of the disease is 5-9 days. Mortality can reach 50-70%. The subacute course is manifested by the same signs as the acute course, but they are much less pronounced. Skin necrosis, persistent constipation, severe exhaustion are sometimes observed. The fever is relapsing, accompanied by jaundice and hemoglobinuria. The duration of the disease is 10-20 days, sometimes more. Lethality is 5-8%. The chronic course lasts 3-5 months. In sick animals, periodic fever with long remissions, exhaustion, atony, anemia, sometimes short-term hemoglobinuria, jaundice of mucous membranes, decrease in milk secretion appear. Sick animals often die from exhaustion. In calves, the course of the disease is rapid or acute and ends after a few hours or days with the death of the animals. A high temperature, damage to the central nervous system, lack of appetite, a state of prostration appear. In pigs, the acute course of the disease is registered more often in pregnant sows and piglets aged 1-60 days at the initial occurrence of leptospirosis in a previously prosperous farm. In sows, there are mass abortions in the last days of pregnancy, stillborn and mummified fetuses, overeating, infertility, the birth of non-viable piglets that die on the 1st-3rd day of life. Leptospirosis in young piglets aged 30 to 60 days is characterized by fever with an increase in body temperature to 40-41.5°C, depression, refusal to feed, conjunctivitis. In piglets, unlike other species of animals, jaundice of the skin and mucous membranes is rare, hemoglobinuria is an exception, mainly in cases where the disease is caused by L. icterohaemorrhagiae. The duration of the disease is 2-7 days. Mortality among young animals can reach 25% or more. In farms with a long course of infection, mainly young animals 2.5-4 months old after the end of passive immunity from mothers are sick. An increase in body temperature up to 41-41.5°C, anemia, sometimes slight jaundice of the mucous membranes and skin, conjunctivitis, shaky uncoordinated gait, convulsions are noted. The duration of the disease is 5-7 days, the mortality rate is 8-12%. The chronic course of leptospirosis in pigs is observed in stationary dysfunctional farms. The disease is asymptomatic, accompanied by massive, long-term leptospirosis, the presence of specific antibodies in almost all pigs. Horses get sick very rarely, mainly in farms that are unfavorable for bovine leptospirosis. The course of the disease is acute, subacute and asymptomatic. During the acute course, the fever is of a constant type, during the subacute and chronic, it's relapsing. In the acute course, depression, jaundice or anemia of the mucous membranes and conjunctiva, pain in the croup muscles, and rapid fatigue are noted in horses. Urine is yellow or dark brown, contains protein. Abortions are possible in foal mares. The duration of the disease is 5-8 days. The subacute course of the disease is manifested by a periodic increase in body temperature, sometimes slight jaundice of the mucous membranes, baldness, peeling of the epidermis in various parts of the body, focal necrosis of the skin. The duration

of the illness is up to 30 days. The chronic (asymptomatic) course of leptospirosis in horses is accompanied by leptospirosis and the formation of specific antibodies. In foxes and foxes, at the beginning of leptospirosis enzootics, a lightning-fast course of infection is observed. In sick animals, short-term fever, acceleration of pulse and breathing, vomiting, diarrhea are detected. Jaundice is very rare. Death occurs after 12-48 hours, accompanied by clonic convulsions. With an acute course, a short-term fever develops, which disappears with the development of jaundice, diarrhea, vomiting, frequent urination, weakness of the buttocks, ulcers appear on the mucous membrane of the oral cavity and lips. The duration of the disease is 3-10 days. The chronic course develops as a complication of the acute manifestation of the disease and is characterized by anemia, cachexia, periodic diarrhea, and ends with the death or slaughter of sick animals. In dogs, leptospirosis occurs in two forms: jaundiced (Stuttgart disease) and non-jaundiced (canine typhus). After illness, dogs remain leptospirosis for a long time (Fig. 4).

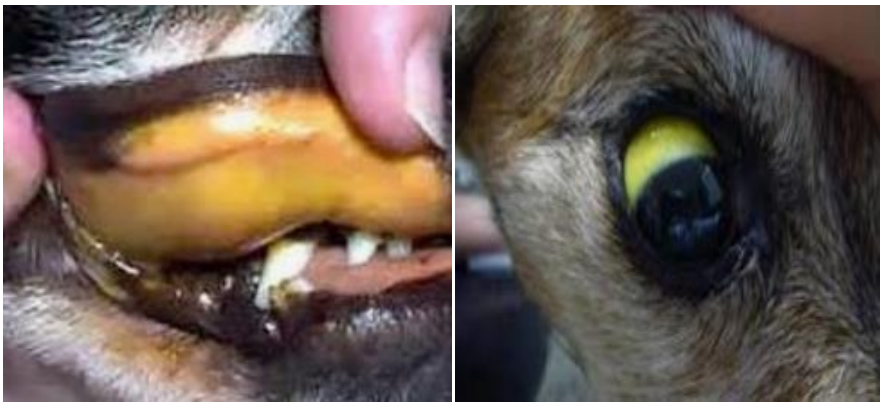
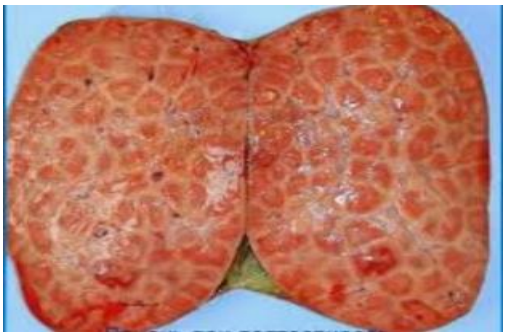
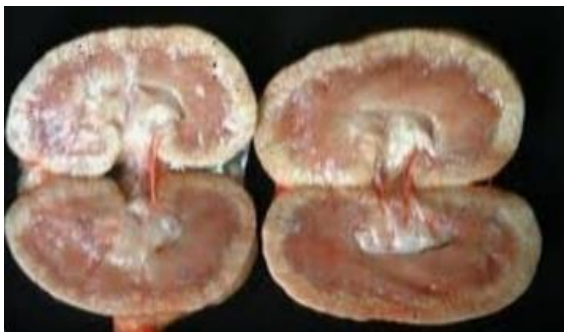


Fig. 4. Ictericity of mucous membranes.

Pathological changes. They are quite similar in different species of animals. In ruminants and horses, there is a jaundiced coloration of mucous membranes and all tissues, accumulation of transudate in the abdominal and thoracic cavities, hemorrhages in the subcutaneous tissue, on the mucous membranes of the intestines, in the lungs, kidneys, and spleen (Fig. 5). The subcutaneous tissue is infiltrated and stained yellow. The peritoneum, omentum, and pleura are jaundiced and covered with hemorrhages. The most pronounced pathological changes are in the liver and kidneys. The liver is significantly enlarged, flaccid, clay-red or ocher-yellow in color with necrotic foci and hemorrhages.



Liver



Kidneys

Fig. 5. *Pathological changes.*

The gallbladder is full of bile with blood impurities, the mucous membrane of the intestines is swollen, hemorrhagically inflamed. The kidneys are enlarged, cherry-clay or dark brown in color, the boundaries between the cortical and medullary layers are smoothed. Dotted or spotty hemorrhages are found on the surface of the kidneys. The bladder is filled with dark cherry-colored urine, interspersed with dotted and striped hemorrhages. The spleen is almost unchanged, slightly enlarged, flabby. The lungs are swollen, the heart is weak, there are point hemorrhages on the epicardium. The brain is swollen, the vessels are injected with blood.

Laboratory diagnostics. It's carried out in accordance with the current Methodological instructions for the laboratory diagnosis of animal leptospirosis. For intravital diagnostics, 3-5 ml of blood from sick animals in the first 5 days of fever, aborted fetuses, and urine from leptospirosis pigs are taken. For postmortem diagnosis, corpses of small animals and rodents are sent, from large animals - heart, parenchymal organs (necessarily kidneys), bladder with urine, cerebrospinal fluid. In the summer, the pathological material is examined no later than 3-6 hours after taking it, in the winter or when the pathological material is stored in a cooled form - after 10-12 hours.

Microscopic examination of pericardial fluid, transudates of the thoracic and abdominal cavities makes it possible to diagnose leptospirosis directly in the household. In order to isolate a pure leptospira culture, inoculations are carried out on special Tersky, Lyubashenko, or Ulengut nutrient media only from that pathological material in which leptospira were detected by preliminary microscopy. The presence of leptospira growth is monitored by microscopy in the "dark field" of crushed drops, which are prepared from crops, starting from 8-10 days of cultivation. The serotype of the isolated leptospires is determined using the cross-reaction of microagglutination with diagnostic agglutinating sera. For the biological test, two young (5-7 day old) rabbits, gophers or guinea pigs are infected, and pathological material in a volume of 2-2.5 ml is injected into the abdominal cavity. After the death of infected laboratory animals, microscopic studies are carried out in the "dark field" of the microscope of preparations made from their organs and blood, as well as cultures on nutrient media. If the animals have not died, they are killed (on the 16th

day after infection) and their blood sera are examined by microagglutination reaction. Microscopic detection of Leptospires in pathological material or positive in microagglutination reactionsrum dilutions of 1:10 and above indicate positive results of the bioassay. Serological diagnosis of leptospirosis is based on the results of the examination of paired sera by microagglutination reaction. As an antigen, 7-10-day cultures of Leptospires of various serotypes, which are constantly grown in diagnostic laboratories, are used. The reaction is placed on plates, examined in the "dark field" of the microscope for the presence of lysed and glued leptospires ("spiders") in various dilutions of serum. The results of the reaction are evaluated according to the five-point system with crosses: (++++) - 100% agglutinated and lysed leptospira; (+++) – 75% leptospira; (++) – 25% leptospira; (–) – agglutination and lysis are absent. A reaction evaluated by at least two crosses is considered positive, provided there is no agglutination and lysis in the control. During the repeated examination of the blood sera of the same animals after 7-10 days, the reaction is performed and evaluated similarly. An increase in the antibody titer in microagglutination reactions by five or more times indicates the presence of leptospirosis infection in the studied animals. Blood sera from vaccinated pigs and sheep can be examined for leptospirosis diagnostic purposes no earlier than 2 months, and cattle - 3 months after vaccination. The diagnosis of leptospirosis is considered to be established, and the farm is unfavorable for leptospirosis, if a leptospira culture is isolated from the pathological material or from the organs of laboratory animals infected with the pathological material under study; during microscopic examination in blood or suspension from organs of dead animals or aborted fetuses, in urine or organs of laboratory animals, of those who died after being infected with the studied material, leptospires were detected; in the blood sera of more than 20% of the studied animals, antibodies were detected at a titer of 1:50 in non-vaccinated animals, at titers of 1:100 and more in vaccinated animals. When a smaller number of positive serological reactions are detected, a microscopic examination of urine is carried out. If the results are negative, blood serum and urine of the same animals are re-examined after 15-30 days. Detection of leptospires or antibodies during repeated research in animals that did not have them before, or an increase in the titer of antibodies by five or more times indicates an unfavorable state of the farm.

Differential diagnosis. Provides for the exclusion of babesiosis, malignant catarrhal fever, brucellosis, campylobacteriosis in cattle; in sheep - brucellosis, campylobacteriosis; in pigs - brucellosis, salmonellosis; in horses - infectious anemia. Babesiosis is a parasitic disease that is seasonal in nature and associated with a certain area and the presence of vector ticks. The temperature reaction is maintained throughout the disease, regardless of the appearance of jaundice. There is no necrosis of mucous membranes and skin, an increase in the spleen is observed. The use of specific chemopreparations gives a good therapeutic effect. Microscopic detection of

blood parasites in the blood is of decisive diagnostic value. Malignant catarrhal fever is characterized by the sporadic nature of the disease, the absence of jaundice and hemoglobinuria, severe nerve damage, and clouding of the cornea. The final diagnosis is established on the basis of bacteriological, serological, and biological studies. With brucellosis and campylobacteriosis, there is no jaundice or hemoglobinuria in sheep, with brucellosis, orchitis is observed in males, with campylobacteriosis, early abortions in females. During the bacteriological examination, the corresponding causative agent of the disease is isolated. In horses, infectious anemia is differentiated on the basis of negative serological indicators for leptospirosis and the lack of therapeutic effectiveness of anti-leptospirosis serum.

Treatment. They are treated with polyvalent hyperimmune anti-leptospirosis serum simultaneously with antibiotics - streptomycin and doxicycline. Serum is used in doses depending on the type and age of animals: for cattle and horses - 150-200 ml; young animals - 20-40 ml; foxes and foxes - 8-10 ml. Streptomycin is used at 10-12 thousand units/kg 2 times a day for 4-5 days in a row, ditetracycline is administered to pigs at a dose of 30 thousand units/kg 2-3 times with an interval of 2-3 days. Amoxicillin (15%) intramuscularly or subcutaneously at 1 ml per 15 kg of weight once a day for 3-5 days is also recommended; kanamycin (25%) intramuscularly or subcutaneously once a day for 3-5 days in doses: cattle and horses - 2 ml per 10 kg of weight, pigs, sheep - 2 ml per 50 kg of weight, dogs and cats - 0.1 ml per 1 kg of weight; pharmazine-200 intramuscularly once a day in doses: for large cattle - 2-5 ml per 100 kg of weight, for small cattle - 2.5 ml per 50 kg of weight, for dogs and cats - 0.5 ml per 10 kg of mass. At the same time, symptomatic treatment is used: a 40% aqueous solution of glucose is administered intravenously (adult animals - 500 ml, young animals - 50-100 ml), Glauber's salt is given orally in the form of a 5-10% aqueous solution (adult animals - 500 g, young animals - 1- 2 g). Sick animals are isolated, placed in darkened rooms, provided with good-quality feed and water acidified with hydrochloric acid. After treatment with antibiotics, leptospirosis does not occur.

Immunity. Animals infected with leptospirosis acquire stable and long-lasting immunity against the causative agent of the homologous serotype. For active immunization, a lyophilized inactivated vaccine against leptospirosis of animals is used in two variants: the first variant is made from strains of Leptospires serogroup icterohemorrhagia, Pomona, and Tarasov for immunization of pigs; the second option is from Leptospira strains of the influenza, pomona, seiro, and taras serogroups for the immunization of cattle, sheep, and goats. Horses, fur-bearing animals and animals of other species are vaccinated with a vaccine of that variant, which includes leptospires found in sick animals of a dysfunctional cell. The vaccine is used in unfavorable and leptospirosis-threatening farms; in fattening farms that are completed without testing for leptospirosis; in case of animal grazing in natural centers of

leptospirosis; when animals whose blood sera are positive for leptospirosis are detected in the household according to microagglutination reaction; in areas with livestock farming. The vaccine is administered intramuscularly once. Immunity is formed after 14-20 days and lasts for calves, lambs, pigs of all age groups and young fur animals - up to 6 months; in sheep, goats and fur animals that were vaccinated at the age of 6 months or more, in cattle and horses that were vaccinated at the age of 12 months or more - up to one year. Revaccination of various types of animals is carried out after 6-12 months.

Prevention and control measures. To prevent animals from contracting leptospirosis, it's necessary to complete the herd only with clinically healthy animals from prosperous farms. During the period of preventive quarantine, serological tests for leptospirosis are carried out on all animals entering or leaving farms, with the exception of animals for stocking of feedlots. Animals intended for sale are examined for leptospirosis according to microagglutination reaction, in case of receiving negative results for the whole group, they are exported without restrictions. If positive serological indicators are found, the whole group of animals is left in the farm, where additional studies for leptospirosis are carried out. During the 30-day quarantine, all pigs imported for breeding purposes are treated with streptomycin sulfate at a dose of 15-20 thousand units/kg every 12 hours for 5 days. Animals are not allowed to come into contact with livestock of farms affected by leptospirosis in pastures and watering places, unvaccinated animals are not allowed to graze on the territory of a natural leptospirosis center. Systematic extermination of rodents is carried out on the territory of farms and in places where fodder is stored. When a diagnosis of leptospirosis is established, the farm is declared unfavorable for this disease; it introduces quarantine restrictions, draws up and approves a plan of measures to eliminate the infection. Under the terms of the quarantine restrictions, it's forbidden to take animals out of a dysfunctional farm, use sick animals for reproduction, sell them to the reproduction, regroup animals without the permission of the head veterinarian of the farm, take out unvaccinated animals against leptospirosis, graze and feed unvaccinated animals on the territory where sick animals were, use slaughter products from sick and suspected animal diseases for food or fodder purposes without appropriate disinfection, use milk from sick animals without boiling. Clinical examination and thermometry of all livestock, isolation and treatment of sick and suspected animal diseases are carried out on the dysfunctional farm. Conditionally healthy animals are vaccinated. Sick animals are isolated, polyvalent hyperimmune leptospirosis serum and antibiotics are used for their treatment. Infected breeders are isolated, treated with leptospirocidal drugs, after 10-12 days the effectiveness of their sanation is monitored using urine microscopy.

All dysfunctional premises, machines, passages, inventory, equipment are subjected to mechanical cleaning and disinfection after the removal of sick and

suspected animal diseases from them. Disinfection of the premises is also carried out every 10 days during the entire period of leptospirosis in the farm. Machines are disinfected after each case of detection of sick animals. 2% formaldehyde solution is used for disinfection; 2% hot caustic soda solution; clarified solution of perchloric lime with a content of 3% active chlorine. Feed is fed only to livestock vaccinated against leptospirosis. After carrying out all the veterinary measures prescribed by the instructions and in the absence of sick animals and leptospirosis-carrying animals, the farm is considered cured of leptospirosis.

Questions and tasks for control.

1. What is the etiological structure of leptospirosis in farm and domestic animals in our country? Who is the reservoir of pathogens?
2. What are the clinical and epizootological features of this disease in animals of different species?
3. When, according to the results of laboratory tests, is the diagnosis of leptospirosis considered established?
4. From what diseases is it necessary to differentiate leptospirosis and according to what data?
5. What veterinary-sanitary, special and organizational-economic measures are carried out in prosperous farms in order to prevent the occurrence of disease?
6. Draw up schemes of restrictive, veterinary-sanitary and organizational-economic measures carried out in dysfunctional breeding, commercial and fattening farms.
7. On what is the prevention of leptospirosis in human based, what are the responsibilities of managers of dysfunctional farms, veterinary and medical workers in preventing the disease of service personnel, field workers and villagers?
8. Methods and means of specific immunoprophylaxis and complex therapy for leptospirosis.

Listeriosis

(diagnosis and contol measures)

Listeriosis – a natural focal disease of various species of animals and birds, which is characterized by septic phenomena, damage to the central nervous system and genital organs. Human is susceptible to listeriosis.

The causative agent of the disease – Listeria monocytogenes — polymorphic, gram-positive small rod with rounded ends, does not form spores and capsules. Grows on normal nutrient media at an optimal temperature of 30-37°C, pH=7.2-7.4. It's well cultured on hepatic media with 1% glucose and 2-3% glycerol, elective MPB with 0.05% potassium tellurite. On blood agar, a clear zone of hemolysis is noted around small transparent colonies. Listeria secrete special antibiotic substances - monocins, as well as bacteriophage, which is used for strain typing and disease diagnosis. Under the influence of various factors, listeria can form L-forms. Among laboratory animals, white mice, rabbits, and guinea pigs are sensitive to listeria. Listeria are quite stable in the external environment: they remain viable in soil and manure for up to 11 months, in manure - 30-106 days, in hay and meat and bone meal - 134 days, in compound feed and oats - up to 105 days, in rodent corpses - up to 4 months, in pond water - up to 1 year, in animal carcasses buried in the ground - from 45 days to 4 months. They are kept for 25-48 days in livestock premises, on manure-contaminated soil - from 8 days in summer and up to 115 - in winter. Listeria can multiply in humus-rich soils, dead substrates, surface layers of silage at low temperatures. Listeria are inactivated by 5% solutions of lysol, creolin, as well as a solution of chlorinated lime with 3% active chlorine - after 10 minutes; 2% solution of caustic soda or formaldehyde, 20% solution of freshly slaked lime - after 20 minutes; 2.5% formaldehyde solution - after 3 hours. Boiling destroys listeria in 5 minutes, heating to 75°C in 20 minutes, solar radiation in 2-15 days.

The diagnosis is made by a complex method based on the analysis of epizootological data, clinical signs of the disease and patho-anatomical changes, as well as the results of laboratory tests.

Epizootological data. In natural conditions, sheep and cattle are susceptible to listeriosis. Pigs, goats, horses, buffaloes, fur animals, dogs, rabbits, poultry and wild birds are also sick. Pregnant femals, young animals, and animals weakened by poor nutrition are especially sensitive to listeria. The main reservoir of the causative agent of listeriosis in nature is mouse-like rodents, among which this infection often occurs in the form of epizootics, and the disease is accompanied by long-term (up to 260 days) listeriosis. During the stay in natural habitats, it's possible to infect farm animals and develop listeriosis among them. However, the main source of the causative agent of infection is agricultural animals clinically sick with listeriosis, from whose bodies listeria is excreted with urine, feces, milk, discharge from the

nasal cavity, genitals (during abortions), and with aborted fetuses. Clinically healthy listeriocarious animals, which play a leading role in maintaining stationary foci of infection and the occurrence of periodic outbreaks of the disease, are no less of a threat. Infection occurs through the digestive tract, although the causative agent of the disease can enter the body of animals through the conjunctiva of the eyes, respiratory tract, damaged skin and mucous membranes, as well as intrauterinely. Listeria can be transmitted by ixod and gamazo mites, blood-sucking insects, and mouse-like rodents. In sheep, listeriosis has a seasonal nature and is observed in the winter-spring period, which is due to the migration of infected rodents to feed storages and a sharp decrease in the body's resistance under unfavorable conditions of keeping and feeding (overcrowding, vitamin deficiency). In other species of animals, clearly expressed seasonality in the appearance of enzootic listeriosis was not noted. Enzootic listeriosis usually begins with sporadic cases or diseases of individual groups of animals. Later, the disease acquires a long-term stationary character. Listeriosis can occur as a mixed infection with plague, Aujeski's disease, salmonellosis, pig pasteurellosis, chicken pullorosis or as a complication of diseases of viral or parasitic etiology. The incidence of listeriosis is 0.5-5%, the mortality in the septic form of the disease can reach 50%, and in the case of damage to the central nervous system - 100%.

Clinical signs and course of the disease. The incubation period lasts 7-30 days. The course of the disease is acute, subacute and chronic. There are several clinical forms of listeriosis - nervous, septic, genital, erased and asymptomatic. In cattle, the course of the disease is acute or subacute, the nervous form prevails. At the beginning of the disease, depression, refusal of food, cessation of chewing, a short-term increase in body temperature up to 41.2°C, discharge of a significant amount of transparent viscous mucus from the nostrils, and viscous saliva from the oral cavity are observed. Lacrimation, hyperemia of mucous membranes are observed. On the 3rd-7th day, characteristic symptoms of the disease appear due to damage to the central nervous system: anxiety attacks, uncoordinated movements, paresis of certain muscle groups, unilateral paresis of the tongue or ear, dilated pupils, weakening or complete loss of vision. The duration of the disease is from a few hours to 10 days. The genital form of the disease is accompanied by abortions at 4-7 months of gestation, the birth of dead and weak calves, retention of litter, endometritis, mastitis. The prognosis for this form of the disease is favorable. The septic form of listeriosis is registered in calves. Severe depression, refusal of feed, diarrhea are noted. Body temperature remains normal, sometimes rising to 41°C. The duration of the disease is 1-2 weeks. When the central nervous system is affected, from the 4th to the 5th day of the illness, calves have a shaky gait, loss of balance, convulsive muscle contractions, neck curvature, and a stupor-like state. Sometimes the nervous symptoms pass, the calf gets up, takes food, looks healthy on the outside. However, after 2-3 days, attacks of nervous

phenomena recur and the animal dies.

In sheep and goats, lethargy, indifference to the environment, timidity, refusal of feed, cessation of chewing, mucous secretions from the nasal cavity, mucous-purulent discharges from the eyes are observed. The body temperature rises to 40.5-41.0°C, sometimes it is within the normal range. Damage to the eyes is often noted - strabismus, squint, weakening or loss of vision, conjunctivitis. On the 2nd or 3rd day, signs of the nervous form of the disease develop (Fig. 1). Spasms of neck, occipital, masticatory muscles, skin twitching appear. The head is thrown up or turned to the side, the neck is stretched forward and sharply bent upwards. Uncoordinated movements are observed, the animal bumps into foreign objects, often rests its head against the feeder or the wall. General weakening of the body is noted, paralysis develops. Death occurs in 3-7 days.

Fig. 1. Nervous form.

In cats, sheep and goats, a characteristic symptom of listeriosis is abortion and mastitis (Fig. 2). In lambs, the disease is detected at the age of 2-15 days. It has a septic form, without signs of damage to the nervous system. Depression, fever, lack of appetite, weakness, diarrhea with blood admixture are observed. Most lambs die on the 2nd or 3rd day of illness.

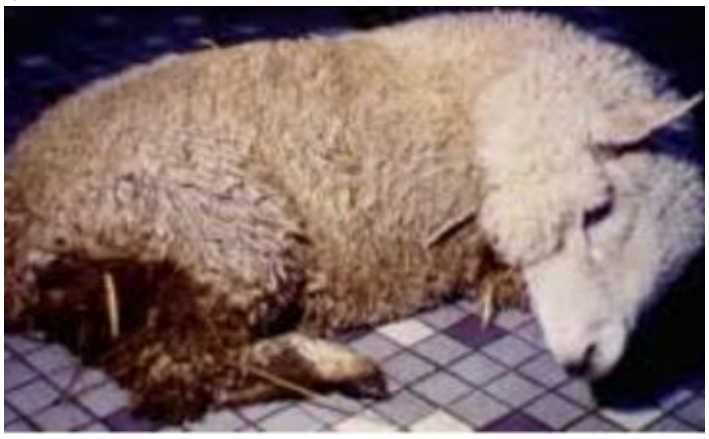


Fig. 2. Genital form.

In pigs of different age groups, listeriosis manifests itself differently. In suckling piglets and piglets, the disease takes a nervous form with sharply expressed symptoms of meningoencephalitis. In sick pigs, a short-term increase in temperature up to 40-41°C, excitement, convulsions, frequent chewing movements, muscle tremors, impaired coordination of movements, paresis and paralysis of limbs are observed. In suckling piglets, the disease often has a septic form, which is accompanied by severe general weakness, complete lack of appetite, bluing of the skin in the abdomen and ears, conjunctivitis, rhinitis. In the case of a subacute course in piglets, cough, discharge from the nose, diarrhea are noted. In adult pigs, the course of the disease is subacute or chronic. Weight loss, anemia, cough, refusal to feed, uncoordinated movements, muscle twitching, and some stiffness of the front limbs are observed. Sometimes listeriosis is detected only by abortions in sows. The duration of the disease is 2-3 weeks. In pigs, asymptomatic infection is possible, which is accompanied by long-term listeriosis. In horses, listeriosis has a sporadic manifestation. Reflex excitability, impaired coordination of movements, conjunctivitis, scleral jaundice, subfebrile temperature, paresis of limbs are noted. In dogs, the phenomenon of encephalitis, weakening of vision. A septic, rarely a nervous form of the disease is noted in rabbits. Pregnant females have abortions, gangrenous metritis, death of sick uteri and mummification of fetuses. Minks have abortions, pathological births, the birth of dead puppies and the death of females. Poultry listeriosis often affects young birds with signs of acute or chronic sepsis and dominant signs of cachexia. Listeriosis can complicate the course of other diseases of viral and parasitic etiology.

Pathological changes. Depends on the clinical manifestation of the disease. With the nervous form, vascular injection and cerebral edema, hemorrhages in the brain tissue, and some internal organs are detected (Fig. 3).

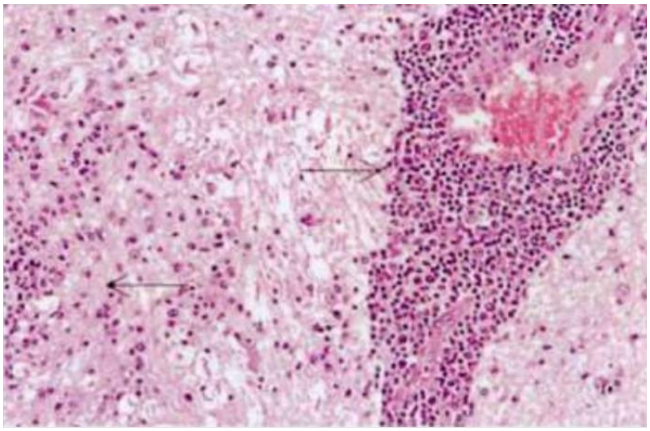


Fig. 3. Meningoencephalitis.

Acute catarrhal processes in the alimentary canal are sometimes observed in pigs. With the septic form, hyperemia and edema of the lungs, congestion and

hemorrhages on the serous and mucous membranes are noted in young animals; dystrophic processes and necrotic cells in the liver, kidneys, spleen, myocardium; hyperemia of the spleen and lymph nodes. The genital form of listeriosis is characterized by endometritis and metritis. Necrotic nodules typical for listeriosis are found in the liver, spleen, and brain of aborted fetuses.

Laboratory diagnostics. Includes microscopic, bacteriological, serological and biological studies. Fresh corpses of small animals or the head (brain), affected areas of the lungs, parenchymal organs (part of the liver, spleen, kidneys) of large animals are sent to the laboratory, in case of abortions - the fetus and it's membranes, secretions from the genitals. Blood is sent from sick animals at the beginning of the disease, and blood serum from sick animals. In case of mastitis, milk is taken from the affected lobes of the udder for research. Pathological material is sent fresh or preserved in a 30% solution of glycerin. Microscopic studies include microscopy of smears, smears-prints and histological sections from the brain, parenchymal organs, as well as from milk and other native pathological material; smears from broth and agar cultures; smears from centrifuges of a mixture of various pathological material. The prepared smears are stained by Gram to identify characteristic gram-positive rods under a microscope or with fluorescent listeriosis serum to detect the glow of listeria in the pathological material under a fluorescent microscope (Fig. 4).

In order to isolate a pure culture of Listeria, the pathological material is cultured on meat peptone liver broth and agar with 1% glucose and 2-3% glycerol. Cultures are incubated at 37°C, as well as at 4°C (for differentiation from other bacteria that do not grow at this temperature), with a daily inspection of them in the first 3-4 days and subsequent observation for two weeks.

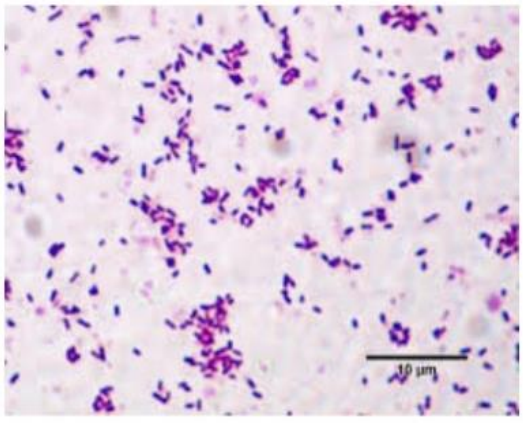


Fig. 4. Listeria monocytogenes. Gram staining.

When growth is detected, the culture is transplanted, morphological, cultural-biochemical (mandatory differentiation with the causative agent of swine distemper) and serological indicators are studied.

The isolated culture is examined using a phagolysis reaction with listeriosis monophages and an immunofluorescence reaction with listeriosis immunofluorescence sera. Identification and serotyping of the isolated culture is carried out using droplet agglutination on glass with listeriosis agglutinating sera - polyvalent and sera of the 1st and 2nd serogroups. The bioassay is placed on white mice, guinea pigs, and rabbits, which are injected with pathological material or an isolated broth culture of Listeria in a dose of 0.3-0.5 ml subcutaneously, conjunctivally, or intradermally. In case of death of infected animals, patho-anatomical and bacteriological studies are carried out with re-isolation of listeriosis culture. The term of biological research is 14 days. Agglutination reaction, indirect hemagglutination reaction and complement binding reaction with blood sera collected from animals at 14-day intervals can also be used as diagnostic indicators in combination with other diagnostic tests. An increase in titers of specific antibodies in paired blood sera indicates the development of a herd of listeriosis infection. The diagnosis of listeriosis is considered established when a gram-positive polymorphic motile bacillus is isolated from the pathological material, which produces catalase and breaks down glucose, maltose, rhamnose and salicin with the formation of acid; positive agglutination reaction of the selected culture with listeriosis serum; positive results of luminofiuorescence-serological studies; pathogenicity of the selected culture for laboratory animals; an increase in the titers of specific antibodies in the agglutination reaction, the indirect hemagglutination reaction, and the complement binding reaction in paired blood sera from sick animals.

Differential diagnosis. When establishing a diagnosis, listeriosis must be distinguished from rabies, Aujeski's disease, malignant catarrhal fever, brucellosis, campylobacteriosis, trichomoniasis, coenurosis (sheep), and feed poisoning. Rabies is observed only in bitten animals, characterized by significant aggressiveness of sick animals, the presence of Babesh-Negri bodies in the brain, and a positive reaction of immunodiffusion with antirabies globulin. Aujeski's disease differs from listeriosis in it’s pronounced contagiousness, rapid and wide coverage of pigs of various ages, lung damage in adult pigs. The diagnosis is confirmed by a characteristic bioassay on rabbits. With malignant catarrhal fever, only a single diseased animal is found. High fever, eye damage, stomatitis are observed. The results of bacteriological and biological studies are negative. Brucellosis, campylobacteriosis, trichomonosis are accompanied by abortions, there are no signs of damage to the nervous system. During the bacteriological examination, the causative agents of the corresponding disease are isolated. Cenurosis is established on the basis of the detection of ceenurosis in the brain. Fodder poisoning is characterized by mass, negative results of microscopic and bacteriological studies, and stops after the exclusion of low-quality feed.

Treatment. Sick animals with signs of damage to the central nervous system should be sent for slaughter. The remaining sick and suspected animal listeriosis

patients are isolated and treated with intramuscular administration of tetracycline antibiotics. Oral use of biomycin in a dose of 25 mg, teramycin - 30 mg/kg of body weight 2-3 times a day until the body temperature decreases or amoxicillin (15% solution intramuscularly or subcutaneously, 1 ml for every 15 kg of body weight once a day) is also effective within 3-5 days). After the normalization of the temperature, the use of long-acting drugs is recommended - rifampicin and ampicillin (10,000 IU/kg 2 times a day), neomycin (10-15,000 IU/kg 2 times a day). Cardiac, enveloping, disinfectant drugs are also used, and a diet is prescribed.

Immunity. Studied notenough. It's assumed that the main role in protecting the body against listeriosis infection belongs to cellular immunity, which ensures an increase in the metabolic and phagocytic activity of macrophages and the completion of phagocytosis. For active immunization, a live dry vaccine from the avirulent strain of listeria AUF is proposed, which is used for preventive immunization of sheep, cattle, pigs and rabbits only in farms unfavorable for listeriosis during an outbreak of the disease, or in farms where the disease was previously registered. In sheep, pigs, rabbits, the vaccine is administered intramuscularly from the inner surface of the thigh, in cattle - in the gluteal muscles. The vaccine is administered twice with an interval of 10 days. Immunity is formed 10-14 days after vaccination and lasts for one year. It's not recommended to use antibiotics a few days before the vaccine and 10 days after.

Prevention and control measures. To prevent the occurrence of listeriosis, it is necessary to systematically destroy rodents, as the main reservoir of listeria in nature. Completing the herd (flock) should be carried out only with animals from prosperous farms. During the 30-day preventive quarantine period, a clinical examination of imported animals is carried out, and in case of suspicion of latent listeriosis, bacteriological and serological studies are carried out. They organize a systematic fight against rodents, take measures to protect feed storage facilities from them. Compound feed and meat and bone meal are subject to mandatory bacteriological examination. In the case of the appearance of the disease, the farm (herd) is recognized as unhealthy with regard to listeriosis, quarantine restrictions are introduced in it, and measures aimed at eliminating the disease are developed. Feeds are thermally treated or replaced. Sick animals are isolated and treated. The rest of the animals are subject to permanent veterinary supervision, and they are vaccinated with an anti-listeriosis vaccine. Milk obtained from sick animals is boiled for 15 minutes or processed into ghee. Disinfection and deratization are systematically carried out on farms and their adjacent territories. Compound fodder, hay, straw from skirts and piles, which were inhabited by a large number of rodents, are subjected to heat treatment at 100°C for 30 minutes, and the silage mass is disinfected by the biothermal method. The farm is considered safe with respect to listeriosis 2 months after the last case of isolation of clinically sick animals and receiving negative

serological results for agglutination reaction, indirect hemagglutination reaction and complement binding reaction in two blood sera tests with an interval of 14-20 days, as well as after the final disinfection of the farm premises and territory. Breeding of sheep within two years after the recovery of the farm from listeriosis is allowed only if the results of the research of their blood sera for listeriosis are negative. Breeding of other species of animals is allowed under the same conditions for one year. In farms that were unfavorable for listeriosis, once a year, before transferring animals to stables, serological examination is carried out. 3% hot solution of caustic soda with exposure for 3 hours is recommended for disinfection of livestock premises in case of listeriosis; 16% hot solution of soda ash with exposure for 4 hours; 5% hot emulsion of xylonaphtha with exposure for 5 hours; 6% hot emulsion of disinfecting creolin with exposure for 6 hours; clarified solution of perchloric lime, containing at least 2% active chlorine, with an exposure of 4 hours. Aerosol disinfection is carried out with a 20% formaldehyde solution at the rate of 20 ml per 1 m^3 of the room with exposure for 4 hours; formalin-creolin (xylon naphtha) mixture, which consists of three parts of formalin containing 40% formaldehyde, and one part of 50% aqueous emulsion of disinfectant creolin or xylon naphtha at the rate of 15 ml per 1 m^3 of the room, with exposure for 4 hours.

Questions and tasks for control.

1. Name the features of the epizootic process in listeriosis.
2. Describe the course and forms of the disease in different species of animals.
3. What are the general and specific measures for the prevention of listeriosis in animals?
4. Draw up a plan for improving the dysfunctional economy.
5. Carry out a differential diagnosis of listeriosis based on a set of data, including bacteriological research.
6. What are the methods and means of treating sick animals?

Tetanus

(diagnostics, specific prevention measures of struggle)

Tetanus – acute non-contagious wound toxic infection of various species of animals, which is characterized by increased reflex excitability and prolonged convulsive contraction of skeletal muscles. Human is susceptible to tetanus.

The causative agent of the disease – tetanus bacillus Cl. tetani, which is widespread in nature, constantly resides and multiplies in the intestines of herbivores. It's released into the environment with feces and pollutes the upper layers of the soil, where it forms spores. The tetanus bacillus is an anaerobic motile microorganism, which, due to the placement of round or oval spores at one end of the cell, has the shape of a drum stick (Fig. 1).

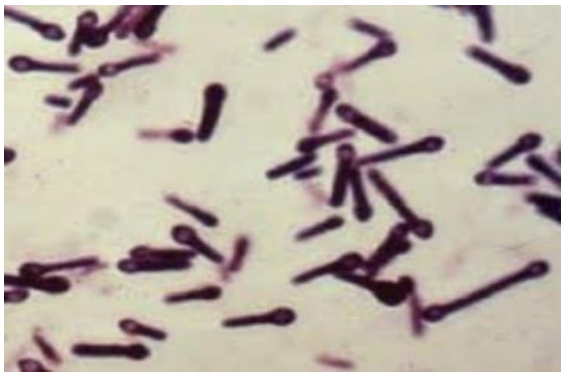


Fig. 1. Clostridium tetani. Gram staining.

In preparations from the affected tissue, 2-3 cells are placed, in young broth cultures it appears in the form of long intertwined threads. It produces a very strong toxin in wound tissues and broth culture. Vegetative young cells stain well with alcohol-based solutions of aniline dyes and are Gram-positive. For the cultivation of Cl. tetani use Kitt-Tarozzi broth with pieces of liver, where after 8-24 hours of growth, the pathogen causes intense turbidity and gas formation, an unpleasant smell of burnt horn (Fig. 2).

Fig. 2. Cultivation on Kitt-Tarozzi broth.

It causes blackening on brain medium, on glucose-blood agar it forms characteristic delicate colonies with processes and a raised center, sometimes with a zone of hemolysis (Fig. 3).

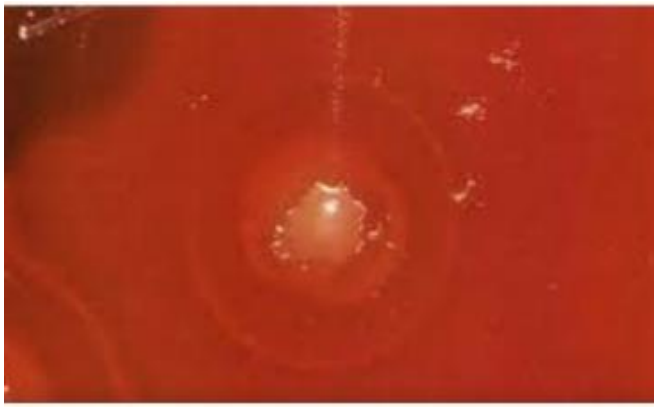


Fig. 3. Cultivation on glucose-blood agar.

In spore form, the causative agent shows a fairly high resistance - it persists for years in dry feces, dry soil, on the contaminated surface of various objects protected from light. Direct solar radiation destroys spores only after 30 days, boiling - after 1-3 hours, dry heat at 115°C - after 20 minutes. Spores are resistant to various disinfectants: 1% formaldehyde solution, 5% phenol solution inactivate them only after 6-15 hours, 5% creolin solution - after 5 hours, 3% formalin solution - after 24 hours.

The diagnosis of tetanus is made by a complex method on the basis of epizootological data, typical clinical signs of the disease, laboratory tests are used only in exceptional cases.

Epizootological data. Horses, guinea pigs, mice are very sensitive to tetanus toxin, and to a much lesser extent - cattle, sheep, goats and pigs. Poultry rarely gets tetanus. Dogs and cold-blooded animals are not susceptible to this disease. Young animals are more sensitive than adults. The disease is not contagious, appears sporadically. Severe cooling or overheating of animals contributes to the development of the disease.

The source of the pathogen is healthy animals that excrete it with feces and contaminate the soil, where tetanus spores can persist for up to 11 years. Infection of animals occurs as a result of the penetration of spores into deep lacerations with crushed tissues, hemorrhages, necrosis, in which favorable anaerobic conditions are created for the reproduction of bacilli. Horses mostly get tetanus from deep nail punctures in the area of the sole of the hoof, from blows, serrations, chaining, as well as from castration without observing the rules of asepsis. In cows, tetanus can occur after difficult births, in sheep - due to tail clipping, careless shearing and castration of rams, in newborn animals - due to contamination of the umbilical cord stump. Cases

of tetanus occurring several months and even years after the healing of a wound in which spores remained have been reported.

Clinical signs and course of the disease. The incubation period lasts 6-20 days. The course of the disease in all animals is acute. The severity of the clinical manifestation of tetanus is largely determined by the level of species susceptibility of the animal to the causative agent of the disease.

In horses, at first there is a certain tension in movements, difficulty in accepting and chewing feed, falling of the third eyelid when raising the head. Soon, convulsions of all the muscles of the body develop, and general numbness sets in. The horse stands motionless in one and the same place with legs wide apart, head extended forward and neck bent upwards. The abdomen is taut, the back is convulsively concave, the tail is slightly raised. The ears are motionless, the pupils and nostrils are dilated, the jaws are convulsively compressed (trismus). Palpation reveals very hard tense muscles protruding in relief under the skin. The sick animal has a pronounced reflex excitation, which causes convulsions even in the case of a slight noise, a light touch to the skin. Taking food becomes impossible due to muscle spasms; excretion of feces is difficult. During the disease, the body temperature is normal (in an agony state it rises to 42°C), the pulse and breathing are accelerated. Death occurs after 2-12 days, and the body temperature before death can rise to 43°C. The lethality is 50-90% (Fig. 4).

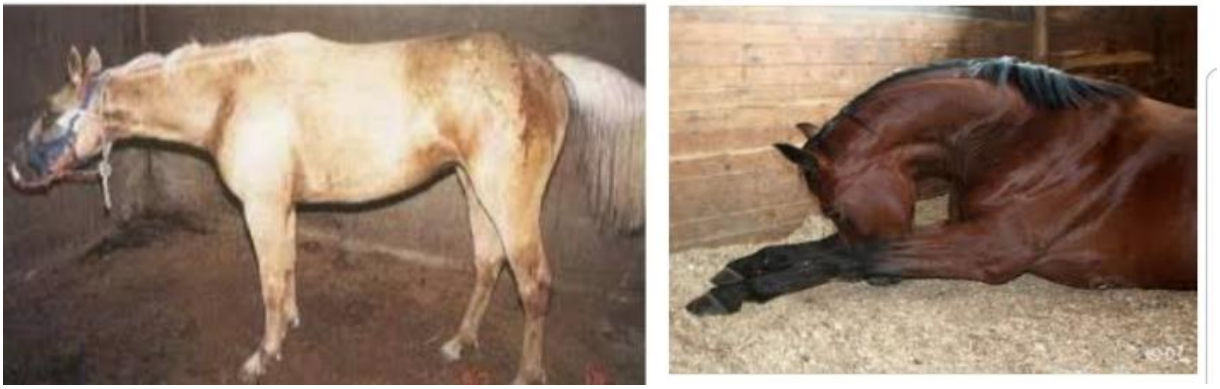


Fig. 4. Tetanus in horses.

In cattle, as a result of spasms of the abdominal muscles, chewing and belching stop, and tympany develops.

In sheep and goats, a characteristic clinical sign is opisthotonus (head tilting back). The disease lasts 2-7 days. Animals die from asphyxiation. Lethality in adult animals is 50-80%, in lambs it can be 90-100% (Fig. 5).

Fig. 5. Opisthotonus.

In pigs and dogs, damage to the masticatory muscles is observed. The unusual posture of the sick animal is characteristic, when the spine is bent downwards, the front limbs are strongly stretched forward, and the hind limbs are stretched back.

Pathological changes. The muscles have the appearance of boiled meat, pierced with hemorrhages. Degenerative changes in the liver and kidneys are noted. The lungs are hyperemic, swollen. Hemorrhages are observed on the epicardium, in the heart muscles, and in the pleura. The membranes of the brain and spinal cord are hyperemic, covered with small hemorrhages.

Laboratory diagnostics. Wound exudate, pieces of affected tissue, which are taken from the depth of the wound, are sent to the laboratory for examination. From dead animals, pieces of tissue from the places of damage, as well as liver and spleen, blood (5-10 ml) are sent. Laboratory studies involve the detection of tetanus toxin and isolation of the causative agent culture, followed by toxicity testing. To detect tetanus toxin, 2-3 white mice or 2 guinea pigs are infected subcutaneously with filtrate from pathological material. In the presence of the toxin, after 48-96 hours, infected animals develop characteristic signs of the disease, which are accompanied by tetanic muscle contraction, first of individual groups, and then of the entire body musculature. Laboratory animals die in a characteristic position with their paws stretched forward and the spine bent in the direction of the paw into which the pathological material was injected (Fig. 6).

Fig. 6. Positive bioassay on mice.

In case of detection of tetanus toxin in the pathological material, further studies are not carried out. If the results of studies on the detection of the toxin are negative, the pathological material is seeded on the Kitt-Tarozzi medium, followed by the determination of the toxicity of the selected culture for mice and guinea pigs. The diagnosis of tetanus is considered to be established in case of detection of tetanus toxin in the examined material without isolation of a culture or isolation of a culture from a pathological material with properties characteristic of the causative agent of tetanus, which produces the toxin. The research period is 15 days.

Differential diagnosis. Presupposes the need to exclude rabies, muscular rheumatism, meningitis. Rabies is characterized by significant aggressiveness of animals, paralysis of the lower jaw, drooling, lack of trismus. With muscular rheumatism in sick animals, there is no increase in reflex excitation, the muscles are very tense and painful. Meningitis is characterized by paralysis and general depression, there is no trismus.

Treatment. It's effective only if the anti-tetanus antitoxic serum is used early, since neutralization of the tetanus exotoxin is impossible after interaction with the cells of the nervous system. Anti-tetanus antitoxic serum is administered intravenously or subcutaneously in a dose of 80,000 IU to large animals, 40,000 IU to small and young animals until complete recovery. Spinal injection of serum under anesthesia is also recommended. Careful antiseptic treatment of the wound must be carried out, various sulfonamide drugs and antibiotics are used. 30-50 ml of chloral hydrate in 300-500 ml of starchy mucus or subcutaneously 50 ml of 30% solution of magnesium sulfate are used daily in the form of an enema to relieve convulsive muscle contractions. Intramuscular administration 2-3 times a day of 50-80 ml of 96% alcohol in 1 liter of 5% glucose solution is useful. Sedative drugs and drugs to support cardiac activity are indicated. A sick animal should be kept in an isolated, dark room, providing it with rest and adequate nutrition.

Immunity. After an illness, the animal acquires stable anti-toxic immunity. Using vaccines agains tetanus. For active immunization, a concentrated tetanus toxoid is used, which is injected subcutaneously in the upper third of the neck in a dose of 1 ml for large animals and 0.5 ml for young animals and small animals. Immunity is formed after 21-30 days and lasts more than one year, and in horses - 5 years.

Prevention and control measures. To prevent animals from getting tetanus, the requirements of asepsis and antiseptics during surgical operations and various injections should be strictly followed, and in case of injuries, wounds should be treated in a timely and correct manner. In case of deep lacerations, burns, severe childbirth, anti-tetanus anti-toxic serum should be administered. To consolidate passive immunity, simultaneous use of specific serum and concentrated tetanus toxoid is recommended. In disadvantaged areas, where frequent cases of tetanus are

observed, all susceptible animals should be regularly immunized with concentrated tetanus toxoid. Scheduled preventive vaccinations against tetanus are mandatory in stud farms. 3% formalin solution, 5% carbolic acid solution, 5% creolin solution, 10% chlorinated lime solution are used for disinfection of premises where patients and suspects of animal tetanus disease were located.

Questions and tasks for control.

1. Causative agent of tetanus and it's characteristics.
2. What is the specific susceptibility of animals to tetanus and what are the ways of infection?
3. Describe the course and forms of clinical manifestation of tetanus in animals of different species and ages.
4. Diagnostic methods.
5. What depends on the effectiveness of treatment.
6. Means of specific prevention.
7. Prevention and control measures.

Pasteurellosis

(diagnosis, specific prevention, measures of struggle)

Pasteurellosis, (hemorrhagic septicemia) – an acute disease of many species of domestic and wild animals, which is characterized by septic phenomena, croupous inflammation of the lungs, pleurisy, edema in various parts of the body in an acute course; with subacute and chronic course - purulent-necrotic pneumonia, arthritis, keratoconjunctivitis, endometritis, mastitis, sometimes hemorrhagic enteritis.

The causative agent of the disease – Pasteurella multocida – a small, gram-negative, immobile and non-spore-forming bacterium. Its painted by bipolarly with aniline paints (Fig. 1).

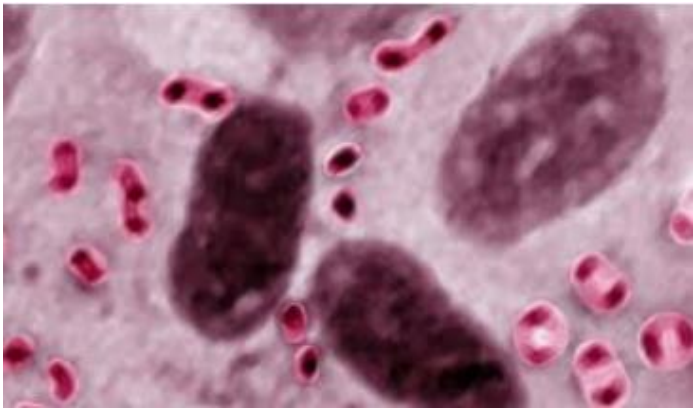


Fig. 1. Pasteurella multocida. Bipolar staining.

In smears of pathological material, it's located in isolation, sometimes in pairs, less often in chains, and often has a well-defined capsule. Pasteurella are facultative aerobes. They grow well at 37°C on ordinary nutrient media, better with the addition of blood serum (Fig. 2).

Fig. 2. Cultivation on blood agar.

Pasteurelles are very polymorphic in cultures, forming a mucous capsule; bipolarity is rare. On the meat peptone broth in the first days of growth, the environment is clouded, on the 3-4th day there is enlightenment with the formation of a slimy sediment. In broth cultures and in the body of animals, Pasteurella produces toxins. When cultured on meat peptone agar, small bluish transparent colonies of three forms appear: smooth (S), rough (R) and mucoid (M). Pasteurella are antigenically heterogeneous and are divided into 4 capsular serological groups (A, B, D and E) and 12 somatic types. It has been established that different types of pasteurella are more virulent in relation to the species of animals from which they are isolated. Among laboratory animals, white mice, rabbits, and pigeons are susceptible to epizootic strains of Pasteurella.

Pasteurella are unstable in the environment: under the influence of sunlight, they die in 10 minutes, when dried - 2-3 days, at 70-90ºC - 5-10 minutes. They are stored in blood and intestinal contents for 6-10 days, in water - for 2-3 weeks, in corpses - for 1-3 months, in frozen poultry carcasses - for 1 year. They quickly die under the action of disinfectants: in 5% carbolic acid after 1 minute; freshly slaked and perchloric lime after 5-10 minutes.

The diagnosis is made by a complex method based on the analysis of epizootological data, clinical signs of the disease, pathological changes, with mandatory bacteriological examination.

Epizootological data. All types of domestic and many types of wild mammals, as well as poultry, are susceptible to pasteurellosis. Relative resistance is shown by carnivores and horses, in which pasteurellosis as an independent disease is rare. Human are also sick with pasteurellosis.

Young animals are more sensitive, especially in industrial animal husbandry, where under the influence of various violations in feeding and maintenance, a mass disease of calves and piglets with pasteurellosis can occur.

The source of the causative agent of infection is sick and animals - carriers of pasteurella. Pasteurellosis is characterized by a wide carrier of the causative agent by clinically healthy animals, which can reach 45% among pigs, sheep - 50%, rabbits - more than 50%, chickens - 35-50%, cattle - 70% in unhealthy farms. Therefore, in most cases, pasteurellosis initially occurs in the farm without introducing the pathogen, and as a result of autoinfection with a decrease in the body's resistance in bacteria carriers. Later, when passing through the body of weakened animals, Pasteurelles increase their virulence and cause disease even in healthy, well-fed animals. Outbreaks of infection are also possible when pasteurella-carrying animals are brought in for stocking from disadvantaged farms or when new susceptible (non-immune) animals are admitted to a disadvantaged farm.

Pasteurelles are excreted from the body of animals with: feces, nasal discharge, saliva, exhaled air during the illness, as well as within 1 year after recovery. Infection

of healthy animals occurs through the mucous membranes of the respiratory tract, digestive tract and damaged skin. Transmission factors – feed, water, air, litter, care items contaminated with secretions of patients; slaughter products, leather, wool and other raw materials obtained from sick, forcibly slaughtered animals and those who died from pasteurellosis. Pasteurella can be carried by rodents, blood-sucking insects, and wild carnivores. Pasteurellosis as an independent disease occurs in European countries often in the form of enzootic, in tropical countries – epizootic.

The spread of pasteurellosis is facilitated by various violations of veterinary and sanitary rules for keeping and feeding animals (high humidity, overcrowding, starvation, worm infestation, feeding infected feed). Pasteurellosis is characterized by seasonality (outbreaks are recorded in summer and early autumn) and stationarity, which is due to widespread and long-term pasteurellosis. Pasteurellosis often complicates such infections as plague, Aujesky's disease, swine rabies, and acute respiratory diseases of calves.

Clinical signs and course of the disease. The incubation period lasts from several hours to 2-3 days. In all animals, pasteurellosis can occur instantly, acutely, subacutely, and chronically. In cattle, septic, edematous, thoracic and intestinal forms of the disease are distinguished.

With a sudden course, a septic form is detected, which is clinically manifested by a sudden increase in temperature to 41-42°C, severe cardiac disorders, acute gastroenteritis, and sometimes bloody diarrhea. Animals die after 6-12 hours. Sometimes animals can die even before the appearance of clinical signs.

In the acute course, intestinal, thoracic and edematous forms of the disease are detected. In all forms, elevated body temperature up to 41oC, severe depression, and complete refusal of feed are noted. The intestinal form is manifested by bloody diarrhea, weakness, progressive exhaustion. Thirst, anemic mucous membranes, difficulty in movement are observed. The thoracic form is characterized by signs of acute fibrinous pleuropneumonia - rapid and difficult breathing, rapid pulse, cough, serous, and then serous-purulent discharge from the nose. With the development of pleurisy, tenderness is observed when palpating the intercostal areas. The disease often takes a subacute and chronic course. The edematous form is determined by the appearance of necrotizing painful inflammatory swellings of the subcutaneous tissue and intermuscular connective tissue in the area of the head, neck, intercranial space, subthoracic, sometimes limbs, and genitals. Breathing and swallowing are very difficult. Cows stop giving milk. Death occurs after 1-2 days. The subacute course lasts from 5 to 14 days and is manifested by signs of croup pneumonia (chest form). In animals, along with fever, a dry, painful cough, serous discharge from the nose, which later turns into muco-purulent discharge, conjunctivitis, pain in the chest area are noted. Sometimes, at the end of the disease, enteritis develops, which is accompanied by bloody diarrhea. The chronic course is characterized by the slow

development of pneumonia, exhaustion, diarrhea, swelling of the joints. The disease lasts several weeks and often ends in death. In calves, pasteurellosis is registered in the first days of life and is characterized by a rapid course and development of clinical signs. Body temperature suddenly rises to 41-42°C; the pulse is frequent, tense; breathing is accelerated; the animals are very depressed. Diarrhea appears, often bloody. Death occurs within the first two days. Damage to the respiratory organs is very rare, mainly in calves of older age groups and in farms that are not stable with respect to pasteurellosis.

In small cattle, pasteurellosis is accompanied by the development of edema of the subcutaneous tissue of the front part of the body and fibrinous pleuro-pneumonia. Patients die on 2-5 days.

In pigs, pasteurellosis can manifest itself as an independent septic disease - hemorrhagic septicemia, or often as a secondary infection with plague, dysentery, Aujeski's disease, leptospirosis. Hemorrhagic septicemia proceeds instantly, acutely and chronically. The immediate course is accompanied by high fever (41-42°C), shortness of breath, severe depression and thirst. There is no appetite. Swelling appears in the area of the intermaxillary space and neck, pharyngitis develops, cyanosis of the skin on the abdomen, thighs, and ears. Death occurs after 1-2 days from asphyxiation. In the acute course, in addition to fever, croup pneumonia, congestion with the formation of red spots on the skin, cyanosis of the mucous membranes, and leukocytosis are detected. Animals die on 3-8 days (Fig. 3).

Fig. 3. Hemorrhagic septicemia with pasteurellosis in pigs.

In the subacute course, fibrinous pleuropneumonia develops. Mucous-purulent discharge from the nose, painful cough, difficulty breathing, cyanosis of the mucous membranes, conjunctivitis, severe depression are observed. Death occurs on the 3-8th day of the disease. The chronic course lasts 3-7 weeks and is accompanied by pneumonia, a periodic increase in body temperature, progressive exhaustion, and sometimes swelling of the joints. In most cases, pigs die after 1.5-2 months.

In birds, the instantaneous course of pasteurellosis is observed at the beginning of the epizootic, they suddenly fall and die without any signs of the disease. In most

cases, pasteurellosis in birds occurs acutely and is characterized by lethargy, the head is thrown back or tucked under the wing, the body temperature rises to 44°C and above, anorexia and thirst develop. Foamy mucus is released from the nostrils and beak, profuse diarrhea appears, sometimes bloody. The comb and beard are cyanotic, breathing is strained, with wet wheezes. Birds die from convulsions or with drowsiness. With the subacute and chronic course, anemia, exhaustion, inflammation of the joints with subsequent abscessation gradually develop. Chronic pasteurellosis is sometimes manifested only by signs of rhinitis, sinusitis and the accumulation of exudate around the nostrils and on the conjunctiva.

In rabbits, the course of the disease is often chronic or subacute, rarely acute. Cases of an acute course occur at the beginning of enzootic disease and are characterized by sudden death. The subacute course is often manifested as a complication of the chronic form; At the same time, an increase in body temperature, depression, runny nose, sneezing, sometimes diarrhea, and death in the first two days of the disease are observed. In dysfunctional farms, the disease proceeds chronically, manifested by rhinitis with serous-purulent discharge, conjunctivitis (Fig. 4). Pasteurellosis is often complicated by pneumonia, otitis, encephalitis, the formation of purulent abscesses in the subcutaneous tissue and internal organs.

Fig. 4. Pasteurellosis in a rabbit.

In fur-bearing animals (sable, fox, mink, beaver) during an acute course, sharp depression, anorexia, slow and shaky gait, and an increase in body temperature up to 42°C and above are observed. As a rule, signs of hemorrhagic gastroenteritis develop, especially in silver foxes. In minks, swelling in the head area, paresis and paralysis of the hind limbs appear. The disease lasts from 12 hours to 2-3 days.

Pathological changes. Depends on the duration and form of the disease. With a sudden and acute course, hemorrhagic diathesis is found in dead animals (multiple hemorrhages and inflammatory hyperemia in most organs, on the mucous and serous membranes), the liver and kidneys are degenerated, the spleen is swollen, and the lymph nodes are swollen, dark red in color. In the subcutaneous tissue, especially in

the edematous form, diffuse serous-fibrinous infiltrates are found in various parts of the body. The lungs are swollen with changes characteristic of the initial stages of croup pneumonia. With the intestinal form, there is a clearly expressed fibrinous and hemorrhagic inflammation of the stomach and the entire intestine.

The corpses of animals that died from subacute and chronic forms of pasteurellosis are severely emaciated and anemic. There may be dense fibrinous layers on the serous membranes of the thoracic and abdominal cavities. Peribronchial lymph nodes are enlarged, hyperemic, with many hemorrhages. Different stages of red and gray hepatization are found in the lungs. in some areas of the focus of necrosis; with complicated - purulent-fibrinous foci. The spleen is slightly enlarged, small foci of necrosis are found in the liver and kidneys (Fig. 5).

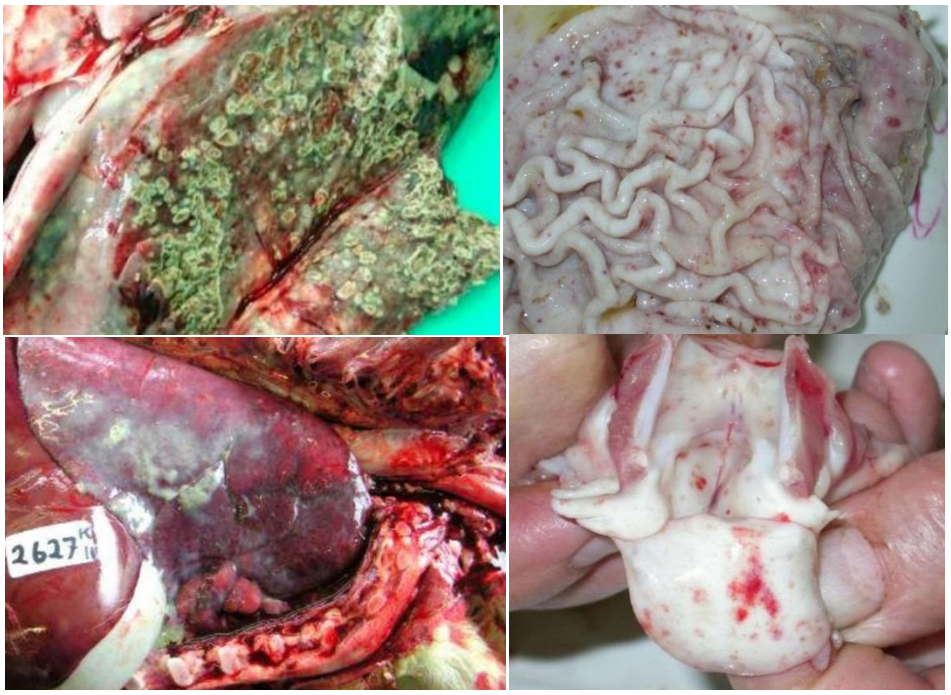


Fig. 5. Pathological-anatomical changes in pasteurellosis.

Laboratory diagnostics. Laboratory studies include microscopy of smears from blood and parenchymal organs, isolation of a pure culture of pasteurella, setting up a biological test to determine the virulence of the isolated pathogen. Blood, sterilely collected from a vein during the period of increased body temperature, is sent to the laboratory from sick animals, from corpses - blood from the heart, exudate from the lungs in sealed pipettes, lymph nodes, lungs, tubular bone, pieces of parenchymal organs, which are collected no later than 3- 5 hours after the death of untreated animals. Carcasses of small animals (rabbits, minks, nutria) are sent whole. If necessary, the pathological material is preserved with a 40% sterile aqueous glycerin solution.

Microscopic studies. In the superacute and acute course of pasteurellosis, smears are prepared from blood, exudate, and parenchymal organs; with subacute and

chronic course - from affected parts of organs. Preparations are painted according to Romanovsky-Giems, Lefler's son, according to Muromtsevky. They look under a microscope to detect bipolar ovoids or small coccobacilli.

Bacteriological research. Cultures from blood, exudate, deep layers of the lungs, liver, spleen, kidneys, lymph nodes, as well as from bone marrow, tubular bone (from a stale corpse) are carried out in meat peptone broth, on meat peptone agar, better - in Hottinger or Marten broth, cultivated for 24- 48 hours at 37°C. When growth appears (turbidity of the broth, formation of small transparent colonies on agar), identification of the microbe is carried out - swabs are prepared from the culture, stained with Gram to detect the capsule, checked for mobility (hanging or crushed drop) and biochemical activity (sowing on medium with lactose, glucose , sucrose, dulcitol, sorbitol and mannitol), 3-4-day cultures on Hottinger or Marten broth are examined for the formation of indole.

Biological test. Filtrate of pathological material or a daily broth culture of Pasteurella is injected into 2 white mice subcutaneously in a volume of 0.2 ml. In the presence of virulent pasteurella in the studied material, infected mice die after 18-36 hours. A pure culture of the pathogen is isolated from blood from the heart and parenchymal organs. It should be remembered that Pasteurella strains isolated from patients with secondary infection are often not virulent for laboratory animals.

Differential diagnosis. Pasteurellosis of cattle must be differentiated from anthrax, emkar; in pigs - from plague, salmonellosis, dysentery, anthrax.

With anthrax in cattle, the spleen is greatly enlarged, blood does not clotting. In smears and cultures of pathological material, spore-forming bacilli are found, which are located in the form of short chains.

Emkar is distinguished by the crepitation of the infiltrate, the black-red color, and the dry appearance of the affected muscles. Large, mobile, spore-forming anaerobic rods are found in the pathological material and cultures.

With swine fever, the contagiousness, epizootic nature of the infection is more pronounced. Infarcts of the spleen, diphtheritic lesions of the intestines (plague buds) are revealed. If necessary, a bioassay is performed on piglets.

Erysipelas differs from the acute course of pasteurellosis in the absence of pneumonia, with bacteremia. examined isolate a gram-positive bacillus.

Salmonellosis is characterized by enlargement of the spleen, lymph nodes, fibrinous inflammation of the mucous membrane of the colon, and cheesy decay of solitary follicles.

There is no pneumonia in pigs with anthrax. Bacteriological examination allows reliably differentiating these diseases.

Treatment. Sick animals are placed in warm, dry stalls, provided with complete feed, and tetracycline antibiotics and sulfonamide drugs are used in accordance with accepted guidelines. The use of anti-pasteurellosis serum can be effective for acute

pasteurellosis in animals only in the initial stages of the disease, when the first clinical signs appear. The therapeutic effect is significantly increased when the serum is used in combination with prolonged antibiotics, sulfonamides, and symptomatic agents. The course of treatment depends on the condition of the animal. Birds with pasteurellosis are not treated.

Immunity. Sick animals acquire immunity lasting from 6 to 12 months. Preventive vaccination of animals is carried out in farms that are not stable with regard to pasteurellosis and neighboring farms.

To immunize cattle and buffaloes, an emulsified vaccine against pasteurellosis of cattle, buffaloes, and sheep is used; small cattle - precipitated formol vaccine against pasteurellosis of sheep and pigs; emulsified vaccine against pasteurellosis of cattle, buffaloes, sheep and pigs.

For vaccination of pregnant sows and piglets under the age of 2 months, formolalum vaccine against paratyphoid, pasteurellosis and diplococcal septicemia of piglets is used. An emulsified vaccine against pig pasteurellosis is used in farms that are at risk of swine pasteurellosis.

For the prevention of pasteurellosis in birds, it is recommended to use dry live vaccines, as well as inactivated emulsion vaccines. Live vaccines are used to vaccinate chickens and waterfowl in unfavorable (acute outbreaks) and pasteurellosis-threatening farms after culling all sick and suspected birds. Immunity is formed on the 5th day and lasts up to 4-6 months. Emulsinvaccine is used mainly in farms that are at risk and have stable problems with regard to pasteurellosis, as well as during outbreaks of the disease. On the 4th day after vaccination, all birds are given sulfadimezin or norsulfasol with feed for 3-4 days. Immunity is formed on the 8th day and lasts up to 6 months in chickens, up to 7 months in waterfowl, after which revaccination is carried out without sulfonamide drugs.

Prevention and control measures. In order to prevent the disease of pasteurellosis in cattle and pigs, farms are stocked only with healthy animals from farms safe from this disease. Imported animals must be kept in quarantine departments under careful veterinary observation for 30 days. During the keeping and operation of animals, veterinary and sanitary rules and zoohygiene regulations should be followed and animals and poultry should be provided with a complete diet. It is impossible to allow livestock weakened by severe wintering to graze on lowland marshy pastures and to drink from shallow non-flowing water bodies. Preventive vaccination with vaccines should be carried out in disadvantaged farms. Farms in which pasteurellosis was registered should be stocked only with animals vaccinated against pasteurellosis within one year after recovery, which is carried out at the supplier's farm or during preventive quarantine. In the event of the occurrence of pasteurellosis, the farm is declared unhealthy for this disease and quarantine restrictions are introduced. In the epizootic cell, a clinical examination and

thermometry of all animals of the unfavorable group are carried out. Sick and suspected animal diseases are isolated and treated, and a separate service staff, appropriate equipment, transport, and veterinary support are attached to them. Piglets and lambs under diseased ewes are injected with hyperimmune anti-pasteurellosis serum in therapeutic doses and antibiotics of the tetracycline series. Calves up to 3 months of age, which are on the territory of a troubled farm, are injected with hyperimmune anti-pasteurellosis serum and drink milk from healthy cows. 14 days after the introduction of serum, calves are vaccinated with a vaccine against pasteurellosis. Disinfection, deratization, and disinsection are regularly carried out in livestock premises. The corpses of dead animals are burned or disinfected in biothermal pits. Quarantine restrictions are removed from the farm 14 days after the last case of pasteurellosis, vaccination of all animals against pasteurellosis, final disinfection and the entire set of organizational, economic and veterinary-sanitary measures. After the lifting of quarantine restrictions, all susceptible animals of this farm, as well as all incoming livestock, are vaccinated within one year. For disinfection, use a 10-20% mixture of freshly slaked lime or a 2% solution of caustic soda with exposure for 1 hour; clarified solution of perchloric lime, containing at least 1% active chlorine, with an exposure of 1 hour; 0.5% formaldehyde solution with a temperature of at least 16°C and an exposure of 3 hours. For aerosol disinfection, a 20% solution of formaldehyde is used at the rate of 20 ml per 1 m3 of the room with exposure for 3 hours. Manure is subjected to biothermal disinfection, 0.5 ml of a clarified solution of chlorinated lime containing 25 mg/l of active chlorine is added to a manure pit per 1 m3, the mixture is stirred and kept for 12-18 hours. In the event of the appearance of pasteurellosis among poultry, the poultry farm is declared to be unfavorable for pasteurellosis and quarantine restrictions are introduced. All sick, weak and exhausted birds are slaughtered by the bloodless method and processed into meat and bone meal or destroyed. Clinically healthy birds are given antibiotics and sulfonamide drugs for preventive purposes. After the end of the egg-laying (fattening) period, it is slaughtered. Removal of poultry and hatching eggs from a dysfunctional farm is prohibited. Quarantine restrictions in a dysfunctional farm are lifted 1 month after the last disease and death of the bird, the final disinfection of the poultry houses and the territory for walks. At the same time, for the rapid elimination of enzootics in a dysfunctional farm, in the presence of appropriate conditions, a general slaughter of poultry can be carried out, followed by thorough disinfection of the premises and inventory. When pasteurellosis is established among poultry belonging to private individuals, quarantine restrictions are introduced in unfavorable yards. All the birds of the dysfunctional yards are slaughtered, the carcasses of sick birds are destroyed, and the carcasses of clinically healthy ones are digested and used as food within the yard. Restrictions from the poultry house (yard) are removed after the slaughter of all the previously unhealthy

birds with regard to pasteurellosis, cleaning of the territory, disinfection, deratization and final disinfection with bacteriological control of its quality. In rabbit farms, strict restrictions are introduced for pasteurellosis. Sick and suspected rabbit diseases are slaughtered. All healthy animals are treated with intramuscular administration of antibiotics at a dose of 20 mg/kg of body weight - terramycin once, biomycin - twice with an interval of 8-10 hours. After 24 hours, rabbits over 45 days old are vaccinated against pasteurellosis. On rabbit farms, measures are taken to improve the feeding and keeping of rabbits, disinfection of cages and inventory is carried out. In case of pasteurellosis, quarantine restrictions are introduced in animal farms. Patients and suspected animal diseases are treated with anti-pasteurellosis serum, which is administered 10-15 ml to adult minks and sables, 5-10 ml to young animals up to 4 months of age; adult foxes - 20-30 ml each. Antibiotics are also used. Clinically healthy mink and nutria are vaccinated with a vaccine against pasteurellosis. At the same time, they improve the conditions of keeping the animals, provide them with cooked fodder.

Questions and tasks for control.

1. What are the clinical and epizootological features of the manifestation of animal pasteurellosis depending on the serotype of the causative agent?

2. What factors determine the stationarity and seasonality of the disease?

3. What biomaterial should be sent to the laboratory for research and when is the final diagnosis of the disease considered established?

4. What set of measures should be carried out on a dysfunctional farm?

5. Name the means and methods of treatment of sick and suspected animals with pasteurellosis.

6. How is specific immunoprophylaxis of pasteurellosis carried out in animals of different species?

Necrobacteriosis

(diagnosis, control measures)

Necrobacteriosis – subacute or chronic infectious disease of all types of domestic and most wild animals and birds, which is characterized by purulent-necrotic lesions of the skin and adjacent connective and muscle tissues, mainly on the lower parts of the limbs, as well as mucous membranes of the oral and abdominal cavities and respiratory tracts, sometimes parenchymal and genital organs. Human can get necrobacteriosis.

The causative agent of the disease – Fusobacterium necrophorum, which is common in the external environment. This is an anaerobic, immobile, gram-negative, extremely polymorphic microorganism. It does not form spores or capsules. Stains well with Tsil's fuchsin, Leffler's blue, and also according to Muromtsev. In smears - impressions from encapsulated cells, chronic lesions, as well as in smears from old cultures, fusobacteria have the form of short sticks, which are stained unevenly, granularly, more intensely at the ends. In smears from pathological material and young cultures, the pathogen is observed in the form of long intertwined threads of 60-80 segments, which often have intensely colored bulbous thickenings and spherical swellings (Fig. 1).

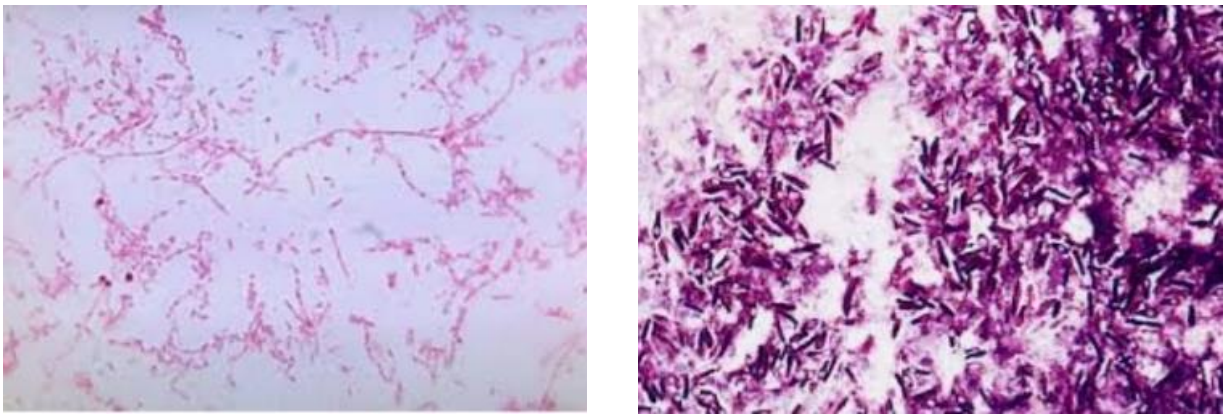


Fig. 1. Fusobacterium necrophorum in smears from pathological material.

Fusobacteries are cultivated in anaerobic conditions on Kitt-Tarozzi medium, Marten's broth, Hottinger's liver broth, Zeissler's glucose-blood agar, serum agar, brain medium at a temperature of 36-37°C. When sowing on Kitt-Tarozzi broth, the growth of bacteria is observed after 1-2 days and is accompanied by intense turbidity, followed by clarification and the formation of sediment. On serum agar, after 48-72 hours, delicate white round, sometimes with appendages of the colony grow. Small colorless colonies with smooth edges are observed on the surface of Zeissler's glucose blood agar (Fig. 2).

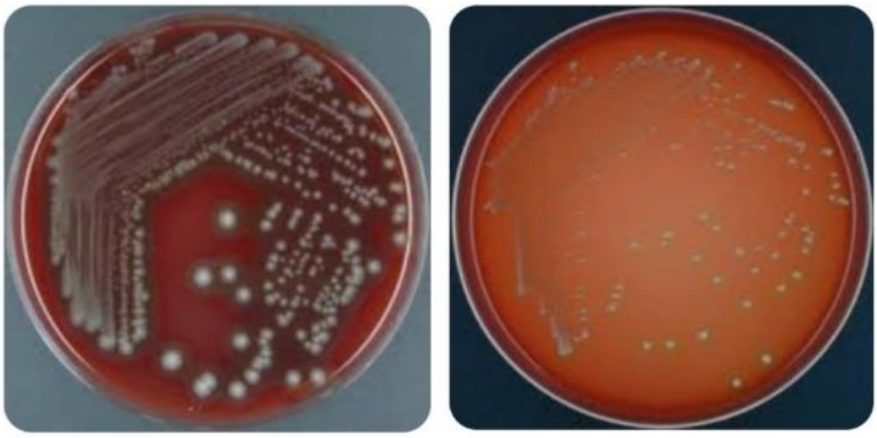


Fig. 2. Fusobacterium necrophorum. Cultivation on blood agar.

Fusobacteries are relatively unstable microorganisms, but they can be stored for a long time in objects of the external environment: in a frozen state, they remain viable for 30-40 days, in manure - 50 days, in soil - 20-40 days, in urine - 15 days, in water - 15 days During boiling, they are destroyed in 1 minute, when heated to 65°C – in 15 minutes, to 70°C – in 10 minutes. They are inactivated under the influence of solar radiation after 8-9 hours, after drying - after 1-4 days.

The diagnosis of necrobacteriosis is made by a complex method on the basis of epizootological data, characteristic clinical signs of the disease, pathoanatomical changes and the results of laboratory studies.

Fusobacteries are permanent residents. The causative agent of necrobacteriosis is released into the environment with feces and saliva Epizootological data. In natural conditions, sheep, reindeer, cattle, horses, pigs, dogs, rabbits, poultry, and many wild animals are affected by necrobacteriosis. Young animals are more susceptible to the disease, but lambs do not get sick before weaning from ewes.

The source of the causative agent of infection is sick and sick animals with necrobacteriosis - bacteria carriers, as well as healthy animals, especially ruminants, whose rumen contains rejected necrotic tissues and contaminates dung, soil, pastures, walks, water bodies. Infection of animals occurs when the causative agent of the disease enters the injured areas of the skin or mucous membrane of the alimentary canal, which appear when animals graze on lowland marshy pastures, on stubble, as well as when kept in pens on wet litter, feeding on thorny grasses, during long-term running along hard, stony soil. Necrobacteriosis is registered both in the pasture and in the stable period. In reindeer, the disease becomes widespread in the summer, which is caused by the mass flight at this time of blood-sucking insects, which become carriers of the pathogen. Necrobacteriosis occurs sporadically in deer, sheep, cattle, piglets, and chickens, but severe enzootics and even epizootics may occur in conditions of a sharp decrease in the body's resistance or a significant violation of zoohygienic standards for keeping and feeding animals. Necrobacteriosis can complicate the course of various diseases of viral or helminthic etiology. Under

unfavorable veterinary and sanitary conditions, necrobacteriosis often becomes stationary and affects various types of animals. Long-term bacteremia during the chronic course of the disease, untimely isolation and treatment of sick animals also contribute to the stationarity of the disease.

Clinical signs and course of the disease. The incubation period lasts 1-3 days. In young animals, the course of the disease is acute, in adults it is subacute or chronic. Benign and malignant forms of the disease are distinguished.

In sheep, necrobacteriosis occurs chronically, often in a malignant form. The disease lasts from several weeks to several months. It's characterized by purulent-necrotic, and sometimes gangrenous lesions of the extremities. The pathological process is localized in the tissues of the interradicular gap, corolla, soft tissue and may end with necrosis of bones, phalanges, tendons, and ligaments. The main clinical sign of the disease is lameness. In case of disease of both front limbs, the animals cannot move at all and crawl on the front surfaces of the putative or carpal joints. Hot and painful swellings first appear in the area of the interspinous cleft, the scrotum and the corolla, and later ulcers form in their place, from which stringy pus with an unpleasant specific putrid smell is released. Due to the spread of the necrotic process in depth, muscles, tendons, ligaments, joints, bones are exposed; sometimes there is a decline of the horn shoe. In young sheep, necrotic lesions can also be localized in the area of the lips, nose, oral cavity, genitals, liver, lungs, heart, and brain. Abortions are observed in cat ewes. The death of sheep occurs as a result of exhaustion of the body, metastases, secondary infection. In lambs, the course of necrobacteriosis is acute. At the same time, the body temperature rises to 40-40.5°C, weakness, exhaustion, and lack of appetite are observed. Croupous-diphtheritic layers and deep ulcers appear in the oral cavity. The disease is often complicated by metastases in the lungs, liver and kidneys. Death of lambs occurs as a result of sepsis and reaches 60-90%.

In cattle, the course of the disease is chronic or subacute. An increase in body temperature, severe depression, decreased appetite, lack of chewing, decreased milk production, and progressive lameness are observed. The affected limbs, mainly the back, are enlarged and very painful. Deep ulcers and purulent fistulas form in the area of the corolla and the wall of the horn shoe. Necrotic disintegration of ligaments, tendons, muscles, bone damage is observed, even loss of finger phalanges is possible. Necrotic cells are also found on the scalp, neck, and trunk. Mucous membranes of the alimentary canal can be affected, as well as internal organs, in beef cows - the udder and genitals (necrotic vaginitis, metritis). In calves, the disease has an acute course and lasts 4-7 days. Necrotic lesions of the skin and mucous membranes of the oral cavity, esophagus, stomach, intestines, navel predominate. At the same time, severe depression, increased body temperature, salivation, purulent secretions from the oral and nasal cavities, diarrhea are observed. Death occurs from sepsis or heart failure (Fig. 3).

Fig. 3. Necrobacteriosis in cattle.

In horses, necrobacteriosis is subacute, sometimes chronic, in a benign or malignant form. With the benign form, limited necrosis of the skin and subcutaneous tissue is observed, followed by the formation of scar tissue. In the malignant form, a purulent-necrotic phlegmon develops in the affected areas with necrosis of cartilage, tendons, ligaments and the formation of sequestrations. High body temperature, severe depression, refusal to feed, acceleration of pulse and breathing, frequent cases of complications with purulent-necrotic pneumonia, which lead to the death of the animal, are revealed.

In pigs, necrobacteriosis occurs rarely, mainly among suckling piglets during teething and fang biting. Wounds of the mucous membrane of the oral cavity that occur in this case become the gate through which the causative agent of the disease enters the body. In piglets, the disease is manifested by necrotic rhinitis and enteritis, as well as skin necrosis. The main clinical signs are frailty, emaciation, lack of appetite, cough, diarrhea, ulcerative lesions and the formation of scabs in the oral cavity. Necrotic rhinitis and necrotic enteritis in piglets usually ends fatally. Necrotic dermatitis, which is accompanied by the formation of abscesses of the skin and subcutaneous tissue, passes much more easily.

Dogs and cats are seriously ill with necrobacteriosis. First of all, the skin and subcutaneous tissue are affected, where necrotic and phlegmonous processes develop, numerous encapsulated abscesses are formed. Animals become weak, exhausted, refuse food, and their fur falls out. Death occurs as a result of general intoxication on the 20th day of the illness.

Chickens aged 1-2 months are especially susceptible to necrobacteriosis. Characteristic clinical signs of necrobacteriosis in them are necrotic lesions and diphtheritic layers on the root of the tongue and larynx, as well as swelling in the neck and submandibular space. Mortality of chickens reaches 75-80%.

In reindeer, necrobacteriosis has a malignant form and is characterized by phlegmonous-purulent inflammation of the lower phalanges of the limbs, purulent

arthritis, sometimes necrotic lesions of the mucous membranes of the alimentary canal and internal organs. The prognosis is unfavorable.

In rabbits, necrobacteriosis is accompanied by the phenomena of stomatitis and rhinitis, sometimes a pyemic form is observed with the formation of skin and subcutaneous abscesses in various parts of the body.

Pathological changes. The corpses of dead animals are exhausted. Purulent-necrotic masses are found in the center of the inflammatory process, and subcutaneous tissue infiltration on the periphery. Some areas of the affected skin are also infiltrated, stained dark, and brittle. In severe cases, there is deep necrotic decay of muscle tissue with exposure of tendons, ligaments and joints, exfoliation of the stratum corneum, thinning and deformation of the hoof wall. The cells of purulent-necrotic disintegration of the tissue of different shapes and sizes are found in the lungs on cross-section. The pleura is thickened, covered with fibrinous layers. In the liver, kidneys, and brain, there are light yellow necrosis centers, sometimes abscesses. The lymph nodes are hyperemic and enlarged.

Laboratory diagnostics. Whole corpses of small animals or affected tissues and pieces of parenchymal organs with necrotic foci from large animals are sent to the laboratory for research. Scrapings of pathological material on the border of healthy and necrotic tissue are selected for intravital diagnosis. Microscopy of swabs from pathological material, cultures on nutrient media, and infection of rabbits are carried out in the laboratory. In the case of positive results, gram-stained smears of scrapings from pathological material reveal gram-negative long granular rods and filaments, short rods and cocci from old lesions. In cultures on Kitt-Tarozzi broth, fusobacteria cause intense turbidity of the medium without gas formation after 13-24 hours. Characteristic small colonies of the pathogen appear in Petri dishes with serum-glucose agar within 48-72 hours. The biosample is placed on rabbits, which are injected subcutaneously with a 10% suspension of pathological material or a 24-hour broth culture of fusobacteria. If the causative agent of necrobacteriosis is present in the injected material, necrosis is observed at the injection site in rabbits after 3-4 days. If characteristic granular rods and threads are detected in smears from the center of necrosis, the biosample on rabbits is considered positive. The diagnosis of necrobacteriosis is considered to be established in the case of the isolation of a culture from the pathological material with characteristic properties of the pathogen and the development of a necrotic cell in rabbits at the place of introduction of a suspension of the original material or culture, followed by the detection of typical microorganisms in smears from this cell; the formation of a necrotic cell in an infected rabbit at the place of introduction of pathological material and the detection of typical microbes in smears from it, even in the absence of pathogen growth in cultures from the source material. The research period is up to 10 days.

Differential diagnosis. Presupposes the need to rule out foot-and-mouth disease in ungulates, hoof rot and contagious ecthyma in sheep and goats. Foot-and-mouth disease is an extremely contagious disease with an acute course, accompanied by the formation of typical canker sores, which are located not only on the extremities, but also in the affected oral cavity. In foot-and-mouth disease, there are no purulent-necrotic tissue lesions characteristic of necrobacteriosis, lameness is insignificant and quickly passes. Virological, bacteriological and serological studies make it possible to establish an unmistakable diagnosis. Only sheep and goats are affected by hoof rot. The disease is accompanied by purulent-necrotic decay of the hoof horn, peeling and melting of the inner walls of the hooves and sole, and the fall of the horn shoe, which causes severe pain in the limbs, lameness and even the inability to move. Detection of characteristic dumbbell-shaped rods of Bact in smear-prints made from zones of active putrefactive process. nodosus, is irrefutable evidence of this infection. In case of contagious ecthyma, sheep and goats observe a clearly expressed staging of the development of the pathological process (roseolae, papules, vesicles, pustules), which is not the case with necrobacteriosis. When examining smears-imprints stained according to Morozov or Pashen from the lesions, elementary bodies of the virus of the smallpox group are revealed.

Treatment. Sick animals are isolated and treated by a complex method. Careful surgical treatment of the affected areas of the skin and mucous membranes is carried out using bactericidal and disinfectant preparations in the form of ointments, powders, emulsions. For general treatment, prolonged antibiotics (bicillin-3-5, dibiomycin, ditetracycline) are used, which are administered intramuscularly on fish oil or oil. At the same time, sulfonamide drugs are used. In the case of damage to the limbs, after surgical treatment, cattle are passed through gentle baths with a 5-10% formalin solution or a 10-20% solution of copper sulfate with an interval of 5-7 days. In case of deep necrotic lesions, treatment is inappropriate.

Immunity. Immunity is not formed after an illness. Effective vaccines against necrobacteriosis have not been proposed.

Prevention and control measures. To prevent necrobacteriosis, it is necessary to protect animals from injuries to the limbs, timely treat wounds, the umbilical cord of calves, birth canals of ewes and cows in case of pathological calving and calving, create housing and feeding conditions that comply with zoohygienic standards, especially during childbirth, regularly clean and disinfect livestock premises , to equip watering places, walking yards, summer camps, races, to perform necessary melioration works on pastures. Positive results are given by the correct organization of sheep grazing, replacement of pastures for the purpose of their rehabilitation, as well as an increase in the general resistance of the body. Long-term grazing of animals on low-lying, swampy pastures, tiring races on hard stony roads should be avoided. Special attention should be paid to timely trimming and cleaning of hooves,

trimming of exfoliated horn. At least once every 2 months, a veterinary examination of animals and cleaning of hooves should be carried out, and preventive treatment of hooves with a 5-10% solution of formalin, 10-20% solution of copper sulfate or 5% solution of paraform with an interval of 5- 7 days. In case of necrobacteriosis, the farm is declared unhealthy and restrictions are introduced. Clinical examination of all livestock, isolation and treatment of sick animals, disinfection of premises are carried out. The corpses of dead animals are burned after skinning. Milk from sick cows is destroyed, milk from those suspected of being infected is boiled. During the grazing period, a separate area is allocated for animals of disadvantaged farms. Clinically healthy animals are passed through gentle baths with a 5-10% solution of formalin or a 10-20% solution of copper sulfate every 5-7 days. Quarantine restrictions on the farm (yard) affected by necrobacteriosis are removed 30 days after the disease has stopped, the final disinfection has been carried out and all the measures provided for by the current instructions have been carried out. A 4-5% caustic soda solution, a 2% formalin solution, a chlorinated lime solution containing 3% active chlorine, a 10% disinfectant creolin emulsion, and a 20% slaked lime suspension are used to disinfect the premises. Manure is disinfected by the biothermal method. For the purpose of reliable disinfection of the unhealthy pasture, it’s not used for grazing animals for 2 months.

Questions and tasks for control.

1. Describe the causative agent and the conditions that contribute to the occurrence of the disease.

2. What are the forms of clinical manifestation of necrobacteriosis in different species of animals?

3. What measures should be taken in a healthy household to prevent disease?

4. Determine the place of specific prevention of the disease in the system of health measures for necrobacteriosis.

Foot-rot

(diagnosis, control measures).

Foot-rot (Paronychia contagiosa) – a chronic contagious disease of sheep and goats, characterized by lameness, inflammation of the skin of the interlaminar gap, followed by putrefactive decay of the base of the skin, horn tissue, and exfoliation of the horn shoe of the hooves.

The causative agent of the disease – Bacteroides nodosus – belongs to the family Bacteroidaceae, genus Bacteroides. It is a straight or slightly bent, large, mobile gram-negative anaerobic rod with thickenings at the ends (Fig. 1). It does not form spores or capsules.

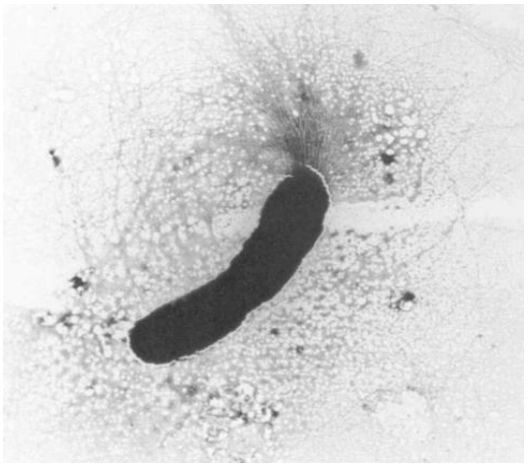


Fig.1. Bacteroides nodosus.

There are 11 known serotypes of this microbe that cause disease in sheep, but are not pathogenic for laboratory animals. In smears from pathological material, clusters of small gram-negative rods are found, which are located perpendicular to bacterial cells like a picket fence, the so-called "Beveridge phenomenon" (Fig. 2).

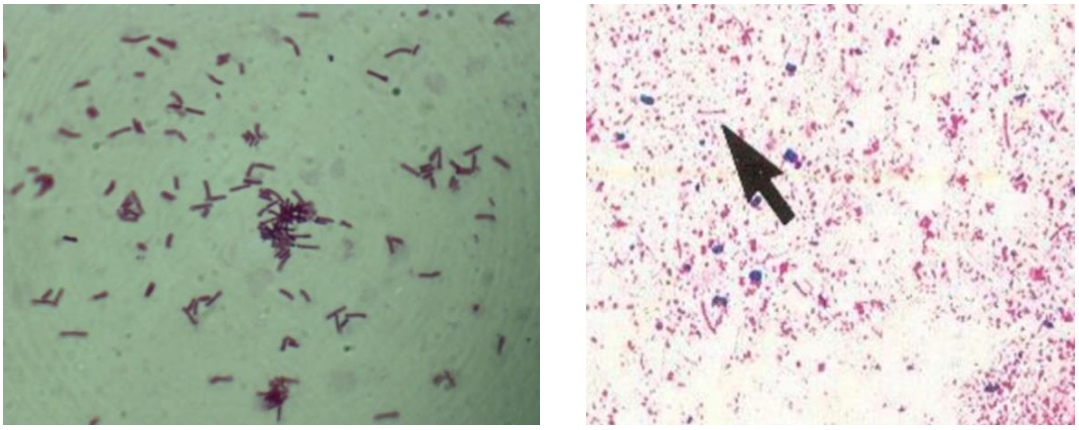


Fig. 2. Bacteroides nodosus in smears from pathological material.
Gram staining.

Bacteroids are cultivated only on special nutrient media - Baktemirov, Masalek, and Klaubs media. On dense media, it forms large flat colonies with a depressed center and uneven, fringed edges or small colonies with a cone-like raised center and smooth edges. In liver-brain broth, casein-hydrolyzate and peptone-liver broths, it causes gradual turbidity followed by clarification. In the affected tissues, the causative agent of the disease remains viable for years, it persists in the pasture from several hours to 15 days. Common disinfectants - 2-3% formaldehyde solution, 2% phenol solution, 3% caustic soda solution, 3% creolin solution, chlorinated lime solutions containing 3-5% active chlorine inactivate Bacteroides nodosus within 10-15 minutes, heating at 90°C - after 1-2 minutes.

The diagnosis is made on the basis of epizootological data, clinical signs of the disease, patho-anatomical changes, as well as the results of laboratory tests.

Epizootological data. Sheep and goats are affected by hoof rot, regardless of age and breed, but lambs under the ewes are not susceptible to the pathogen. The disease is more often registered in areas with lowland wet pastures and high rainfall. In dysfunctional farms, an increase in morbidity is observed in rainy, cold periods of the year (autumn, early spring). The source of the causative agent of the infection is sick animals and micro-carriers that secrete bacterioids with purulent-necrotic secretions from the affected hooves. Infection of healthy animals occurs through direct contact with sick animals, as well as through litter, manure, soil, pastures contaminated with purulent-necrotic secretions from affected hooves contaminated with the causative agent of the disease. The disease is highly contagious, morbidity in unhealthy flocks reaches 80%, mortality - 5-12%.

Clinical signs and course of the disease. The incubation period lasts 3-6 days. The course is chronic. There are initial, mild and severe forms of the disease. The main clinical sign of the initial form of the disease is purulent inflammation of the skin of the interspinous cleft, the presence of surface erosions and mucus with the characteristic unpleasant smell of rotten hoof horn. With a mild form of the disease, peeling of the horn of the inner side walls of the hooves occurs in the area of the heels, sometimes part of the sole. In a severe form, there is significant putrefactive decay of the base of the skin, complete detachment from it of the inner side walls of the hoof and the sole on one or more limbs in the absence of abscesses and ulcers in the area of the corolla (Fig. 3).

Fig. 3. Foot-rot in horse.

A gray-yellow exudate with an unpleasant rotten smell is found under the exfoliated horn. A characteristic clinical sign of hoof rot is soreness in the area of the hooves and associated lameness (Fig. 4). Progressive exhaustion of the animal, hair loss is also noted. Sick sheep do not come into the flock or give birth to weak, non-viable lambs. Foot-rot is often accompanied by necrobacteriosis, which is manifested by a sharp increase in body temperature to 40-40.5°C, the formation of abscesses, ulcers and fistulas in the areas of the corolla and foot, damage to joints, ligaments, tendons, as well as necrosis of the mucous membrane of the oral cavity. lips, front part of the head, udder. The disease can last for months, which necessitates the forced slaughter of animals.

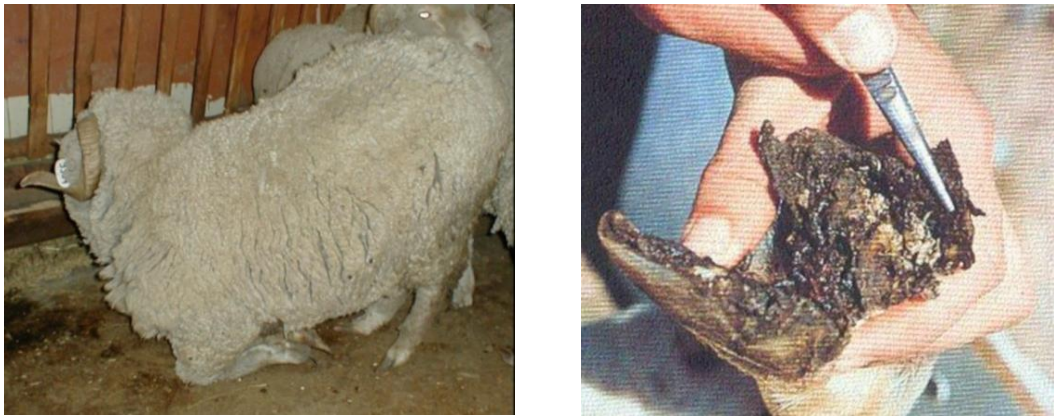


Fig. 4. Foot-rot in sheep.

Pathological anatomical changes. There are hooves in the area. The base of the skin of the sole and lateral inner walls is in a state of purulent-necrotic decay, the

corneous wall is deformed, the corneous layer of the sole is exfoliated almost to the point of separation of the horn shoe of the hooves.

Laboratory diagnostics. Includes microscopic and immunofluorescent examination of pathological material and, if necessary, a biological test on lambs. In the initial stage of the disease, the purulent exudate covering the interradicular virginity, and later the exudate from the depth of the pocket, which was formed as a result of exfoliation of the horn, as well as pieces of tissue taken from freshly affected areas of the base, are sent to the laboratory for examination no later than 24 hours after the time of collection hoof skin, or a hoof from a slaughtered sick animal. A laboratory diagnosis of hoof rot is considered to be established in the case of a positive bioassay on lambs, detection of characteristic rods of the causative agent in Gram-stained smears, and positive results of fluorescent microscopy.

Differential diagnosis. Necrobacteriosis, smallpox, foot-and-mouth disease, contagious ecthyma, and various hoof diseases of non-infectious etiology should be distinguished from foot-rot. With necrobacteriosis of the limbs, the pathological process is localized mainly on the corolla and is manifested by damage to joints, ligaments, tendons, the formation of ulcers, abscesses, and fistula passages. Lambs in the first days of life are seriously and always fatally ill, in which necrosis of the mucous membrane of the oral cavity, lips, and front part of the head is often observed. An autopsy revealed necrotic cells in the parenchymal organs, on the mucous membrane of the intestines. Bacteriological and biological research (infection of rabbits, white mice) makes it possible to establish a reliable diagnosis. It is necessary to remember the possibility of a mixed infection of necrobacteriosis and hoof rot. The course of smallpox is acute, with high body temperature. Characteristic smallpox rashes are found on the head, lips, wings of the nose, inner surface of the limbs, udder, intercostal space, as well as damage to internal organs. Smallpox virus is detected during microscopic and virological examination. Foot-and-mouth disease is acute, in the form of epizootics with simultaneous disease of other animal species. Characteristic aphthae and erosions are found on the skin of the inguinal gap and the edges of the corolla. Lambs have diarrhea, high mortality. Virological and serological studies determine the foot-and-mouth disease virus. Contagious ecthyma is accompanied by almost 100% damage to livestock, including young animals under one year of age. In animals, together with lameness, damage to the mucous membrane of the mouth, lips, as well as in the area of the nose, ears, eyelids, and genitals is detected. Papules, vesicles, pustules and crusts are observed on the skin of the corolla and the interradicular gap. Virological and microscopic examination and bioassay allow reliable differentiation of contagious ecthyma and hoof rot of sheep.

Treatment. Conducted by group method or individually. For group treatment, foot baths with 5-10% formalin solution for 1.5-2 minutes once every 7 days, 5% paraform solution for 2 minutes every 2-3 days for 2 weeks, copper sulfate solution

(5 -30% copper sulfate) for 1-2 minutes once every 7 days, 10-20% solutions of zinc sulfate for 1-2 minutes repeatedly. Before the bath, the hooves should be thoroughly washed, the exfoliated horn should be cut off, and the affected tissues should be removed. After the bath, the animals are kept on a concrete platform for 1-2 hours, and then transferred to a dry pen with fresh bedding or to a safe pasture. For individual treatment, 5-10% alcohol solutions of antibiotics (levomycetin, chlormycetin, terramycin, penicillin) are used (after a toilet and thorough surgical treatment of lesions) in the form of irrigation or dressings for 3-5 days, 10-15% emulsion (on fish oil) penicillin, teramycin, tricillin, dibiomycin, neotetramycin in the form of ointments, better with the use of bandages, aerosols of various medicinal products and antibiotics (chloramphenicol, oxytetracycline, teramycin). Drugs based on chloramphenicol are especially effective. In case of complications of the disease, antibiotics of prolonged action are used.

Prevention and control measures. In order to prevent the occurrence of hoof rot, it's necessary to import sheep for stocking the flock only from prosperous farms. During the 30-day preventive quarantine, a thorough inspection and cleaning of the hooves, trimming of an overgrown horn should be carried out. Before transferring to the main herd, the imported livestock is passed through a disinfection bath with a 5% formalin solution, a 10% copper sulfate solution, and a 5% paraform solution. Create suitable conditions for keeping animals, which exclude their long stay on lowland marshy pastures, in pens with high humidity and pollution. At least twice a year, cleaning and trimming of hooves, thorough clinical examination and preventive disinfection are carried out. When the disease of sheep or goats is detected, the herd is declared unhealthy, and quarantine restrictions are introduced in the farm. Removal of sheep for breeding and economic purposes, their regrouping, is prohibited. A thorough clinical examination of the entire herd is carried out, sick animals are isolated in a separate group and treated. After cleaning the hooves, the rest of the animals of the unhealthy herd are passed through a disinfection bath with a 10% solution of formalin or copper sulphate, a 5% solution of paraform at a temperature of 25-35°C, kept on clean, dry litter for 1.5-2 hours, then transferred to a new pasture with equipped approaches to the watering hole. A thorough inspection of the hooves of conditionally healthy livestock, regular trimming, and preventive disinfection are carried out every day. The corpses of dead animals are burned after skinning. Skins and wool of slaughtered or dead sheep and goats are dried on the farm in an isolated room. Export of skins is allowed only in dried form, and wool - in a container made of tight fabric no earlier than 2 weeks after their removal or shearing. Milk from relatively healthy sheep and goats is allowed to be consumed after boiling, milk obtained from sick animals is destroyed. Dry pastures can be used without restrictions 15 days after sick animals have grazed them. Corrals, walking yards, pens, where sick animals were kept, are cleaned of manure and disinfected. If within a month after the

isolation and slaughter of all sick sheep in a conditionally healthy group, no animals with signs of hoof rot appear, then after carrying out veterinary and sanitary measures, the flock is considered to have recovered. The farm is considered safe with respect to hoof rot after 1 month after the last case of recovery or slaughter of sick sheep and goats and the final disinfection. For disinfection with exposure for 1 hour, use 2% formaldehyde solution, 2% hot caustic soda solution, 5% disinfectant (phenolic) creolin emulsion, 5% paraform solution, clarified chlorinated lime solution containing 5% active chlorine, 20% slaked lime suspension . Every 3 days, the floor of the koshar, walking yards and shooting range is sprinkled with a thin layer of slaked lime (pushonki). Manure is disinfected by biothermal method.

Questions and tasks for control.

1. Describe the causative agent and the conditions that contribute to the occurrence of the disease.

2. What are the forms of clinical manifestation of hoof rot in sheep and their symptoms?

3. What are the methods of hoof rot treatment?

4. What studies are carried out in the laboratory diagnosis of hoof rot?

5 What preventive measures should be carried out in prosperous farms to prevent the occurrence of disease?

6. What health measures are carried out in a dysfunctional economy?

Botulism

(diagnosis, control measures)

Botulism (Botulismus) – acute food poisoning of animals, which is caused by the toxin of the botulinum bacillus and is manifested by paralysis of the pharynx, tongue and lower jaw and weakening of skeletal muscle tone. Human is extremely sensitive to botulinum toxin.

The causative agent of the disease – Clostridium botulinum – a large, sessile, anaerobic, nonencapsulated bacillus with rounded ends that stains Gram positive. In old cultures, it appears in the form of long threads and various polymorphic forms. It forms oval spores that are located on the edges of the bacillus, which gives it the characteristic appearance of a tennis racket (Fig. 1).

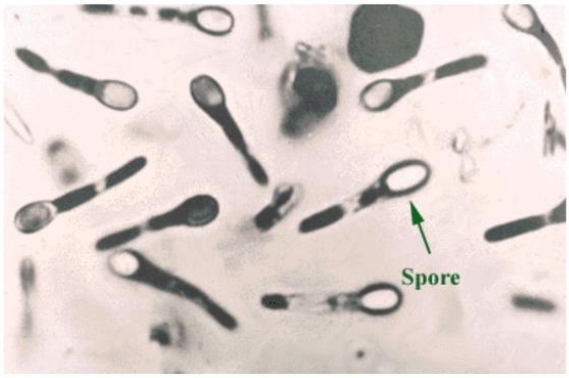


Fig. 1. Clostridium botulinum.

Spores are highly resistant, they can withstand boiling for 6 hours. They are destroyed at 105°C after only 2 hours, at 120°C - after 10 minutes, under the action of 10% solution of chloride (hydrochloric) acid - after 1 hour, 5% formalin solution - after 24 hours.

For the cultivation of Cl. botulinum use nutrient media for anaerobes. The growth of the bacillus on the Kitt-Tarozzi medium is accompanied by turbidity, gas formation with a characteristic smell of rancid oil, precipitation. In Petri dishes with Zeissler's blood glucose agar, after 1-2 days, small transparent dewdrop colonies with smooth or cut edges, a smooth or granular surface, surrounded by a zone of hemolysis are formed (Fig. 2).

The main biological property of the causative agent of botulism is the ability in conditions of anaerobiosis, high humidity and a neutral or slightly alkaline reaction to form extremely strong toxins in nutrient media, food products and feed. The optimal temperature for toxin formation is 25-38°C. Maximum toxin production is observed on day 5-9.

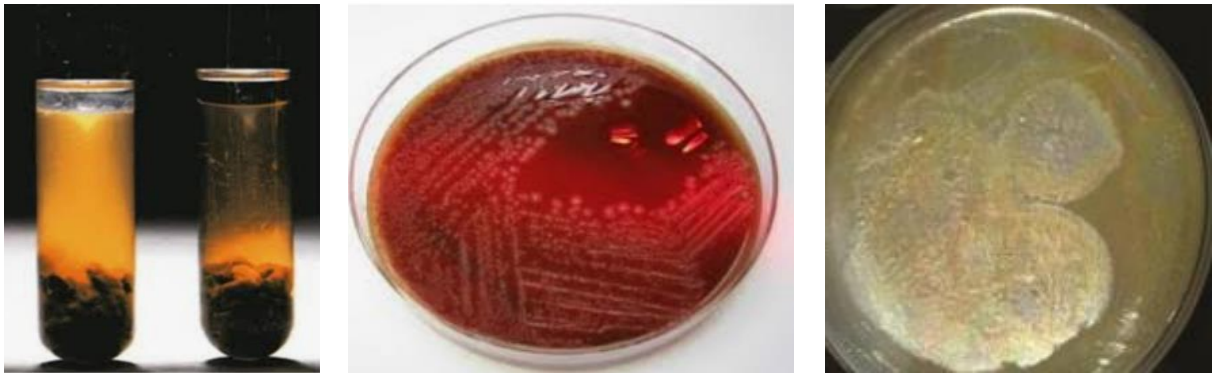


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Fig. 2. Cultivation of Clostridium botulinum:
1. on the Kitt-Tarozzi medium;
2. n Zeissler blood-glucose agar;
3. on yolk agar.

Depending on the antigenic features of the toxin, there are 7 types of botulism causative agents — A, B, C, D, E, F, V. The cultural and morphological properties of all types, as well as their pathophysiological impact on the animal body, are almost the same. The difference lies only in the sensitivity of different species of animals to different types of toxins. The disease in horses is most often caused by toxins of type B and D, rarely - types A and C; in cattle and sheep - C and D; mink and birds - type C. White mice and guinea pigs are the most sensitive among laboratory animals to botulinum toxin. Botulinum toxins are resistant to the action of hydrochloric acid, gastric juice and digestive enzymes. Botulinum toxins are neutralized only by typical antisera, they are destroyed by boiling in liquid media - after 15-20 minutes, in dense substrates (meat, fish) - after at least 2 hours. Grain feed containing botulinum toxin is neutralized with a 1% solution of caustic soda only after 3-6 hours. Botulinum spores at 100°C are destroyed in only 5 hours.

The diagnosis is made by a complex method based on the history of feeding spoiled feed, characteristic clinical signs of the disease, as well as the results of laboratory tests.

Epizootological data. Botulism is more common in horses and poultry, less often in cattle and fur animals. Significant resistance to botulinum toxin is characteristic of pigs, wild rodents, carnivores, dogs, and cats. In farm animals, the disease worsens after feeding contaminated botulinum spores of low-quality silage, musty, wet concentrated fodder, affected moldy son, spoiled vegetables, root crops. Fur animals get sick after eating low-quality meat, canned goods, rotten vegetables and root crops. A characteristic feature of botulinum toxin is its uneven, focal distribution in fodder, which explains the cases of poisoning of not all animals that ate the specified fodder. In the economy, the disease manifests itself sporadically or in the form of enzootics. The duration of an outbreak of the disease is 8-12 days. The

maximum discharge of sick animals is observed in the first 3 days, then the disease declines sharply. The lethality is very high, it can reach 95%.

Clinical signs and course of the disease. The incubation period lasts from 24 hours to 10-12 days. The course of the disease is acute or subacute. A characteristic sign of botulism is the so-called "bulbar paralysis syndrome", which is characterized by paralysis of the muscles of the pharynx, tongue, and lower jaw, as well as a sharp relaxation of skeletal muscle tone (Fig. 3). Botulism is accompanied by normal or even reduced body temperature, preservation of reflexes and consciousness, absence of significant changes in the blood. In horses, botulism can take a lightning course and end in sudden death without any previous signs of the disease.

Fig. 3. «Syndrome of bulbar paralysis».

During the acute course, the disease lasts 1.5-2 days. An early sign of the disease is a violation of the act of chewing, drooling, frequent yawning, mild colic. Later, there are signs of paralysis of the muscles of the pharynx, and soon - paresis and paralysis of the lower jaw and tongue. The craving for food persists, thirst is noted. However, the animal is unable to swallow food, chews it for a long time and keeps it in its mouth. Attempts to drink water end with it flowing back through the nasal passages. The tip of the tongue protrudes from the mouth, is often clamped between the teeth, later falls out of the oral cavity, swells, hangs freely when the paralyzed lower jaw hangs down. The pupils of the eyes are dilated, the upper eyelids are lowered. At the beginning of the disease, the conjunctiva is hyperemic, and then it becomes jaundiced. Due to the sharp relaxation of the skeletal muscles, the animal moves with great difficulty, and at the end of the disease it completely loses the ability to stand on its feet. Pulse and breathing are accelerated, blood pressure is reduced, peristalsis is weakened. However, all reflexes, including corneal, ear and anal, are preserved. The disease lasts 1-5 days. Lethality can reach 90-95%.

With a subacute course, the disease lasts from 2 to 7 days. The symptoms are the same as in the acute form, but the paralysis of the pharynx and tongue is more pronounced. In cattle, the course of the disease is almost the same as in horses. The disease lasts 3-6 days, lung damage is often observed. In cows and oxen, cases of spontaneous recovery occur more often than in other species of animals. In sheep and goats, signs of impaired coordination of movements prevail, in sheep - paralysis of the tongue, swallowing and chewing muscles, drooling, loss of voice and vision. The death of a sick animal occurs within a few hours or 2-3 days. In the bird, there is paresis of the neck muscles ("soft neck"), while the head touches the ground with its side or beak. The disease lasts from 10-12 hours to 3-4 days. Fur-bearing animals (minks) have paralysis of the tongue, pharynx, hind limbs, dilated eye slits and pupils, and involuntary urination. Lethality - 70-80%.

Pathological changes. Not typical. Autopsies reveal inflammation of the serous membranes of the peritoneum, hyperemia and hemorrhages in the lungs, hemorrhages in the kidneys and heart. The vessels of the meninges are full of blood, the skeletal muscles have a grayish color, are soft, and tear easily.

Laboratory diagnostics. Samples of spoiled feed (silage contaminated with soil, poor-quality bran and grain, mixed feed, meat and fish waste) are sent to the laboratory for research, which are taken from the places where they were taken to feed the animals before the disease. At the same time, the contents of the stomach and large intestines (100-200 g) and pieces of the liver of dead animals are collected in wide-mouthed jars made of dark glass, and blood and urine of sick animals are taken in test tubes. In the laboratory, pathological material is examined for the detection of botulinum toxin in feed and the body of animals, the type of toxin is determined, as well as the isolation of the culture of the pathogen and the determination of its toxigenic properties on white mice. The diagnosis of botulism is considered to be established in case of detection of botulinus toxin in the researched material, as well as when a culture with properties characteristic of the causative agent of botulism is isolated from the pathological material, followed by determination of its toxicity by a biological method.

Differential diagnosis. Provides exclusion in horses - rabies, infectious encephalomyelitis, stachybotriotoxicosis; in cattle - parturition paresis, acetonemia, Aujeski's disease; in poultry - Newcastle disease and Marek's disease. For this, an analysis of epizootological, clinical, patho-anatomical data, as well as laboratory research is carried out.

Treatment. In the event of an illness, feed suspected of having a toxin is immediately removed from the diet. Sick animals are provided with soft bedding, lying animals are turned over twice a day to prevent bedsores from developing. At the beginning of the disease, the use of antibotulinum serum, which is administered intravenously in large doses (for horses up to 600,000 IU), is effective. Fast-acting

laxatives (arecoline, pilocarpine, ezerine), warm enemas are also used. The stomach is washed with a 5% solution of soda, 10-15 liters of water with glucose are injected through the probe. In the late stages of the disease, intravenous administration of 10% sodium chloride solution in a dose of 100-150 ml 2 times a day, 50% glucose solution in a dose of 100 ml daily for 5-7 days is indicated. It is recommended to clean the rectum from feces, use heart remedies.

Immunity. Currently, only mink are vaccinated, since botulism rarely occurs in other species of animals. A concentrated alum vaccine is used for minks, as well as an associated vaccine against mink botulism and pasteurellosis. The latter is administered to minks from the age of 40 days in a dose of 1.5 ml once intramuscularly. Immunity occurs 2-3 weeks after vaccination and lasts at least 12 months against botulism and 4-5 months against pasteurellosis. Passive short-term immunity is created when using antitoxic serum.

Prevention and control measures. They should be aimed at providing animals with good quality fodder. It is necessary to adhere to the technology of correct harvesting and storage of fodder in accordance with agrotechnical requirements, to prevent contamination of grain fodder and silage with soil, feces, and rodent corpses. For feeding, you should use fodder that is of good quality in terms of smell, color and consistency. Feed of animal origin can be fed to animals only after thorough boiling for at least 2 hours. In the event of botulism, patients and animals suspected of having botulism are isolated and treated. Foods suspected of containing botulinum toxin are immediately excluded from the diet. The carcasses of the dead animals are destroyed together with the skins. Slaughter for meat of sick animals is prohibited.

Questions and tasks for control.

1. Describe the special properties of the causative agent and the conditions that contribute to the emergence of the disease?
2. What are the main clinical signs and course of the disease in botulism?.
3. The essence of laboratory diagnostics for botulism.
4. Features of botulism treatment.
5. For which animals is specific prevention relevant and why?
6. Prevention and control measures.

Tularemia

(діагностика, заходи боротьби)

Tularemia (Tularaemia) – natural focal disease of wild rodents, fur animals, agricultural and domestic animals, which is accompanied by hemorrhagic septicemia and paralysis in young animals, abortions in adult animals. People get tularemia.

The causative agent of the disease is Francisella tularensis from the genus Francisella Dorofee, a small immobile polymorphic gram-negative bacterium that often takes on a cocoon-like shape. It has a delicate capsule, does not form spores (Fig. 1).

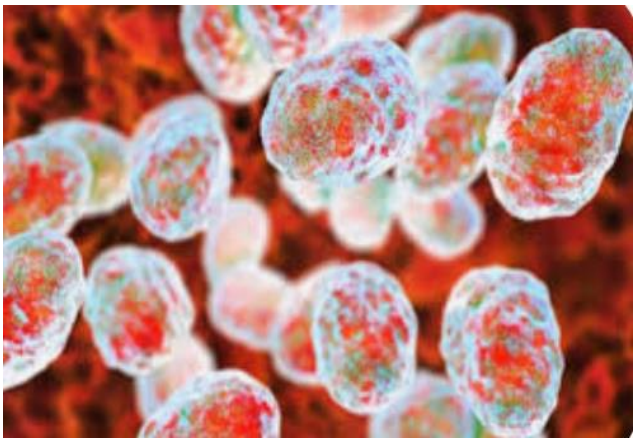

Fig. 1. Francisella tularensis.

Can be dyed with all aniline dyes, as well as according to Romanovsky-Giemsa with long exposure (1-1.5 hours). Francisella are cultivated only on elective nutrient media - McCoy, Francis medium, meat-peptone agar with cystine and blood, on egg-yolk medium (Fig. 2). Growth is detected 2-7 days after sowing pathological material, it is observed in the form of moist, shiny, fine-grained mucus droplets.

Fig. 2. Growth on McCoy's medium.

The causative agent of tularemia is pathogenic for guinea pigs and white mice. Chicken embryos die within 72-120 hours after infection. A characteristic feature of Francisella is the ability to stay in natural conditions for a long time. It is stored in water for 90 days, in piles of hay and straw - 3 months, grain - 133 days, earth - 75 days, rodent skins - 45 days, dried rodent corpses - up to 90 days, frozen meat - up to 93 days, frozen milk - up to 104 days, for the organism of pasture ticks - up to 240 days, for salted hides - up to 15 days. They are inactivated under the influence of high temperatures: at 100°C - instantly, at 60°C - after 5-10 minutes, in sunlight - after 20-30 minutes. Conventional disinfectants in accepted concentrations quickly neutralize the causative agent of tularemia.

The diagnosis is made by a complex method based on the analysis of epizootic and epidemiological data (presence of epizootics among mouse-like rodents, human diseases), clinical signs, patho-anatomical changes, as well as laboratory studies of pathological material from sick and dead animals. For the diagnosis of sheep, allergic studies are carried out.

Epizootological data. In natural conditions, the wild rodents most susceptible to tularemia are hares, rabbits, field mice, field rats, muskrats, beavers, gophers, which create constantly active natural foci of infection. Farm animals are not very sensitive to the causative agent of tularemia, with the exception of lambs and piglets. Sporadic cases of the disease have been described in sheep, pigs, horses, cows, as well as in dogs, chickens and wild birds. The source of the causative agent of the disease for domestic animals is sick, diseased and dead rodents, which contaminate pastures, watering holes, and fodder with francisella. Infection in natural habitats occurs as a result of grazing animals in infected areas or drinking from unhealthy water bodies. The causative agent of the disease can be transmitted by stinging insects and ticks (Fig. 3).

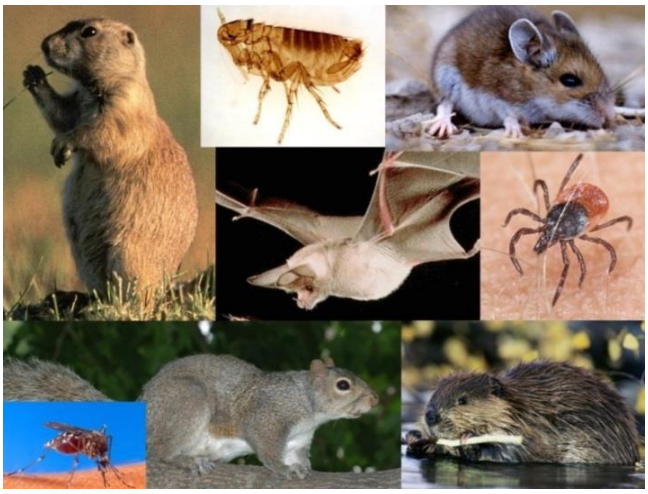

Fig. 3. Tularemia transmission vectors.

Outbreaks of the disease in domestic animals are observed mainly in the spring-summer-autumn seasons, which is associated with significant migratory

activity of rodents at this time and the availability of a transmission path for the transmission of the causative agent of the disease. Tularemia in domestic animals takes place in the form of sporadic cases or small enzootics and is determined by the number of heads found in the natural habitat of wild rodents. Spring epidemics among people are associated with harvesting the skins of industrial rodents, autumn and winter - with late threshing of bread and migration of infected rodents into human homes.

Clinical signs and course of the disease. In adult animals, the course of infection is asymptomatic, in young animals it is acute. At the beginning of the disease, lambs have fever (40.5-41°C), accelerated pulse and breathing, sick animals lag behind the flock, stand with their heads down. After 2-3 days, the temperature decreases, signs of damage to the central nervous system develop - convulsions, paresis and paralysis of the hind limbs. The mucous membranes are anemic, the pharyngeal, cervical and prescapular lymph nodes are enlarged. Sometimes tularemia is accompanied by symptoms of catarrhal conjunctivitis, rhinitis, profuse diarrhea and severe exhaustion. Sick lambs mostly die in the first 3-7 days of illness. In cattle, the course of the disease is latent, infection is detected only during serological tests. There is an increase in superficial lymph nodes, mastitis, paralysis of the hind limbs. In pigs, the disease manifests itself only at a young age. Among the weaned piglets, fever, depression, loss of appetite, and cough are found. In horses, the course of the disease is latent, abortions occur. In rabbits, the disease is accompanied by signs of rhinitis, the formation of abscesses in the subcutaneous lymph nodes. Severe exhaustion, lack of appetite, depression, vomiting, indigestion are observed in cats. In fur animals, the course of tularemia is malignant, the mortality rate can reach 50%.

Pathological changes. Not typical. The corpses of the animals are emaciated, abscesses are found in the enlarged lymph nodes. Small foci of necrosis and hemorrhages are observed in the liver, lungs, and spleen. Symptoms of septicemia are observed in almost all dead animals.

Laboratory diagnostics. During ex vivo diagnosis, bacteriological studies of the blood of sick animals, which are taken during the period of increased body temperature, and punctates from the affected lymph nodes are carried out. During autopsy, blood, pieces of internal organs and lymph nodes are taken. It should be noted that isolation of the culture of the causative agent of tularemia is associated with significant difficulties due to the high requirements of Francisella for nutrient media. The most sensitive and reliable method for detecting tularemia bacteria is a bioassay on white mice, which die after parenteral administration of infected pathological material in 3-4 days, or on guinea pigs, which die 4-6 days after infection. Serological studies involve conducting agglutination reaction with blood serum collected 8-13 days after the onset of the disease. Serological studies make it possible not only to diagnose the septic form of the infection, but also to establish the

latent course of tularemia. For allergic diagnosis of tularemia in sheep, tularin is used, which is injected intradermally into the subcaudal fold in a dose of 0.3 ml. The results of the reaction are recorded 24 and 48 hours after the administration of the drug. A positive allergic reaction is considered to be the formation of an inflammatory painful pasty swelling at the site of tularine injection and an increase in the thickness of the skin fold.

Differential diagnosis. It involves the exclusion of such diseases as paratuberculosis, brucellosis, anaplasmosis and coccidiosis. Epizootological, clinical and pathomorphological data, as well as the results of bacteriological and serological studies are used for this purpose.

Treatment. Means of specific therapy for tularemia have not been developed. For treatment, antibiotics of a wide spectrum of action are used, preferably after first identifying the sensitivity of the causative agent to them. Combined antibiotic therapy with sulfonamide drugs and symptomatic treatment are also carried out. If necessary, surgical removal of affected lymph nodes is carried out.

Immunity. After an illness, animals develop long-lasting immunity. Vaccines for the specific prevention of animal tularemia have not been proposed.

Prevention and control measures. They should be aimed primarily at the destruction of mouse-like rodents and ectoparasites (insects and ticks) in natural foci of tularemia infection. Timely and correct organization of threshing and preservation of grain, skirting of grain crops in areas free from rodents, placement of skirts as far as possible from dependent unnecessary straw and weeds, which should be burned in a timely manner, play a significant role in the prevention of the disease. Systematic monitoring of warehouses for storing grain and fodder for the presence of rodents, regular preventive deratization and disinsection is very important. When tularemia occurs in sheep farms, patients are isolated and treated, exhausted animals are slaughtered. The corpses of dead animals are burned or dumped in biothermal pits. Sick rabbits are slaughtered, the carcasses are destroyed along with the skins. Measures aimed at the destruction of mouse-like rodents and ectoparasites are being taken in the territory affected by tularemia. Disinsection and disinfection of livestock premises and the territory adjacent to them are carried out. Manure is disinfected by the biothermal method. Drinking water is disinfected with chlorinated lime.

Questions and tasks for control.

1. Characteristics of the causative agent and epizootological features of tularemia in animals of various species.
2. What are the features of the clinical manifestation of the disease depending on age?
3. What research methods are used in the laboratory diagnosis of tularemia?
4. What types of therapy are used in the treatment of animals with tularemia?
5. What is paid special attention to when carrying out preventive measures?

Rabies

(diagnosis, specific prevention, control measures)

Rabies – an acute viral disease of all warm-blooded animals, which is characterized by extremely high aggressiveness, damage to the central nervous system, attacks of nervous excitement and the development of paralysis. A person is fatally ill with rabies.

The causative agent of the disease is a neurotropic virus belonging to the family Rhabdoviridae, genus Lissavirus. It has a spherical shape (Fig. 1).

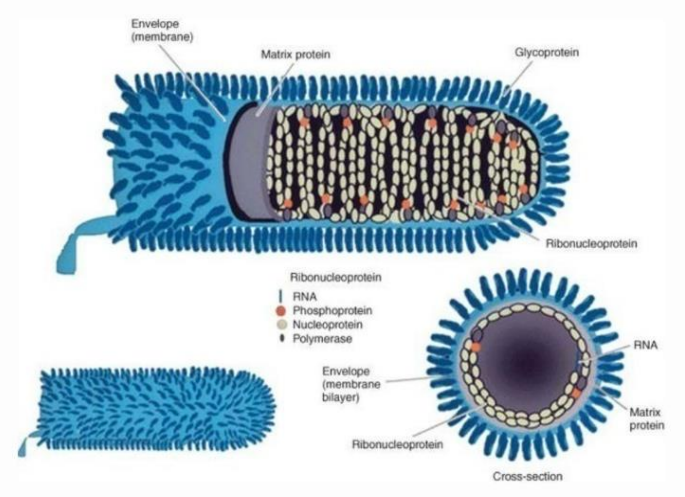

Fig. 1. The structure of the rabies virus.

There are "wild" (street) and "fixed" rabies viruses. Street rabies virus circulates in natural conditions and is characterized by high pathogenicity for humans and animals, forms specific Babesh-Negri bodies in brain cells. The fixed virus was obtained by L. Pasteur by repeated intracerebral passage of the street rabies virus through the body of rabbits, as a result of which it lost its virulence for humans and animals, as well as the ability to form Babesh-Negri bodies in the brain. The fixed virus is used as a starting material for the production of anti-rabies vaccines.

Of the laboratory animals, rabbits, white mice, and guinea pigs are sensitive to the rabies virus during intracerebral and parenteral infection. The rabies virus is resistant to low temperatures, remaining stable for several days at 0°C and 4°C, several years at –70°C and in a lyophilized state. In the saliva secreted by a sick animal, it is stored for up to 24 hours, in a rotting corpse - for 2-3 weeks. It can be stored in the surface layers of the soil for 2-3 months. It is instantly destroyed by boiling and at a temperature of 70°C, at 60°C – after 5-10 minutes, at 50°C – 1 hour, at 35°C – 20-22 days. It is inactivated by sunlight at 5-6°C after 5-7 days, at 16-18°C – 3-4 days, at 37°C – after 40 hours, ultraviolet radiation – after 5-10 minutes, upon drying – after 10-14 days. The virus is unstable to the action of disinfectants: 1-5% solutions of formalin kill it in 5 minutes, 5% solution of phenol - in 5-10 minutes, 1%

solution of potassium permanganate - 20 minutes, 3-5% solution of hydrochloric (hydrochloric) acid - 5 minutes, 10% iodine solution - 5 minutes.

The diagnosis is made by a complex method based on the analysis of epizootological data, clinical signs of the disease, pathological changes, with mandatory laboratory tests.

Epizootological data. According to the degree of susceptibility to the rabies virus, warm-blooded animals are conditionally divided into 4 groups: very high - foxes, rats, cotton rats, wolves, jackals, coyotes, voles; high - gophers, skunks, raccoons, cats, mice, mongooses, guinea pigs, rabbits, bats, as well as cattle; medium - dogs, sheep, goats, horses, primates (man); low - birds. Young animals are more sensitive than adults. All infected animals and humans get sick and die without exception. The rabies virus is transmitted mainly through saliva during bites or drooling (the virus is contained in the salivary glands of 54-90% of dogs that died from rabies). Due to the fact that the release of the virus from saliva begins 8-10 days before the appearance of clinical signs of the disease, it is necessary that animals that have bitten people be kept in isolation for 10 days under the supervision of a veterinarian. There are two types of rabies - urban (street) rabies, when the disease is observed in cities and villages, and the source of the pathogen is sick stray dogs and cats, and forest rabies, when the infection spreads in a natural environment, often in a large forest area, and the source of the pathogen is diseases are wild carnivorous predators (foxes, wolves, lynxes, badgers, martens, ferrets, foxes, raccoon dogs) in a sick state or latently infected. Since 1972, forest rabies has prevailed in Ukraine, and infected red foxes have become the main source of the pathogen. It was established that there is a direct correlative relationship between the size of the population, the density of foxes and the intensity of the spread of forest rabies. The special role of foxes in the maintenance and spread of this disease is determined by the fairly significant density of their population, which is associated with the rapid reproduction of foxes, the destruction by humans of their natural enemies (wolves, jackals), high sensitivity to the rabies virus, close contacts and the aggressiveness of young during the hound and distribution, with frequent cases (40-80%) of chronic and latent course of infection, which ensures long-term persistence of the virus in natural centers. The dominance in the epizootic chain of wild animals and the natural focal nature of forest rabies have led to significant changes in the traditional course of rabies among animals. In the case of street rabies, the epizootic process is ensured by a short cycle of virus reproduction in the body of a sick dog, an acute course of the disease, a characteristic clinical picture, rapid transmission of the causative agent of the disease to the next susceptible animal (usually also a dog) and the death of the sick dog in a short period of time. Sometimes a person bitten by a dog or a domestic animal is accidentally included in the epizootic chain, but this is a dead-end option that is unable to ensure the transmission of the pathogen through bites and further

continuation of enzootic disease. In case of forest rabies, the epizootic process occurs according to the patterns of natural focal infections, where wild carnivorous animals (foxes, wolves, badgers, etc.) become the source of the causative agent of the disease. The disease is characterized by a chronic or latent course, without clearly expressed clinical signs, long-term persistence of the virus in the body of sick foxes, which ensures the constant circulation of the virus in the natural environment in large areas of forest tracts. Dogs with forest rabies cease to play the role of the main source of the causative agent of infection and are included in the epizootic chain by chance, in case of bites by forest animals.

Clinical signs and course of the disease. In dogs, the incubation period lasts from several days to several months (8 weeks on average), which depends on the age, individual resistance of the animal, the distance from the bite site to the head, the size and depth of the wound, the amount and virulence of the virus. The course of the disease is always acute. The clinical picture is characterized by increased excitability and significant aggressiveness (Fig. 2), which is replaced by depression, the development of paralysis, and drooling.

Fig. 2. Exuberant form in dog.

There are several forms of clinical manifestation of rabies: rampant, paralytic, atypical and African form - ulufato. In the violent form of rabies, three stages of the development of the disease are clearly defined: prodromal, or melancholic, stage of excitement, or manic, and paralytic, or depressive. The prodromal stage lasts 1.5-2 days, is characterized by a change in the dog's usual behavior and a gradual increase in clinical signs of the disease. At the beginning of the disease, the dog becomes inattentive to the owner, does not immediately respond to a call, has difficulty getting up from its place, is often very gentle, barks for no reason, clicks its teeth. With the development of the disease, he tries to hide in dark corners, swallows foreign objects, pieces of wood, rags. In some cases, it tears the bite site with its teeth. At the end of the second day, a disorder of the act of swallowing appears, the dog does not touch

the feed, does not drink water. During this period, sick dogs are often taken to the hospital with a request to remove the bone from the throat, which allegedly choked the animal. Over time, salivation intensifies, there is a desire to bite a person or an animal. The stage of excitement lasts 3-4 days. It is characterized by sharply expressed attacks of violence, the desire of the dog to run away from home, aggressiveness towards other animals, especially dogs, attempts to bite them mercilessly. Drooling intensifies, strabismus develops, water phobia. Gradually, the stage of excitement passes into the paralytic stage, which lasts 2-4 days. This stage is characterized by the rapid development of paralysis of the muscles of the hind limbs, tail, trunk, rectum, and bladder. The animal is very exhausted, the coat is disheveled, the eyes are sunken deep, the lower jaw hangs down, the tongue sticks out, a lot of saliva flows from the mouth. As a result of paresis of the hind limbs, the gait becomes shaky, then the animal cannot rise at all. Death occurs 6-8 days after the onset of the disease. With a silent form of rabies, excitement is weakly expressed or absent at all. The silent form is observed in the case of infection of dogs from foxes, characterized by depression, rapid development of paralysis, strong salivation, difficulty swallowing. Death occurs on the 2-4th day of illness. The atypical form is characterized by a subacute course. Exhaustion, muscle atrophy, gastroenteritis, and late paralysis are observed. Dogs are not aggressive. An atypical form is rare. Ulufato is a special form of African rabies, in which the course of the disease is much milder than rabies in temperate countries, and is characterized by paralysis of certain muscles. Recovery of a sick animal is possible. In cats, the disease takes place in a violent form with high aggressiveness, which poses a significant danger to people (Fig. 3).

Cats die 2-5 days after paralysis of the back of the body. A silent form of rabies prevails in cattle. With this form of the disease, a lot of saliva is released from the oral cavity, itching appears in the bite area, paresis and paralysis of the limbs, convulsive contractions of certain muscle groups are detected. There is frequent hoarse roaring, difficulty swallowing, frequent urination. The death of livestock occurs on the 3-6th day of the disease.

In exuberant form, reflex excitability increases sharply, convulsive contraction of individual muscles is noted. The eyes are staring, the animal is restless, grinds its teeth, kicks its legs and horns, roars hoarsely, often shows aggression towards dogs, less often towards other animals and people.

Fig. 3. Exuberant form in cat.

Attacks of rampage are replaced by a period of rest and are repeated after different intervals of time. There is no appetite and chewing gum, a large amount of saliva is secreted from the oral cavity. Often a sign of rabies in cattle is itching and scratching of the skin at the site of the bite. Death occurs suddenly, during an attack of violence or with symptoms of general weakness, bulbar paralysis and a rapid decrease in body temperature. In sheep, the disease lasts 3-5 days, in goats - 8 days, always ending in paralysis and death. In sick animals, there is aggressiveness, hoarse, deaf, prolonged meowing, drooling, grinding of teeth, difficulty swallowing. Death occurs on the 3-6th day of illness. Rabies is rarely observed in horses. In a violent form, it manifests itself in anxiety, sometimes - aggressiveness, a desire to escape. A lot of saliva flows from the mouth, the lips are convulsively compressed, the pupils are dilated. Sexual arousal intensifies, seizures of chewing and respiratory muscles are possible. A common sign of rabies in horses is itching at the site of the bite. A sick horse attacks animals and people, tries to bite or hit them, breaks from the saddle, runs into obstacles, the neighing becomes hoarse. Attacks of violence are replaced by a period of depression, the gait becomes shaky, swallowing becomes difficult, drunk water pours back through the nostrils. Death occurs on the 3-5th day of illness. With a quiet form, the horse is depressed, rests its head against the wall or the feeder, and a lot of saliva is secreted from the oral cavity. Paralysis of the swallowing muscles develops, paralysis of the back of the body progresses, and quick death occurs. In pigs, the disease is accompanied by restlessness, grunting, and excessive salivation. Sometimes itching appears at the site of the bite, death occurs 2-4 days after the onset of paralysis. In wild animals, the most characteristic sign of rabies is the absence of fear of people, as well as aggressiveness. There is no hydrophobia. Before death, they develop paresis and paralysis of the limbs.

Pathological changes. In case of rabies, they are not specific. Animal corpses are emaciated, the skin may have traces of bites, unhealed wounds. An autopsy

revealed hemorrhages, hyperemia of the mucous membranes of the oral cavity and pharynx, and swelling of the tongue. The stomach is empty, sometimes contains foreign objects. The mucous membrane of the alimentary canal is swollen, with hemorrhages of various sizes and shapes. Meninges are also swollen and hyperemic. The blood is dark red, does not coagulate. During histological examination of the brain and spinal cord, cells of disseminated non-purulent encephalomyelitis are revealed. Of great diagnostic importance is the presence of specific acidophilic inclusions in the cytoplasm of neurons - Babesh-Negri bodies with basophilic granules, which in 65-85% of cases make it possible to detect rabies.

Laboratory diagnostics. Laboratory tests for rabies are carried out out of turn, and the results are immediately reported to the veterinarian who sent the pathological material. Autopsy of the corpse, removal of the brain, collection of samples and their research are carried out with strict observance of personal prevention measures - protective clothing is worn, hands are protected with two pairs of gloves (surgical and anatomical), eyes are closed with protective glasses, nose and mouth are covered with a 6-layer gauze bandage. Fresh corpses of small animals or the head of a dead or killed large animal are sent to the laboratory for rabies research. The brain (fresh or preserved in a 30-50% glycerol solution) is sent for the bioassay. The pathological material should be carefully packed in a hermetic container with a polished cork filled with paraffin, and the animal carcass should be placed in any hermetic, waterproof container. Laboratory diagnostics includes microscopic studies of the brain of animals with the aim of detecting Babesh-Negri inclusion bodies, serological tests for the detection of specific rabies antigen, as well as carrying out a biological test on white mice and rabbits. For microscopic detection of Babesh-Negri inclusion bodies, smears, smears-imprints and histological sections are prepared from the ammonium horn, cerebral cortex, cerebellum (in violent form of rabies), as well as from medulla oblongata and spinal cord (in paralytic form of rabies). In histological preparations, inclusion bodies have a rounded, oval or slightly elongated shape (Fig. 4).

Detection of Babesh-Negri cytoplasmic inclusion bodies in the pathological material is a reliable indicator of rabies, and their absence does not exclude this disease. It should be borne in mind that the Babesh-Negri corpuscle is never found in the nerve cells of foxes and corsacs suffering from rabies, as well as in the brains of animals bitten by them.

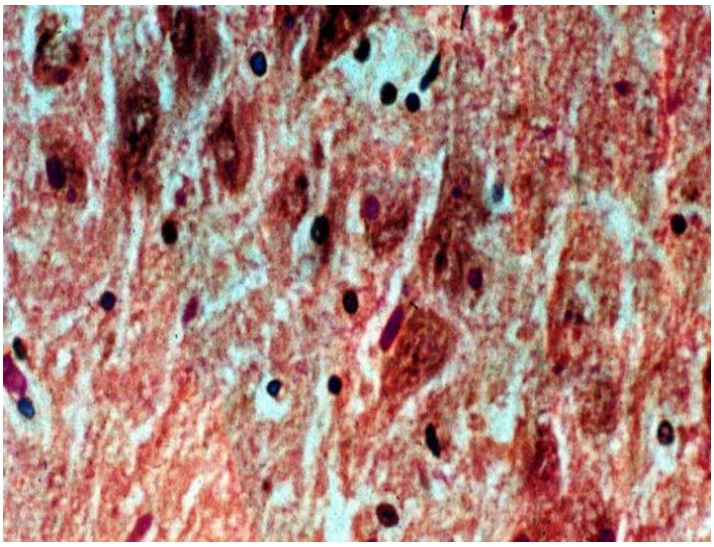

Fig. 4. Babesh-Negri bodies.

For serological studies by immunodiffusion reaction, unpreserved brains of animals that died from street rabies, or the brains of white mice infected for bioassays are used. Setting the reaction of diffuse precipitation in agar gel makes it possible to establish a diagnosis of rabies within one day, even when examining decaying pathological material. Rabies antigen in the brain of infected animals can also be detected using the immunofluorescence method, which is used to quickly make a preliminary diagnosis (Fig. 5).

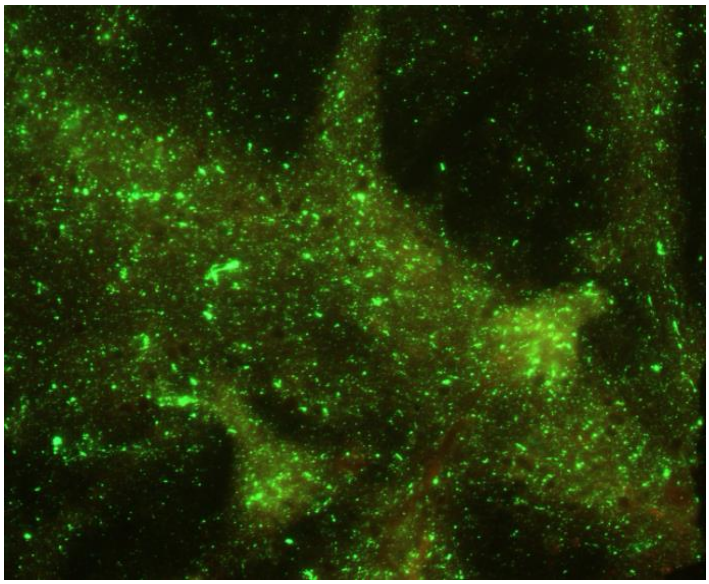

Fig. 5. Immunofluorescence of brain slices.

The biological test is carried out on 6-10 white mice weighing 8-10 g and on 4 rabbits weighing 1.5 kg, which are infected intracerebrately and subcutaneously with the supernatant liquid of 10% brain suspension. In the case of a positive result of the bioassay, mice fall ill and die 7-15 days after infection, rabbits - after 16-21 days. The brain of dead or killed experimental animals is examined for the presence of Babesh-

Negri bodies by immunofluorescence or diffuse precipitation. In doubtful cases, a neutralization reaction is performed on mice.

Differential diagnosis. Presupposes the need to rule out Aujeski's disease, acute meningoencephalitis, and canine distemper. With Aujeski's disease, scratching is detected, there is no aggressiveness, perversions in appetite, paralysis of the lower jaw. Brain cells lack Babesh-Negri bodies. Acute meningoencephalitis is characterized by sporadicity, absence of bites, as well as specific inclusion bodies. Canine distemper is characterized by high contagiousness, a long course of the disease, the presence of conjunctivitis and rhinitis. There is no aggressiveness, there is no paralysis of the muscles of the lower jaw.

Treatment. Not conducted. Sick and suspected animals with rabies are immediately destroyed, except in cases where people or animals have been bitten. In this case, animals suspected of rabies are isolated for special observation for 10 days. The corpses of dead or killed animals are burned or disposed of.

Immunity. For the active immunization of animals against rabies with a prophylactic purpose, several vaccines have been proposed (Fig. 6). Dry rabies phenol vaccine is intended for preventive vaccinations against rabies in dogs and cats, as well as forced vaccinations of high-value farm animals. For prophylactic vaccination in unfavorable and rabies-threatening areas, the vaccine is administered subcutaneously to dogs in a dose of 2 ml, to cats - 1 ml. Immunity occurs 14-30 days after vaccination and lasts more than 6 months, after revaccination - up to 2 years.

Liquid adjuvant-deposited live anti-rabies vaccine AzVI is also used for preventive and forced vaccinations of various types of farm animals, primarily cattle. It is administered subcutaneously once in doses from 2 to 10 ml. Immunity in animals occurs 15-25 days after vaccination and lasts for at least one year. An anti-rabies vaccine has also been developed for oral immunization of wild carnivores.

Prevention and control measures. Includes measures to prevent rabies and measures to eliminate foci of rabies disease in animals.

Rabies prevention measures. Preventive measures include catching and shooting stray dogs and cats; registration and regulation of rules for keeping dogs, cats and carnivores in settlements; protection of domestic animals from the attack of predators on pastures and forest tracts; annual preventive vaccination of dogs, and in necessary cases, cats, against rabies. Sale, purchase, export of dogs, cats, as well as wild animals to other areas is allowed only with a veterinary certificate of vaccination against rabies. The bodies of forestry, nature protection, hunting and nature reserves are obliged to systematically survey the lands and habitats of wild animals. In case of discovery of carcasses of wild carnivores or animals with unusual behavior (lack of fear, unprovoked attack on animals or people), it is necessary to notify the employees of the state veterinary medicine service, and send pathological material to the veterinary laboratory for rabies examination. Every year in November-January,

regulate the size of the fox population, the density of which during the breeding season should not exceed 0.5-1 heads per 1000 hectares of land. Dogs, cats and other animals that have bitten people or animals should be immediately taken to the nearest state veterinary medicine facility for examination and quarantine for 10 days. In some cases, with the permission of the state veterinary medicine institution, an animal that has bitten people or animals can be left under the owner's receipt, provided that it is kept on a leash or in an isolated room for 10 days and periodically supervised by a veterinary specialist.

Measures to eliminate rabies foci of animal disease. In the case of a diagnosis of rabies, the settlement, forest or field massifs, pasture, tract are declared unfavorable for this disease and quarantine restrictions are introduced. The boundaries of the territory unfavorable for rabies, as well as the dangerous zone, are determined, taking into account the source of the causative agent of the infection and the territory to which the migration of wild animals is possible. It is prohibited to hold exhibitions, take out dogs, and take dogs, cats, and wild animals out of the disadvantaged area. Commercial and licensed shooting of wild animals, their capture and removal are prohibited in unfavorable hunting grounds and in the threatened zone. When wild animals become ill with rabies, their shooting is organized regardless of the hunting period. Measures are being taken to reduce the number of foxes and raccoon dogs, oral immunization of carnivorous animals with an atyrabic vaccine is carried out.

Domestic animals and fur animals suspected of being infected with rabies, without clinical signs of the disease, are allowed to be slaughtered and the products obtained from them to be used on a general basis. Milk from clinically healthy animals from a dysfunctional herd (farm) is allowed to be consumed by humans or for animal feed after pasteurization for 30 minutes at 80-85°C or boiling for 5 minutes. Manure from sick and suspected animals with rabies, as well as litter contaminated with the secretions of these animals, after pre-moistening with disinfectant solutions, are burned. Manure is mixed in a manure collector with dry chlorinated lime, which contains at least 25% active chlorine, at the rate of 0.5 kg of chlorinated lime per 20 liters of manure. The location of a sick or suspected animal with rabies, equipment, clothes and other things contaminated with saliva and other secretions of sick animals are disinfected. For disinfection, a 4% formaldehyde solution, a 10% hot (70°C) caustic soda solution, a chlorinated lime solution with a 5% active chlorine content are used. Dog cages are disinfected by burning with a blowtorch. Clothes contaminated with the saliva of a sick animal are boiled. Quarantine restrictions are removed from the rabies-prone point 2 months after the last case of rabies in animals and the completion of all prescribed measures.

Questions and tasks for control.

1. Name the source and reservoir of the causative agent of rabies. What is the role of wild animals in supporting natural foci of the disease?

2. Name the stages of development of the infectious process, the course and forms of clinical manifestation of rabies in animals of different species.

3. How is rabies diagnosed and from what diseases must it be differentiated?

4. How do you deal with an animal suspected of having rabies?

5. What is the regime of preventive and forced vaccination of animals?

6. List the main measures for the prevention and elimination of rabies in the household.

7. How to prevent rabies in humans?

Aujeski's disease

(diagnosis, control measures)

Aujeski's disease (Morbus Aujeszky) – an acute contagious disease of all types of domestic animals, wild and synanthropic carnivores, fur-bearing animals and rodents, which is characterized by damage to the central nervous system (excitement, convulsions, paralysis), unbearable itching and scratching (with the exception of pigs, minks, sables).

The causative agent of the disease – DNA-genomic virus from the Herpesviridae family, spherical in shape, covered with an outer lipoprotein shell (Fig. 1). Causes the formation of virus-neutralizing, precipitating and complement-binding antibodies in the body. Pantropic, found in the upper respiratory tract, lungs, brain, spleen, liver, kidneys, tonsils, lymph nodes, muscles and skin of sick and dead animals. In pigs, on the 1st-6th day of the disease, it is detected in the nasal mucus, in the blood - only at the beginning of the disease, in the tonsils for 120 days. Persistence of the virus in pigs is observed for 180-360 days, in mice and gray rats - 130-140 days.

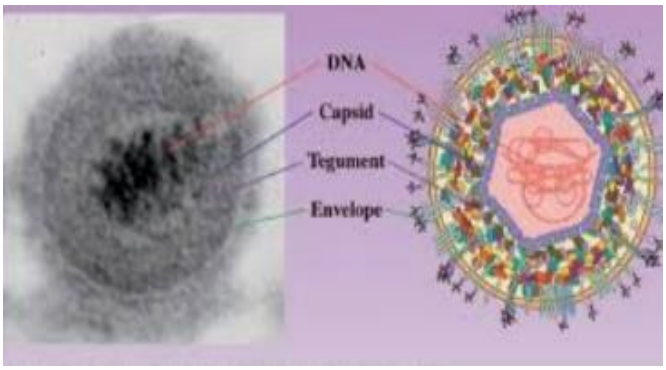

Fig. 1. The structure of the virus.

Cultivated in primary cultures of chicken fibroblast cells, kidneys or thyroid gland of piglets, testicles of calves, in kidneys of pig and cow embryos. It reproduces in the nucleus, causes a characteristic cytopathogenic effect, causing the rounding of cells, the formation of intranuclear eosinophilic inclusion bodies, symplasts and giant forms with 2-10 nuclei. Among laboratory animals, rabbits, young cats, and puppies are susceptible to the virus. It is stable in the external environment, remaining viable in a dried and frozen state for one year, in a lyophilized state - for more than 2 years, at minus 40°C - for 5-10 years. It’s stored in manure, water, feed for up to 30-46 days in winter, 10-12 days in summer, on the surface of the earth and grass in spring and summer - from 12 to 72 hours, in urine in summer - 3 weeks, in winter - 8-15 weeks, in dried corpses of rodents - up to 1 year. Direct sunlight destroys the virus after 6 hours, ultraviolet radiation - after 1 minute, boiling - after 5-10 minutes. Resistant to

creolin and phenol. With biothermal disinfection, manure is inactivated after 5 days in summer and 12 days in winter.

The diagnosis is made by a complex method based on the analysis of epizootological data, clinical signs of the disease, pathological changes, with laboratory tests.

Epizootological data. In natural conditions, pigs, dogs, cats, wild carnivores, and rodents are most susceptible to Aujeski's disease; cattle and fur animals get sick less often, horses, donkeys, mules very rarely. Birds, primates and cold-blooded animals are not susceptible to the Aujeski disease virus. Compared to adults, young animals are more seriously ill and have a higher mortality rate. Cases of human disease are described. The source of the causative agent of infection is sick animals and virus carriers, which release the virus into the external environment with nasal mucus, saliva, urine, conjunctival secretions, vaginal secretions, as well as with semen, feces, and milk. In prosperous farms, the primary occurrence of infection is most often associated with the importation of virus-carrying pigs for stocking. The role of other sources of the virus, in particular virus-carrying mice and rats, in the occurrence of the disease is much smaller. The virus enters the body of animals through food, through the respiratory tract, as well as through damaged skin. Aujeski's disease is characterized by easy transmission of the virus from virus-carrying pigs to healthy animals, especially when they are kept together, during mating, as well as from the mother of the fetus. Piglets are often infected through the milk of a sick sow. Cattle, sheep and goats are infected by contact with sick pigs. The factors of transmission of the causative agent most often become fodder, water, bedding, inventory, contaminated with secretions of sick and sick pigs, virus-carrying pigs. Mechanical carriers of the virus can be various parasites (lice, fleas), as well as birds. Dogs and cats can get sick themselves and spread the virus in other households and farms. Pigs and carnivores can become infected by eating the corpses of infected rodents (mice, rats), as well as undamaged feed of animal origin. Aujeski's disease is characterized by a lack of seasonality and a tendency to stationary. In small pig farms, the infection first manifests itself in the form of enzootic disease, with coverage of 60 to 100% of the herd during the first 8-10 days. At the same time or before enzootic pigs, rodents, dogs, cats can get sick and die. Enzootic disease can last for 1-1.5 months, then subsides. At the same time, up to 93% of pigs remain virus carriers for a long time and maintain a latent infection in the herd. In specialized feedlots with periodic introduction of new non-immune animals, Aujeski's disease can become a long-term stationary enzootic. Aujeski's disease in pigs can be complicated by secondary infections (hemorrhagic septicemia, salmonellosis). Among fur-bearing animals, Aujeski's enzootic diseases are mainly associated with the feeding of non-sterilized slaughterhouse waste, pass very quickly (5-7 days), and are accompanied by high mortality. In cattle, Aujeski's disease occurs rarely, in the form of sporadic cases.

Clinical signs and course of the disease. The incubation period for pigs is 5-10 days, for cattle - 6-15 days, for dogs - 2-4 days. The course of the disease is acute. In pigs, the clinical picture of the disease depends on the age of the animals. The most seriously ill are 1-10-day-old suckling piglets, which are already born infected or become infected through the milk of an infected sow. Such piglets have no characteristic clinical signs of the disease. Only general weakness, depression, sometimes individual convulsions, unsteadiness of gait are observed. Piglets do not urinate on the sow, they lie all the time, almost all die within the first day. In suckling piglets 10-20 days old, in piglets just weaned from the sow, as well as in 3-4 month-old piglets, the disease proceeds in a classic septic form with damage to the central nervous system. Sick piglets first have a fever (up to 41-42°C), depression, refusal to feed, unsteady gait. Over time, the body temperature decreases, signs of damage to the central nervous system appear: sudden epileptic seizures, convulsions, spasms of certain muscle groups, frequent hand chewing, walking in circles, paresis of limbs. Weakness of the back, bending of the back, and in the lying position – swimming movements of the front and hind limbs are characteristic. Salivation, signs of rhinitis and conjunctivitis are also observed. Lasts 2-3 days, mortality reaches 70-90%. Sometimes Aujeski's disease in young piglets occurs in a stupor-like form. At the same time, sick piglets stand, resting their heads against the wall of the machine, the floor or the feeder, showing complete indifference to everything. A significant amount of saliva flows from the oral cavity, mucous fluid from the nose. Loss of voice, disorder of cardiac activity, acceleration of pulse and breathing, frequent inflammation and edema of the lungs are observed. In piglets older than 3 months and adult pigs, the disease is benign, mainly with damage to the respiratory organs. The infection spreads quickly among non-immune livestock, manifested by fever, weakness, lack of appetite, sneezing, coughing. Almost all pigs recover after 3-7 days. The fatality rate does not exceed 3-5%.

In cattle, a characteristic clinical sign of Aujeski's disease is unbearable itching in the region of the mirror, lips, head, cheeks, eyes, less often - the neck, shoulders, hind limbs, and udder. The animal scratches and gnaws itchy areas until it bleeds, has a frightened look, is very excited, meows, shakes its head, breaks free from the tether, injures itself, but never shows aggression. Anxiety attacks alternate with periods of numbness and drowsiness, spasms of masticatory and neck muscles. A short-term increase in body temperature up to 40.0-40.9°C, salivation, thirst, increased sweating, frequent urination is observed. Chewing, rumen movement and milk secretion stop. The death of the animal occurs in 2-3 days. In sheep and goats, the course of the disease is the same as in cattle, but excitement is not observed. The young are seriously ill and always die. In horses, Aujeski's disease is rarely observed, it occurs as a result of contact with sick pigs. In the case of a benign course, short-term fever, lethargy, depression, refusal to feed, bending of the back and lower back are noted.

After 2-4 days, the animal recovers. In the case of a malignant course, symptoms of encephalitis, severe itching, scratching of the skin in various parts of the body, and salivation are observed. Death occurs in 1-2 days. Dogs show severe itching, anxiety, timidity, mournful hoarse barking, sometimes excitement, as in rabies, but there is no fear of water and aggressiveness towards humans (Fig. 2). Paralysis of the pharynx, frequent chewing movements with release of a large amount of foamy saliva from the oral cavity are observed. Body temperature is normal. Death occurs within the first 2 days.

Fig. 2. Itch.

Itching is rare in cats. Sick animals are very excited, react sharply to external stimuli, meow piteously, saliva flows from the mouth. There is paralysis of the pharynx, periodic convulsive contractions of the head and neck muscles, and sometimes the lungs are affected. Death occurs within 24-36 hours. In fur animals, Aujeski's disease occurs in a nervous or pulmonary form. There is a strong uneven dilation of the pupils, scratching of the skin almost to the point of blood, as well as excitement, mane movements, muscle spasms. When the lungs are affected, animals breathe hard, wheezing, cough, spread their paws wide and stretch their necks forward strongly. Death occurs within 2-3 days.

Pathological changes. When examining the corpses of animals, except for pigs, minks and sables, which died from Aujeski's disease, scratching, baldness, skin injuries in the head area or in other places are revealed. Pathological changes are most often observed in the brain: hyperemia of membranes, hemorrhages, softening of the brain substance, accumulation of serous effusion in the ventricles. Swelling of the lungs, an increase in bronchial lymph nodes is revealed. In piglets, hemorrhages occur under the capsule of the kidneys, as well as in the mucous membrane of the epiglottis. Sometimes, small centers of necrosis are found in the liver. During histological examination of the brain and spinal cord, a pattern of acute non-purulent meningoencephalomyelitis is determined. In carnivorous animals, the stomach is clogged with wool, the mucous membrane of the stomach is hemorrhagically inflamed (Fig. 3).

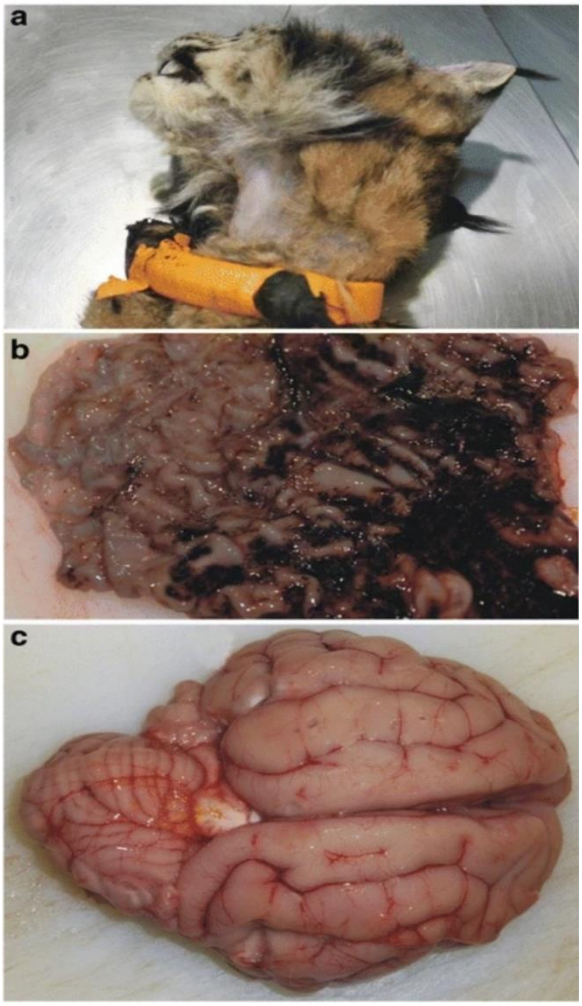

Fig. 3. Pathological anatomical changes.
a) Area of alopecia on the ventral part of the skin of the neck.
b) Hemorrhagic inflammation of the stomach.
c) Hyperemia of meninges.

Laboratory diagnostics. A fresh carcass of an animal or pathological material (head, pieces of the brain or medulla, pharyngeal and bronchial lymph nodes, pieces of tonsils, mucous membranes of the nose, lungs, liver, spleen, kidneys) from dead or slaughtered animals in an agony state are sent to the laboratory for research. Carcasses of small animals are sent whole. Laboratory studies include the detection of the virus in pathological material, its isolation and identification in a sensitive cell culture using a neutralization reaction, conducting a bioassay on rabbits by subcutaneous or intramuscular infection. According to the presence of the virus in the pathological material, the characteristic signs of the disease appear in infected rabbits for 3-5 days - excitement, itching, scratching, paralysis and death. For retrospective diagnosis, studies of paired blood sera are carried out by the reaction of neutralization in cell culture and on rabbits, as well as the reaction of diffuse precipitation, the reaction of binding of complement, the reaction of indirect hemagglutination and the EZISA method.

Differential diagnosis. Presupposes the need to distinguish Aujeski's disease in all animal species from rabies, and in pigs also from plague, Teschen's disease, salmonellosis, influenza, listeriosis, pasteurellosis, A- and D-vitaminoses and sodium chloride poisoning. Rabies is always associated with bites, characterized by great aggressiveness of sick animals towards other animals and people. Positive results of a bioassay on mice, as well as histological studies on the detection of Babesh-Negri bodies. When excluding the plague, the high mortality rate among pigs of different ages, the hemorrhagic diathesis characteristic of this disease, specific pathological changes in the intestines, "marbling" of the lymph nodes, splenic infarcts, and positive bioassays on non-immune piglets are taken into account. Teshen's disease is not accompanied by septic phenomena, the death of rodents, dogs and cats is not observed. Rabbits are not susceptible to Teschen disease virus. Listeriosis, salmonellosis and pasteurellosis are diagnosed by bacteriological methods. Avitaminosis and food poisoning are not accompanied by fever, are characterized by mass, are determined by the results of laboratory studies of food and pathological material. It should be borne in mind the possibility of complications of Aujeski's disease with salmonellosis and pasteurellosis, which is established by bacteriological studies.

Treatment. At the beginning of the disease, a specific gamma globulin is used. To young animals, the drug is administered subcutaneously, to adult animals - intramuscularly in doses: piglets up to 15 days old - 8-10 ml, from 15 days old to one month old - 8-12 ml, from 1 to 2 months old - 12-18 ml, piglets 2 months old and older - 24-30 ml, adult pigs - 40-50 ml; for calves up to 15 days old - 20-25 ml, from 15 days old to 2 months old - 30-45 ml, from 2 months old and older - 50-75 ml, for adult cattle - 120-180 ml. Specific gamma globulin is widely used in fur farms. In order to prevent secondary infections, antibiotics and sulfonamide drugs, vitamins A and D are used.

Immunity. Animals infected with Aujeski's disease develop persistent immunity that lasts 1-3 years. Suckling piglets acquire colostral immunity from immune sows, which, however, does not provide them with protection against infection. A liquid cultural inactivated vaccine against Aujesky disease of pigs, sheep, and fur animals is proposed for active immunization of animals in farms of Ukraine that are unfavorable and threatened by Aujesky's disease. Only clinically healthy animals are vaccinated twice, with an interval of 7-8 days in a dose of 1 to 5 ml, depending on the species and age of the animals. Immunity occurs after 7 days and lasts for 9 months in pigs, 6 months in sheep and fur animals.

Prevention and control measures. They should be aimed at protecting prosperous farms from Aujeski's disease, eliminating the disease in disadvantaged areas, improving the health of animals, and eradicating this disease.

Measures to prevent Aujeski's disease. In order to prevent the occurrence of the disease in safe farms, the stocking of the herd is carried out with animals only from safe farms with regard to Aujeski disease, the imported animals are kept during a 30-day quarantine under strict veterinary supervision.

In the case of purchasing breeding pigs for reproduction abroad, it is necessary to make sure that the documents stipulated by the interstate conditions contain information about the absence of vaccinations against Aujeski's disease in the original herd, the absence of clinical manifestations of Aujeski's disease among the herd during the 12 months before shipment, about complete isolation keeping pigs in the supplier farm for 30 days before sending to the quarantine station and negative results of diagnostic testing for the presence of Aujeski's disease virus. At the quarantine station, imported pigs should once again be subjected to laboratory diagnostic testing to rule out their infection with Aujesky's disease virus. In livestock premises, on the territory of farms, pastures, as well as in feed mills, warehouses, mills, feed kitchens, it is necessary to systematically fight rodents, carry out preventive disinfection and disinsection, and prevent the presence of stray dogs and cats. Undigested meat products obtained from forcibly slaughtered animals, as well as waste from slaughterhouses, canteens and kitchens, are not allowed to be fed raw to pigs and carnivores.

Measures in case of suspicion of Aujeski's disease. When animals show clinical signs typical of Aujeski's disease (convulsions, circling movements, itching), as well as when rodents die in mass, a veterinarian is called, business contacts with safe farms are stopped, feed suspected of being contaminated with the virus is excluded from the diet and replaced with other or disinfected. A veterinarian must establish a preliminary diagnosis, collect and send pathological material to the laboratory, organize measures to prevent the spread of the disease.

Measures to eliminate Aujeski's disease. After establishing the diagnosis, the farm (farm, kennel, private farm, separate yard) is recognized as unhealthy with regard to Aujeski's disease, quarantine restrictions are introduced in it, according to which it is prohibited to import, export, regroup animals, graze, water and keep sick animals together with healthy ones, export livestock products, as well as fodder, fodder, skins, sheepskin, which were stored on a dysfunctional farm. Clinical examination and thermometry of livestock are carried out daily. Sick animals are slaughtered and disposed of, and clinically healthy livestock, including piglets 2-3 days old, are vaccinated against Aujeski's disease. When several species of animals are kept together, all the livestock in the livestock premises are vaccinated. Conduct disinfection, deratization, disinfestation; destroy rodents, stray dogs and cats. Animal carcasses are burned or disposed of. Disinfection in machines is carried out after each case of detection of a sick animal, and the entire premises - every 5 days until the quarantine is lifted. For disinfection, a 2-3% hot solution of caustic soda, a 1%

solution of formaldehyde, a lighted lime solution containing 5% active chlorine, and a 20% suspension of freshly slaked lime are used. Manure is disinfected biothermally, manure - with chlorinated lime at the rate of 12 kg per 1 m^3.

Questions and tasks for control.

1. Describe the epizootic process in Aujeski's disease.

2. What are the characteristics of the manifestation of the disease in animals of different species and ages?

3. When is the diagnosis of Aujeski's disease considered established and from which diseases should it be differentiated?

4. How is the specific immunoprophylaxis of Aujeski's disease carried out in healthy pig farms?

5. Name the general and specific measures to eliminate the disease in the household.

Foot and mouth disease

(diagnostics, health measures)

Foot and mouth disease (Aphtae epizooticae) – an acute, extremely contagious viral disease of domestic and wild equids, which is characterized by a short-term fever, the development of aphthous and erosive lesions on the mucous membrane of the oral cavity, hairless areas of the skin of the corolla, integumentary gap, and udder. Human can get foot-and-mouth disease.

The causative agent of the disease – a virus from the Picornaviridae family. There are 7 types of FMD virus - A, O, C, SAT-1, SAT-2, SAT-3 and Asia-1, each of which has several serological variants and differs in antigenic and immunological properties. After an illness, animals acquire immunity only to the homologous virus, which does not exclude the possibility of re-infection with a new type of foot-and-mouth disease pathogen. The foot-and-mouth disease virus is resistant to the effects of physical factors and chemicals. It is not destroyed by 75% alcohol solution (unlike enteroviruses), ether, chloroform, carbon tetrachloride, toluene, lysol, phenol in concentrations that inactivate other viruses. Chlorinated lime, cresol, sulema destroy the foot-and-mouth disease virus after only a few hours. In the walls, the aphthous virus can be stored on pastures until the next season, in summer the virus is active in stagnant water bodies for 6-12 days, in hay - 30 days, in autumn and winter - 185-200 days. In sewage, it remains viable in the cold for 130 days, in summer and autumn - 20-49 days, in a manure pit - up to 40 days. It is stored on the wool of livestock for up to 50 days, on people's clothes - up to 100 days, indoors - up to 70 days. It’s stored in salted and smoked products for up to 50 days, in frozen products - up to 28 days, meat - up to 8 months, in butter at 5°C - up to 45 days, in fresh milk at 37°C - 12 hours, dry milk - up to 2 years. Destroys at 37°C after 12 hours, at 70°C – 30 minutes, in milk at 65°C – after 30 minutes, at 70°C – 15 minutes, at 80-100°C – in a few seconds. With biothermal disinfection, manure dies at a depth of 30-40 cm in 6 days, in more superficial layers - in 10-15 days. Hot 2% caustic soda or potassium solution, 2% formaldehyde solution, 20% solution of freshly slaked lime are active disinfectants that neutralize the virus within 10-30 minutes.

The diagnosis is made by a complex method based on the analysis of epizootological data, a characteristic clinical picture, patho-anatomical changes and the results of laboratory tests.

Epizootological data. Large and small cattle, pigs and wild ruminants are most susceptible to foot and mouth disease. In camels, the infection is asymptomatic. Buffaloes, camels, dogs and cats rarely get foot-and-mouth disease. Equidae and poultry are not susceptible to foot-and-mouth disease. In young, weakened and especially in newborn animals, the course of foot-and-mouth disease is more malignant than in adult animals. Cases of foot-and-mouth disease in humans occur

infrequently, mainly among children after eating raw milk from sick cows. The source of the causative agent of infection is sick domestic animals, which begin to secrete the virus during the incubation period and especially in significant quantities during the clinical manifestation of the disease. In the conditions of livestock farming, the source of the causative agent of the disease can be wild ruminants (saigas, antelopes), among which foot-and-mouth disease often becomes epizootic and spreads over large areas. The virus is released into the environment with saliva, scraps of aphthae, milk, urine, and feces of sick animals. With milk, the virus begins to be released 7 days before the manifestation of clinical signs, with saliva and semen - after 4 days. Most secretions and excreta are infectious during 4-5 days of illness, saliva - 11 days. About 50% of recovered animals remain virus carriers for 8 months, some animals for up to 2 years. Infection with foot-and-mouth disease occurs as a result of contact with sick animals, as well as through virus-contaminated feed, clothes and shoes of people, meat products, raw materials of animal origin, vehicles. Under certain meteorological conditions (hurricane), the foot-and-mouth disease virus can be carried over a long distance, suddenly causing the disease thousands of kilometers from the affected point. Cases of foot-and-mouth disease causative agent being carried over long distances by passengers of airplanes and trains arriving from territories unfavorable for foot-and-mouth disease, without complying with the requirements of quarantine veterinary and sanitary rules, have been noted. Birds, dogs, cats, rodents, insects, and ticks can play a role in the spread of foot-and-mouth disease. A significant risk for the spread of foot-and-mouth disease is not disinfected milk, but also by-products coming from dairies for feeding piglets and calves, food and slaughterhouse waste when fattening pigs. Factors of virus transmission can be pastures, watering holes, meat processing plants, milking stations, livestock loading and unloading stations, motor vehicles, tracks for racing animals, fairs, markets, as well as people in the epizootic zone. Spontaneous infection of FMD-sensitive animals occurs through the mucous membranes of the alimentary canal during the intake of feed and water contaminated with the secretions of sick and sickly virus-carrying animals. The foot-and-mouth disease virus can also enter the body of susceptible animals through the mucous membranes of the nose, mouth, external genitalia, conjunctiva of the eyes, teat ducts of the udder, and through damaged skin. Foot-and-mouth disease always tends to spread quickly over large geographical areas and takes the form of epizootics and panzootics. A characteristic feature of foot-and-mouth disease is extremely high contagiousness, almost 100% of the disease in susceptible animals and rather low mortality, which is 1.2% for cattle, 8.3% for pigs, and 0.78% for sheep. However, with a malignant form of the disease, the mortality of young animals can reach 90%. The duration of an outbreak of foot-and-mouth disease does not exceed 21-30 days. In the case of foot-and-mouth disease among cattle, other types of animals kept on the farm may also become ill. In the natural course, epizootic outbreaks occur every 5-7 years, which is caused by the renewal of the herd

at the expense of newborn young animals and the gradual loss of immunity in adult animals acquired as a result of a previous illness. The implementation of vaccinations and broad-based anti-epizootic measures has a significant impact on the patterns of occurrence and manifestation of this very dangerous animal disease.

Pathogenesis. At the site of initial penetration, the virus reproduces extremely quickly and after 24-36 hours forms primary aphthae, which often remain unnoticed. From here, with blood and lymph, the virus spreads throughout the body, causing viremia and the formation of secondary aphthae on the mucous membrane of the oral cavity, the heel of pigs, on the skin of sows, the udder, the crown, the gap between the hoofs and the base of the horn. Sometimes the virus reproduces in the sarcoplasm of the muscle fibers of the myocardium and skeletal muscles. In some cases, the virus exhibits pantropic properties and affects parenchymal organs, the nervous system, and endocrine glands, which causes a general infection, high temperature, and the development of characteristic symptoms of the disease. Calves, piglets and young lambs develop viremia, which is mostly not accompanied by the formation of aphthae, but leads to the rapid death of animals.

Clinical signs and course of the disease. The incubation period lasts 2-7 days. The course of the disease is acute. In cattle, benign and malignant forms of the disease are distinguished. With a benign form of foot-and-mouth disease, the first sign of the disease is a loss of appetite and slow chewing of gum. Then a fever appears (up to 40.5-41.5°C), acceleration of the pulse and breathing, refusal of feed, and the yield of milk drops sharply. At the beginning of fever, the mucous membrane of the mouth is dry, hot and hyperemic. After 2-3 days, blisters (aphthae) appear on the mucous membrane of the oral cavity, tongue, wings of the nose, and sometimes on the nasal speculum, at first insignificant, the size of a pea, filled at first with a clear, and then cloudy liquid. Over time, the aphthae increase to the size of a walnut, merge with each other, forming large aphthae, which rupture, releasing lymph, which mixes with saliva and is released from the mouth. At the site of ruptured canker sores, painful erosions with uneven edges are formed, which are covered with epithelium and heal over the next 5-8 days. During the period of fever and the appearance of aphthae and erosions, severe salivation, thirst, difficulty in taking food and chewing gum, characteristic "sucking" are observed. In addition to the mucous membrane of the mouth, aphthae can form on the skin of the corolla and the integumentary gap, on the teats of the udder. Damage to the skin of the limbs causes limping and strained gait. Under the conditions of stable maintenance and a sufficient amount of dry litter, the affected areas heal in 7-12 days. Long races of animals, keeping them in damp, festering rooms can lead to complications of inflammatory phenomena with secondary microflora, development of arthritis or panaritium. When the udder is damaged, aphthae, erosion, and scabs of various shapes and sizes appear on the teats, which causes difficulties in expressing milk and changes in its quality (Fig. 1).

Fig. 1. Demages of foot-and-mouth disease in cattle.

Milk becomes slimy, has a bitter aftertaste. With careful care and timely treatment, the affected areas of the udder heal quickly, otherwise complications with secondary microflora are possible. In all cases, regardless of the damage to the udder, foot-and-mouth disease has a very negative effect on the productivity of cows, the decrease in milk yield per herd can reach 50-75%. Recovery of milk productivity is slow and sometimes takes up to 14 months or more. During the disease, calving cows may have abortions, delayed litter, birth of dead or weak calves. In the malignant form of foot and mouth disease, in addition to aphthous and erosive lesions of the mucous membranes and skin, there is a violation of the function of the cardiovascular system, weakness, severe general depression, clonic convulsions, shortness of breath, wheezing. This form of foot-and-mouth disease causes a very high mortality rate, which reaches 50-70% among cattle, 100% in goats, and 21.8% in pigs. In calves up to 2 months of age, foot-and-mouth disease occurs in a non-afthous form, characterized by the phenomena of acute hemorrhagic gastroenteritis, sepsis, and myocarditis. Fever, convulsions, weakness, reluctance to urinate colostrum, severe depression appear. Sick calves die in the first 12-30 hours of illness. The fatality rate can reach 60%. In sheep, foot-and-mouth disease affects the limbs and udder more often, and aphthae rarely form in the oral cavity. There is no drooling. Patients have a short-term fever, refusal to feed, slowed chewing, severe lameness, more often in the front limbs. The disease lasts about 2 weeks, mostly ends with recovery. Lambs are very seriously ill, mainly in the non-aphthous form, with damage to the central nervous system, acute gastroenteritis. In goats, the mucous membrane of the oral

cavity and limbs are more often affected, rarely the udder. Sick animals are depressed, lie down more, have difficulty moving, and limp. Salivation is weakly expressed. In the oral cavity, on the lower lip, in the corners of the lips, small aphthae and erosions are found (Fig. 2). Often, sick goats have constipation at the beginning of the disease, which is replaced by diarrhea with mucus and streaks of blood. Recovery occurs in 10-14 days.

Fig. 2. Canker sores and erosions in goats with foot-and-mouth disease.

In pigs, foot-and-mouth disease is accompanied by loss of appetite, depression, decreased appetite, aphthous-erosive lesions of the corolla, rump, formation of aphthae on the heel and udder, very rarely - in the oral cavity. Sick pigs mostly lie down, move crawling, on the wrist joints. Sometimes there is a decrease in the mottling. The duration of the disease is 8-25 days. In piglets, the course of the disease is malignant, with high temperature, signs of severe gastroenteritis, sometimes numerous aphthae on the piglet and the mucous membrane of the oral cavity. Up to 60-80% of sick piglets die. Diarrhea, aphthous-erosive lesions of the mucous membrane of the oral cavity and the skin of the limbs are noted in deer. The disease lasts 10-12 days, then recovery occurs. Damage to the mucous membrane of the mouth and the skin of the limbs is observed in camels. There is no drooling. The course of the disease is benign.

Pathological changes. Autopsies of animals that died from foot-and-mouth disease revealed acute catarrhal inflammation of the mucous membrane of the oral cavity, pharynx, and respiratory tract, and in young animals of young age, hemorrhagic inflammation of the intestine and degeneration of the myocardium. Apthas, erosions and ulcers are characteristic, which are observed on hairless areas of the skin, mucous membranes of the oral cavity, intestines, respiratory tract, as well as on the udder. The aphthous process on the udder is often combined with serous catarrhal mastitis, and in the case of complications, with purulent mastitis. Regional lymph nodes are enlarged, juicy, focally or diffusely hyperemic. In the case of a malignant course, patho-anatomical changes are also detected in the heart muscle - degenerative and necrotic, yellow-gray cells of various shapes and sizes, white stripes and striations on the heart that give it a spotted appearance ("tiger heart"), pallor and

laxity of the heart muscle Numerous dystrophic and necrotic lesions are also found in the muscle fibers of the muscles of the front and hind limbs, back, intercostal and masticatory muscles, and tongue muscles. Dystrophy and focal necrosis in the liver and kidneys, hyperemia and edema of the lungs, hyperplasia of lymph nodes are noted. Postmortem changes in the oral cavity with malignant foot and mouth disease are weakly expressed or may not be present at all. Hemorrhagic gastroenteritis, degenerative changes in the liver, skeletal muscles, sometimes "tiger heart" are found in calves, piglets and lambs. In other species of animals, pathological changes in foot-and-mouth disease are similar to those described in cattle.

Laboratory studies. Send to the laboratory at least 5 g of the walls and contents of the aphthae (without signs of decay) taken from the mucous membrane of the tongue of cattle, from the heel of pigs, as well as from the skin of the corolla and the interdigital gap of large and small cattle, pigs, camels and other animals. In the absence of aphthous disease, the blood of sick animals is taken during the period of increased body temperature and the blood of animals that have fallen ill. Lymph nodes of the head and epiglottis ring, pancreas and heart muscle are taken from the carcasses of young animals of all species. For retrospective diagnosis, samples of esophageal-pharyngeal mucus are taken. The pathological material is placed in vials with rubbed caps and delivered to the laboratory for examination no later than 6-12 hours after the moment of selection. In case of impossibility of delivery within the specified time, the samples are frozen or preserved in glycerol-phosphate buffer (pH=7.4-7.6). Laboratory diagnostics involves the detection and identification of a specific typical and variant antigen of the foot-and-mouth disease virus directly in the pathological material obtained from animals with clinical signs of the disease; isolation and indication of the virus using a bioassay on white mice and guinea pigs or infected primary cultures of kidney cells of calves and piglets, as well as conducting a bioassay on cattle; identification of the virus using complement binding reactions, diffuse precipitation reactions, immuno-enzymatic analysis, neutralization reactions (in cell culture by the method of cross immunity on cattle, guinea pigs and vaccinated cattle). In the laboratory, the pathological material is examined by the complement binding reaction, the diffuse precipitation reaction, the indirect hemagglutination reaction (with antibody erythrocyte diagnostics) and the ELISA test for the detection of foot-and-mouth disease antigen and its typing. At the same time, primary cultures of kidney cells of calves or piglets are infected with a suspension of pathological material. In the presence of the foot-and-mouth disease virus, cellular degeneration appears after 1-3 days. The specificity of cellular degeneration is controlled by the complement binding reaction. 10 mice 4-6 days old and 5 guinea pigs are used for the bioassay, if necessary, 2 cattle 18 months old and 4 piglets 3 months old are infected. After 2-3 days, aphthae appear at the place of inoculation of infectious material. In order to confirm the specificity of skin lesions, they are

selected, suspension is made, and research is carried out according to RZK. Determination of foot-and-mouth disease virus types in pathological material and study of antigenic properties of epizootic strains is carried out using the immunodiffusion reaction.

Differential diagnosis. Presupposes the need to distinguish foot-and-mouth disease from other diseases with vesicular syndrome. Cowpox is accompanied by the stages of development of smallpox exanthema of the skin: roseola, papule, vesicle, pustule, crust. Only teats and udders are affected. If necessary, microscopy of smears from fresh papules is carried out to detect elementary bodies and infection of chicken embryos. Rinderpest affects only one type of animal, causing high mortality. There is never an aphtha on the mucous membrane of the oral cavity, there is no damage to the limbs and udder. The disease is often accompanied by diarrhea. Virus isolation in cell culture, detection of specific antigen and specific antibodies using complement binding reaction and immunodiffusion reaction are carried out; put a bio-test on guinea pigs and calves (guinea pigs are not sensitive to the plague virus). Vesicular stomatitis affects not only cattle, but also horses and donkeys, on which a bio sample is placed if necessary. White mice susceptible to the vesicular stomatitis virus are infected. Necrobacteriosis is a chronic disease of many species of animals, occurring in the form of enzootic disease. Canker sores are not formed in this disease, lesions are found not only of the myocardium, but also of the liver and prestomach. An anaerobic microbe is isolated during bacteriological examination. Viral diarrhea is characterized by a slow development of enzootic disease, affects only cattle, mainly aged from 6 months to 2 years, watery diarrhea is characteristic. Diarrhea virus is isolated, which is typified by neutralization reaction, immunodiffusion reaction, and immunofluorescence reaction. Vesicular disease of pigs is registered only in this species of animals, the mortality rate is low. The causative agent of the disease is very stable in an acidic environment and at room temperature, while the foot-and-mouth disease virus is completely inactivated under these conditions. Guinea pigs, white mice, rabbits are resistant to enterovirus. The final diagnosis is established based on the results of the complement binding reaction, immunodiffusion reaction, and immunofluorescence reaction. If necessary, biotests are performed on various types of farm animals. Vesicular exanthema of pigs can be differentiated from FMD by a bioassay on guinea pigs, by the complement binding reaction with vesicular fluid and specific hyperimmune sera. Catarrhal fever of sheep is characterized by seasonality, lack of contagiousness, as well as specific aphthous lesions of the mucous membrane of the oral cavity, skin, and extremities. With vesicular stomatitis of non-infectious etiology, there is no fever and aphthous disease.

Treatment. Sick animals are provided with soft nutritious feed, hygroscopic soft litter (peat, sawdust), clean, dry rooms, good-quality drinking water with the addition of 1 g of copper sulfate per bucket of cold water. For specific treatment, anti-

foot-and-mouth disease serum of convalescents is used (1.0-1.5 ml per 1 kg of animal weight), for young animals - immunolactone (piglets, lambs, calves under 3 months of age - 1 g; over 3 months of age - 0.2 g per 1 kg of animal weight), as well as immunoglobulin (for calves - 5-10 ml per head, for lambs and piglets - 2 ml per head). Depending on the clinical manifestation of the disease, symptomatic treatment is carried out. The oral cavity is washed 2-3 times a day with weak disinfectant and astringent solutions: 2% solution of acetic acid, potassium permanganate - 1:1000, furacilin - 1:5000, 2% solution of boric acid. Erosions are lubricated with iodoglycerin. The affected areas of the skin on the limbs are cleaned of dirt and lubricated with fish oil mixed with tar or antibiotic emulsions. It's also useful to run animals through special foot baths with 2% formaldehyde solution, 0.5% caustic soda solution, 2–3% creolin or lysol emulsion every day. It is advisable to periodically treat the hooves, the skin of the crowns, and the interdigital (intercarpal) gap with pine tar mixed with fish oil. In case of a severe course, cardiac drugs are used.

Immunity. After contracting foot-and-mouth disease, animals develop persistent immunity to re-infection with the same type and variant of the virus from 1 to 10 years. However, if a different type of foot-and-mouth disease appears, animals can get sick again. The persistence of the foot-and-mouth disease virus in the body of sick animals for one year or longer has been proven. For active immunization against foot-and-mouth disease, mono- and polyvalent vaccines from lapinized virus A, O, C and A48 are proposed; mono- and polyvalent sorbed vaccines from virus O, A and C, which are grown on the epithelium of the tongue of cattle; monovalent vaccines against foot-and-mouth disease type A, O, C and Asia-1; emulsion monovalent vaccine against foot-and-mouth disease type A22 or O1 for vaccination of pigs. Vaccines are used for immunization against foot and mouth disease of various types of susceptible animals with a preventive and forced purpose in the threatened zone and disadvantaged areas.

Prevention and control measures. Managers of farms of various forms of ownership and specialists of veterinary medicine are obliged to systematically carry out preventive measures against foot-and-mouth disease and to be well informed about effective methods of combating this disease. If there is a suspicion of an animal disease, it is necessary to immediately determine the exact boundaries of the foot-and-mouth disease center, the unfavorable point and the threatening zone and organize the implementation of appropriate anti-epizootic measures. Anti-hospitality measures involve the introduction of strict security and quarantine restrictions, preventive vaccination and disinfection of the virus in the external environment. In the event of a threat of foot-and-mouth disease being introduced into safe zones, strict protective measures aimed primarily at the complete termination of any economic or administrative-public relations with the area of foot-and-mouth disease distribution are of decisive importance. It is necessary to carry out extensive educational work

among livestock workers and the population about the danger of foot-and-mouth disease, ways of its introduction and prevention. In the farms of the threatened zone, access to their territory by outsiders and vehicles is prohibited. For the care of animals, permanent brigades are established, strict veterinary supervision is established for the collection and export of livestock, animal raw materials, and the import of animal husbandry and agricultural products. During the grazing period, cattle are taken to camps with caretakers permanently attached to them, grazing of cattle for individual use together with the public herd is prohibited. Veterinary supervision is being strengthened at running tracks and places of livestock trade, as well as at enterprises processing and storing livestock raw materials. Of great importance in the fight against foot-and-mouth disease is the timely establishment of a diagnosis, the correct and quick organization of veterinary-sanitary, quarantine and special measures in the affected area. A dysfunctional farm or settlement is immediately quarantined, and a dangerous zone is defined around it. A special commission for the fight against foot-and-mouth disease is created in a disadvantaged area, security and quarantine police, civil, and, if necessary, paramilitary posts are organized. In order to carry out quarantine measures, all movements of animals, poultry and people are prohibited within the unfavorable point - the introduction and removal of animals, livestock trade, exhibitions, travel and departure of people, harvesting operations, joint grazing, watering and keeping of sick animals together with healthy ones. According to the decision of the local authorities of the self-governing bodies, 24-hour security and quarantine posts are set up, all roads leading to the unsafe point are closed, with 24-hour guard posts being posted and detours and information signs prohibiting the passage of vehicles. Preventive disinfection of livestock premises, territory and transport serving farms is carried out regularly. The corpses of animals that died in the foot-and-mouth disease are burned. Manure, feed residues and bedding are taken to a specially designated place for biothermal disinfection every day and used no earlier than on the 30th day from the moment of laying. Areas of pastures, where sick animals were grazed, cattle drives, where sick cattle were driven away, can be opened for grazing and driving livestock in the summer no earlier than 1 month later, and for vaccinated animals - 2 weeks after vaccination. Quarantine from the foot-and-mouth disease-prone point is lifted 21 days after the last case of animal recovery and final disinfection. For disinfection during an outbreak of foot-and-mouth disease, hot 2% caustic soda solution, 1% formaldehyde solution, chlorinated lime solution containing 2% active chlorine, 5% iodine chloride solution are used; hot 3% solution of causticized soda-potash mixture - once, during the final disinfection - twice. The floor, passages, and sewers are sprinkled daily with freshly slaked lime powder, the walls are whitewashed with a 20% mixture of freshly slaked lime, and the feeders are disinfected with a 2% solution of caustic soda. Small inventory and animal care items are immersed for 1 hour in a 2% solution of caustic

soda, a 1% solution of formaldehyde, a clarified solution of perchloric lime containing 2% active chlorine. Disinfection barriers are filled with 2% formaldehyde solution, 3% caustic soda solution, 5% disinfectant creolin emulsion, 4% xylonaphtha emulsion. The final disinfection of the premises is allowed to be carried out by the aerosol method, using a 20% solution of formaldehyde at the rate of 20 ml per 1 m3 of the room with an exposure of 3 hours, as well as a mixture of 3 parts of formalin and 1 part of creolin or xylon naphtha at the rate of 15 ml per 1 m3 of the room with an exposure of 3 hours.

Questions and tasks for control.

1. What antigenic differences of the causative agent of foot-and-mouth disease must be taken into account in the anti-foot-and-mouth disease treatment?
2. What are the features of the epizootic process in foot and mouth disease?
3. What are the sources and reservoirs of the foot-and-mouth disease virus, the ways of its transmission and ways of spreading the disease?
4. How is foot-and-mouth disease diagnosed and from what diseases must it be differentiated?
5. List a set of general and specific measures for the prevention and elimination of foot-and-mouth disease in animals of various species.
6. What anti-foot-and-mouth disease measures are carried out in an epizootic outbreak, an unfavorable point and a threatened zone?

Smallpox

(diagnosis and control measures)

Smallpox (Variola) – an acute contagious viral disease of various species of animals and birds, characterized by the development of a specific papular-pustular rash on the skin and mucous membranes, which successively goes through the stages of formation from roseules to scabs and crusts. A person is susceptible to smallpox.

Pathogens of the disease – epitheliotropic viruses from the Poxviridae family, which are morphologically similar in different animal species, but differ in pathogenicity, antigenic and immunological properties. Natural cowpox virus and vaccinia virus can cause disease in cattle, pigs, buffalo, camels, mules, and horses; human smallpox virus - in humans and cattle; sheep pox virus - in sheep and goats; goat and fowl pox viruses - only in goats and fowl. Regardless of their species, smallpox virions have a complex type of symmetry, a large enough size, which makes it possible to detect them under an ordinary microscope. The cluster of virions was called "elementary bodies", or Paschen bodies, which are well stained by the Morozov silvering method, as well as by the Romanovsky-Giems method. Under an electron microscope, smallpox virions look like short, thick rods, in the central part of which there is a DNA nucleoid (Fig. 1).

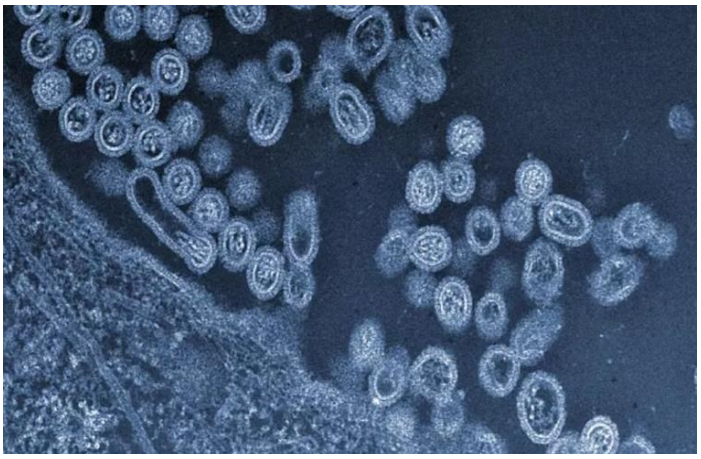

Fig. 1. Natural cowpox virus.

The smallpox virus is cultivated in primary cultures and subcultures of cells of kidneys and testicles of lambs, calves, goats, where they cause a cytopathogenic effect after 48-96 hours. The chicken pox virus can be cultivated in 10-12-day-old chicken embryos when infected on the chorionallantoid membrane, as well as in the culture of fibroblasts of chicken embryos. Of laboratory animals, rabbits are susceptible to the smallpox virus. Experimental infection is also possible in young sheep with intradermal infection with sheep pox virus; in young piglets - with intradermal, subcutaneous, intravenous inoculation of swine pox virus; in non-immune chickens and chickens - when infected in the scarified comb, earrings and

feather follicles. The smallpox virus is quite resistant to environmental factors. It remains viable in lymph at 2-4°C for at least 2 years, in dry crusts - 4-5 years, in coops and poultry houses - up to 6 months, on pasture - up to 65 days, in sheep's wool - up to 2 months. In a lyophilized state at minus 15-20°C, the virus remains active for up to 20 years, cultured virus at minus 40°C is preserved for 5-6 months. High temperatures and decay quickly destroy the virus. Virions are also inactivated by 3% formaldehyde solution, 3-5% chloramine solution, 20% slaked lime solution. When boiling - for 2-3 minutes, at 70°C - 5 minutes, 60°C - 10 minutes, 55°C - 20 minutes, 39°C - 24 hours. Ultraviolet radiation kills the virus within 4 hours.

The diagnosis is made by a complex method, which includes the analysis of epizootological data, detection of smallpox exanthema characteristic of the disease, patho-anatomical changes, as well as conducting laboratory tests.

Epizootological data. Sheep, pigs, goats, cattle, camels, horses, rabbits, chickens, turkeys, pigeons are susceptible to smallpox. Young animals are more malignant and with high mortality (20-90%), especially when complicated by secondary microflora. The source of the causative agent of infection is sick animals, as well as sick virus carriers, in which the causative agent of the disease persists on fur and skin for up to 8 weeks. The virus is released from the body of infected animals with the contents of smallpox pustules, crusts and falling off scabs, saliva, secretions from the nose and eyes. The smallpox virus can be found inside eggs and on the shell. Factors of pathogen transmission can be pastures, pens, paths in places where livestock are run, as well as care items, fodder, wool, skins, manure, clothes and shoes of service personnel contaminated with the virus. Biting insects, lice, mouse-like rodents, cats and dogs can play a role in the spread of smallpox. The rapid spread of the infection in the herd is facilitated by the transmission of the pathogen by milkmaids during the milking of cows. Infection occurs by contact when healthy animals are kept together with sick ones, through the respiratory tract, damaged skin, less often - through the digestive tract. Intrauterine infection is possible in sheep. The disease occurs at any time of the year, but more often appears in the stall period, in cold and rainy weather. Among sheep, goats, pigs, and poultry, smallpox occurs as an epizootic, among cattle and horses as an enzootic. Horses are often infected with cattle pox. An outbreak of smallpox among pigs can occur if collected or whole milk from smallpox-affected cows is used as feed. The infection spreads quickly and within 2-3 weeks can cover up to 80-100% of susceptible animals. The emergence and significant spread of the infection is facilitated by various stress factors associated with the violation of feeding and maintenance of animals, especially young animals. A severe course of smallpox in lambs of thin-wooled breeds, in which the incidence can reach 100%, as well as in piglets - 80%. Epizootic foci of smallpox can turn into stationary ones, in which, against the background of post-infectious immunity, the disease is detected only in young animals, often with an atypical development of the infectious process.

Pathogenesis. After entering the body, the smallpox virus reproduces in the sensitive cells of the epithelium of the respiratory tract, then enters the blood, causes viremia, is carried throughout the body by blood, settles in the epithelial cells of the mucous membranes and skin, where it causes the exanthem characteristic of smallpox. During the development of viremia, fever, depression, and chills are observed in sick animals. The course of the pathological process in smallpox depends on the virulence of the causative agent, as well as the state of resistance of the organism, species, age and breed of the animal. In the typical form of smallpox, there is a clear phasing of the development of smallpox exanthema on the mucous membranes and hairless tender areas of the skin, which ends within 12-18 days. In the first 1-2 days, roseolae (red spots) appear, which during the next 1-3 days turn into papules with serous fluid and become vesicles. During this period, the body temperature decreases, the animal's health improves. Then, within 3 days, the vesicles turn into pustules (suppurative stage), in place of which scabs appear after 2-3 days (crusted stage). After 5-6 days, the scabs fall off, the pathological process of exanthema formation stops, recovery occurs. In complicated cases, the pustules merge with each other and form wide foci of suppuration, the so-called "draining smallpox". Sometimes multiple hemorrhages appear inside the pustules, hemorrhagic, or black, smallpox develops. Skin lesions of the smallpox virus can be limited to the formation of nodules, then smallpox is observed. In pigs, sheep and goats, the stages of vesicles and pustules pass unnoticed.

Clinical signs and course of the disease. The incubation period lasts 3-14 days. The course of the disease can be benign or malignant. There are typical, atypical (stone), draining and hemorrhagic forms of smallpox.

In sheep, with the typical form, there is an increase in body temperature to 41-42°C, increased breathing, depression, chills, loss of appetite, cessation of chewing, hyperemia of the nasal mucosa, conjunctivitis, mucous, and later mucous-purulent discharge from the nose and eyes . After 1-4 days, smallpox exanthema gradually develops on the hairless and sparsely covered areas of the head, around the eyes, on the nose, the inner surface of the thighs, belly, tail, and udder (Fig. 2).

Fig. 2. Smallpox in sheep.

With a benign course of the disease, at the end of 3-4 weeks, smallpox crusts fall off, the animals recover. With a malignant course, complications from the respiratory and digestive organs appear. Coughing, wheezing, nasal discharge, clouding of the cornea are observed, cat sheep abort. In the atypical form, red hard nodules (papules) of rounded or oblong shape are formed on the skin, which dry up and disappear without transitioning into vesicles (vesicles). Sick sheep soon recover. In the confluent form of smallpox, there is fever, depression, loss of appetite, purulent and ichorous discharge from the nose; a lot of saliva flows from the mouth with an unpleasant ichorous smell. Purulent inflammation of the subcutaneous tissue, extensive skin lesions are observed. In the hemorrhagic form of smallpox (blackpox), as a result of hemorrhages in the skin and internal organs, vesicles and pustules acquire a dark red or black color, hematuria, bloody diarrhea, severe general condition of animals and high mortality are observed. The tips of the ears, large areas of skin, as well as areas of the lips and eyelids become necrotic and fall off.

In cows, the course of the disease is benign and is manifested by a short-term fever, slight depression, loss of appetite, and a decrease in milk yield. On the udder, lips, skin of the inner surface of the thighs (rarely), and in bulls, on the scrotum, there is a staged formation of smallpox exanthema. The disease in dairy cows can be complicated by mastitis and the formation of "navel-like" depressions on the udder, which leads to a significant loss of milk productivity (Fig.3).

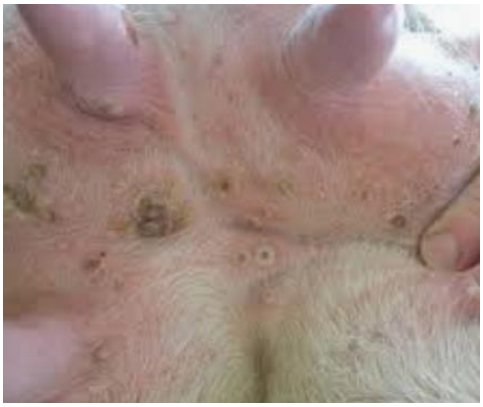

Fig. 3. Smallpox on the cow's udder.

In adult pigs, the course of smallpox is benign. The disease is manifested by the formation of smallpox blisters on the heel, the outer surface of the ears, the udder, the inner surface of the thighs, which quickly pass, and the animals recover. In piglets, the course of the disease is malignant. General weakness, fever (41-42°C), loss of appetite, conjunctivitis are observed. Roseolae, then vesicles, scabs appear on the skin of various parts of the body (Fig. 4). The disease is often complicated by pneumonia and gastroenteritis. Mortality can reach 80%.

Fig. 4. Swine pox.

In horses, the course of the disease is benign and ends with recovery within 7-10 days. The mucous membrane of the mouth and tongue are mainly affected. Less often, smallpox exanthema appears on the mucous membrane of the nose, genitals, as well as on the skin in the neck and groin area. The animals have short-term fever, loss of appetite, reduced performance, difficulty in accepting and chewing food.

In goats, smallpox is rarely registered and is accompanied by fever, depression, characteristic smallpox lesions of the skin on the udder. Sometimes smallpox exanthema appears on the scalp, the inner surface of the thighs, the abdomen, on the mucous membranes of the external genitalia, oral and nasal cavities. Abortions, complications with pneumonia, mastitis are possible.

Pathological anatomical changes. During the examination and autopsy of the corpses of animals that died from smallpox, characteristic exanthematous lesions of the skin in various parts of the body, hard nodules with cheesy decay under the pleura, inflammation of the mucous membranes of the respiratory tract and digestive tract, enlargement of the spleen, degenerative changes in the myocardium and liver, foci of hepatization in lungs Lymph nodes are swollen and enlarged. In sheep, in which the disease took place in a malignant form, in addition to characteristic skin lesions, smallpox lesions are also found in the lungs, liver, kidneys, on the mucous membranes of the alimentary canal and respiratory organs. Multiple hemorrhages in the serous membranes, enlargement and hyperemia of lymph nodes, degenerative changes in the liver, kidneys, and heart are observed. Pulmonary pneumonia and gangrenous foci are sometimes found in the lungs. In cows, vesicles and pustules are found on the skin of the udders, in cattle - on the scrotum, mucous membranes of the oral and nasal cavities, pharynx, antrum, where erosions and ulcers are often found. With smallpox, there is diffuse swelling of the skin and subcutaneous tissue, large exposed wound surfaces, scars on the skin. With hemorrhagic smallpox, due to hemorrhages in the skin, the contents of vesicles and pustules acquire a dark red color, in the internal organs of hemorrhages. In horses with smallpox, a papular-pustular rash appears on the skin of the joint joints and thighs, as well as on the mucous membrane of the nose, lips, and eyes. In pigs, smallpox is manifested by

specific smallpox lesions of the skin and mucous membranes. In the draining or hemorrhagic form of smallpox, hemorrhagic inflammation of the mucous membrane of the alimentary canal, numerous hemorrhages, and degenerative changes in parenchymal organs are observed.

Laboratory diagnostics. It includes the microscopic detection of elementary bodies in the pathological material, the infection of chicken embryos, and in doubtful cases - conducting a bioassay on sensitive animals. Vesicular fluid collected in the capillaries of Pasteur pipettes and entire papules cut with scissors on the border with intact tissue are sent to the laboratory for examination, which are placed in a vial with a 50% glycerin solution. For viroscopy, thin smears and smears-imprints of smallpox skin lesions and pustules are prepared, which, after drying, are examined in their native state or stained according to the Morozov or Paschen method. During the microscopic examination of Morozov-stained smears on a light brown background of the drug, viral particles have the appearance of small rounded elementary bodies of black color, placed singly, in pairs, in short chains or clusters. According to Paschen's method, small rounded elementary bodies in smears have a dark red color. To diagnose smallpox in poultry, 10-12-day-old chicken embryos are infected with pathological material. With positive results on the chorionalantoid membrane of dead (or killed) chicken embryos during the first 3-6 days, small small pimples placed separately or large clusters of small pimple lesions are found. In case of an atypical form of smallpox in sheep, a biological sample is used for diagnosis. The studied pathological material in a volume of 0.1 ml is injected intradermally into the hairless surface of the tail of a non-immune young sheep. In positive cases, a specific local smallpox process develops at the inoculation site within 10 days, which is confirmed by the presence of elementary bodies in smears. For the diagnosis of smallpox in pigs, the pathological material is rubbed into the incisions of the skin on the outer surface of the ear or the inner surface of the thigh of 2-3-month-old piglets. In positive cases, after 6-8 hours at the incision site, characteristic smallpox lesions are observed, the specificity of which is confirmed by the detection of elementary bodies in smears. The identification of the smallpox virus, which caused the disease in pigs, is carried out on two sick piglets, which are rubbed with smallpox vaccine into the freshly scarified surface of the skin on the back of the ear or on the inner surface of the thigh. The absence of an inflammatory reaction at the site of vaccine injection indicates infection of pigs with cowpox virus or smallpox vaccine. To diagnose cowpox, experimental pathological material is injected into the cornea of rabbits (Paul's test). During histological examination of the affected areas of the cornea, specific inclusion bodies of Guarnieri are revealed. If necessary, a bioassay is carried out on calves.

Differential diagnosis. Presupposes the need to distinguish smallpox of sheep and goats from scabies and scabies; cattle pox - from foot-and-mouth disease and

nodular dermatitis; swine pox - from a rash with salmonellosis, leptospirosis and foot-and-mouth disease, as well as with impaired metabolism; horse pox - from vesicular stomatitis. Scabies is diagnosed by detecting microscopic fungi in the pathological material, scabies by finding specific mites in the crusts. Bovine foot-and-mouth disease is distinguished from smallpox by specific aphthous and erosive lesions of the mucous membrane of the oral cavity and tongue, the udders do not show "umbilical depressions" characteristic of smallpox. If necessary, conduct a bioassay on guinea pigs. Nodular dermatitis of cattle is not accompanied by a characteristic stage of development of skin lesions, only nodular rashes are observed. In pigs, skin lesions in salmonellosis and leptospirosis do not have the stages of development characteristic of smallpox, bacteriological studies determine the corresponding causative agent of the disease. In horses, vesicular stomatitis manifests itself as a characteristic vesicular rash on the mucous membrane of the oral cavity, the skin of the corolla and the interatrial fissure. The virus is identified by the complement binding reaction and the neutralization reaction.

Treatment. Specific means of treatment of smallpox are not offered. Sick animals are isolated in dry, clean, well-ventilated rooms, provided with soft nutritious food. Symptomatic treatment is carried out. Mucous membranes are irrigated with antiseptic and astringent liquids, smallpox skin lesions are treated with various ointments (borane, propolis, zinc, salicylic), emulsions (streptocide, synthomycin) and antiseptic liquids. The skin of sick pigs is moistened with a weak solution of creolin, lysol or caustic alkali every 6-7 days until the crusts fall off. In case of conjunctivitis in horses, the eyes are washed with 1% zinc solution, 0.5% tannin solution. Broad-spectrum antibiotics are used to prevent and treat complications caused by bacterial microflora.

Immunity. Cows, camels, and goats who have contracted smallpox develop permanent immunity for life, sheep and chickens - for 2-3 years, pigs and horses - for several months. For specific prevention, hydroxydaluminum formol vaccine against sheep pox, dry culture virus vaccine against sheep pox and hydroxydaluminum formolglycerin vaccine against goat pox are used. Hydroxidaluminum formol vaccine against sheep pox is used for preventive purposes in disadvantaged or threatened farms. Clinically healthy animals are vaccinated regardless of their physiological state and age. Lambs vaccinated before the age of 2 months are revaccinated after 2-3 months, then twice a year. Immunity in sheep is formed on the 15th day after vaccination and lasts for 6-8 months. Dry cultured sheeppox vaccine virus is used for preventive immunization of clinically healthy sheep in epizootic centers and smallpox-threatening areas. Youngsters are vaccinated from the age of one month, revaccinated at the age of 6 months. Adult sheep are vaccinated once every 12 months. Immunity occurs 4-5 days after vaccination and lasts for 12 months. Hydroxidaluminum formolglycerine vaccine against smallpox of goats is used for

prophylactic purposes in all disadvantaged farms without any restrictions. The young are revaccinated after 3-4 months. Immunity lasts up to 6 months.

Prevention and control measures. They provide for the protection of farms against the introduction and spread of the smallpox virus; protection of animals from smallpox infection; timely diagnosis; identification, isolation and treatment of sick animals and vaccination of healthy ones; elimination of the disease in the unfavorable point and prevention of the spread of the infection to other farms; destruction of the causative agent of the disease in the center of infection.

In order to prevent the introduction of sheep and goat smallpox, it is not allowed to import animals, fodder, and inventory from smallpox-prone farms. All newly arrived sheep and goats are kept in quarantine for 30 days, during which they are under constant veterinary supervision. Before being introduced to the general flock, the sheep are bathed in creolin baths. Permanent pastures, watering holes and race tracks are fixed behind each flock. Contacts with flocks of other farms and individual owners are not allowed; constant monitoring of the health of animals is ensured. In order to prevent smallpox, all sheep in the danger zone are regularly vaccinated. In the event of sheep or goat pox and the diagnosis is confirmed, the farm is declared to be pox-free, a quarantine is introduced, and a guard-quarantine veterinary-police post with 24-hour duty is set up. The entry and exit of all types of animals is prohibited in the unfavorable point; regrouping of animals within the farm, as well as grazing, feeding and keeping sick sheep together with healthy animals of all species; removal of fodder from an unfavorable point; use of sheep's milk and products obtained from it in an uncontaminated form; shearing of sheep in dysfunctional flocks until the quarantine is lifted; trade in animals and livestock products; conducting exhibitions, fairs, bazaars; passage of all types of transport on the unfavorable territory. Permanent caretakers, transport, and pastures are assigned to a dysfunctional herd. The corpses of dead animals are burned, it’s forbidden to remove the skins and use the wool from the corpses. Sick and suspected animal diseases are isolated and treated. All clinically healthy sheep and goats are vaccinated against smallpox with one of the existing vaccines according to current instructions. Vaccination of animals in smallpox-threatening farms is also carried out. During the entire period of quarantine, mechanical cleaning and disinfection of premises and other places where sheep are kept is carried out every 5 days. Quarantine is lifted 20 days after the complete recovery, death or slaughter of the last sick sheep, as well as after the final disinfection of the premises, walking yards and pens where the sheep were sick with smallpox. After the quarantine is lifted, all sheep entering the farm are vaccinated against smallpox during the 30-day quarantine period. In the future, sheep will be vaccinated against smallpox annually on the territory of the previously unfavorable point for the next three years. When sheep pox appears in areas where it has not been registered for three years or more, all sheep of the affected group are

slaughtered at a specially equipped slaughterhouse in compliance with the relevant veterinary and sanitary rules.

When a diagnosis of swine pox is made, the farm is declared to be pox-free and quarantine restrictions are introduced in it. Patients with swine pox are isolated and treated; healthy people are vaccinated. Pigs that died with existing clinical signs of smallpox are disposed of together with the skin. Disinfection of premises, equipment, and inventory is carried out every 5 days in the smallpox center. Overalls and shoes are disinfected daily in a paraformalin chamber or treated with a 3% solution of chloramine, a 3% solution of perchloric lime; hands are disinfected with a 1% chloramine solution. Quarantine restrictions are removed from a swine smallpox-afflicted farm 21 days after complete recovery, death or slaughter of smallpox-affected animals, treatment of the skin of pigs with a 1-1.5% solution of creolin or lysol, 0.3% solution of caustic alkali, as well as carrying out final measures. Hot 2-4% solutions of caustic soda or potassium are used to disinfect premises and care items; 20% mixture of freshly slaked lime; clarified solution of perchloric lime containing at least 2% active chlorine; hot 3% solution of sulfate-carbolic mixture; 2% formaldehyde solution. Manure is disinfected for 3 weeks by the biothermal method, manure - by pouring quicklime or chlorinated lime into manure collectors at the rate of 1 part of lime to 5-6 parts of manure. The clothes and shoes of the service and veterinary staff are disinfected in a paraformalin chamber.

When smallpox appears in cattle, the sick animals are isolated and treated. Milk from sick cows is pasteurized. Patients with horse pox are isolated and treated. Veterinary and sanitary measures are carried out in smallpox outbreaks.

Questions and tasks for control.

1. Etiological structure and epizootological features of smallpox in animals of various species.
2. Name the methods of diagnosing smallpox.
3. From which diseases and on the basis of which data should the differential diagnosis of smallpox be carried out?
4. What is the purpose of histological research?
5. In what cases are quarantines introduced when a disease occurs, and when are quarantine restrictions imposed?
6. What is prohibited in a dysfunctional economy?
7. What is the procedure for using milk in smallpox-affected farms?
8. List the biological preparations that are used for immunoprophylaxis of smallpox in animals.
9. What disinfectants are used to disinfect premises?

Chlamydioses

(enzootic abortion of sheep, chlamydia of pigs, chlamydia of cattle*)*

General characteristics of chlamydia.

Chlamydioses is a group of infectious diseases caused by pathogenic obligate intracellular microorganisms of the genus Chlamydia, which are characterized by multiple mechanisms and ways of transmission, various clinical manifestations, and have.

Chlamydias were first discovered by S. Provacek in 1907, who gave them the name "chlamydozoa" due to the fact that they form intracellular microcolonies surrounded by a mantle - "chlamyda" (from the Greek chlamus - cloak). Chlamydia are obligate intracellular parasites of humans and animals. This is a peculiar taxonomic group of pathogenic microorganisms with similar antigenic, morphological, and biochemical characteristics. Chlamydia do not freely exist outside the cell of the host organism, because they are not capable of independent synthesis of ATP and use the bioenergetic systems of macroorganism cells. Normal development of chlamydia is possible only in conditions of intracellular parasitism. Chlamydia reproduce by binary fission. Chlamydia are small bacteria, spherical or oval in shape, have two nucleic acids, do not form spores and capsules, are non-motile, gram-negative. Reproduce by dividing transversely. Cultivated on tissue cultures and chicken embryos, contain DNA and RNA (Fig. 1).

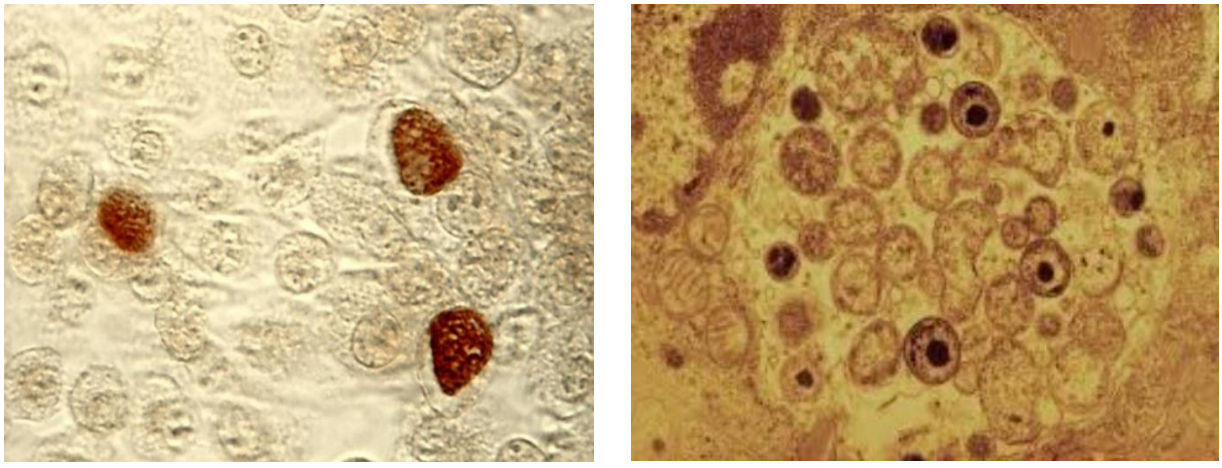

Fig. 1. Chlamydia under microscopy.

The life cycle of chlamydia is represented by two cell forms that can exist both inside and outside the cell: highly infectious, highly virulent, extracellular, which do not show metabolic activity, elementary bodies that have a spherical shape, and a vegetative form - reproductive intracellular reticular bodies that can have an ovoid shape , crescent, bipolar rods, coccobacillus. Carriers of chlamydia species are elementary bodies. The life cycle begins with the infection of sensitive cells of the host by elementary bodies using the so-called process of pinocytosis (phagocytosis).

Thus, the first stage of the infectious process is the attachment of the metabolically inactive, but infectious form of chlamydia, the elementary body, to the host cell. Usually these are cells of the non-ciliated cylindrical or cubic epithelium of mucous membranes (conjunctiva), epithelial cells of various organs, reticuloendothelial cells, leukocytes, monocytes and macrophages. After attachment, the elementary body is phagocytosed (penetrates the host cell). Inside the cell, the elementary body of chlamydia exists in a cytoplasmic vacuole - the phagosome, where chlamydia remain throughout the growth cycle, forming a kind of microcolony. A cell can contain several elementary bodies at the same time, that is, several microcolonies of chlamydia can appear in the cytoplasm of cells. Each cycle of reproduction of chlamydia lasts on average from 48 to 72 hours.

How intracellular parasites of chlamydia multiply in the yolk sac of chicken embryos (6–7 days old) at a temperature of 33-41°C, in cell cultures of various vertebrates, as well as in the body of sensitive animals (in the lungs of mice, guinea pigs, in the conjunctiva primates).

Outside the body, at room temperature, chlamydia die in 24–36 h, but some species (for example, C. psittaci) are able to persist in the external environment for up to 2–3 weeks. Chlamydia are sensitive to high temperatures (at a temperature of 90-100°C they die within 1 minute, at 60-70°C – 10 minutes, at 50°C – 30 minutes), ultraviolet rays, antiseptics and disinfectants (70% alcohol, 6% hydrogen peroxide, 2% chloramine solution). In the environment, chlamydia die quite quickly under the influence of drying and elevated temperatures. At low temperature values (from –20 to –70°C) in a lyophilized state, chlamydia remain contagious for years.

All detected chlamydia are pathogenic, they are not among representatives of normal microflora. Factors of pathogenicity include adhesion factors (chlamydia show tropism to cells of cylindrical epithelium), surface membrane antigens, endotoxin, exotoxin. Representatives of the genus Chlamydophila are particularly pathogenic for animals and birds. Chl. abortus is widespread among ruminants, causing abortions, stillbirths, gynecological diseases in cattle, pigs, sheep, goats, horses, and laboratory animals; arthritis and polyarthritis in young children; meningitis and encephalitis, conjunctivitis and damage to lymphoid organs. Chl. pecorum is exclusively a causative agent of animal disease. It is isolated from cattle and sheep suffering from encephalitis, polyarthritis, pneumonia and diarrhea. For Chl. psittaci main hosts are birds. Chl. felis causes conjunctivitis and rhinitis in domestic cats. Moreover, all these species can be transmitted to humans and, under certain conditions, cause zoonotic infections. Chl. trachomatis and Chl. pneumonia are pathogenic exclusively for humans. Chlamydia are widespread in nature. In addition to humans, they are found in more than 200 species of animals and birds, in some fish, molluscs, arthropods and higher plants.

Enzootic abortion of sheep

Enzootic abortion of sheep or Chlamydiosis of sheep (lat. – Abortus enzootica ovis) – a contagious, enzootically occurring disease, which is clinically manifested mainly by abortions in the last week of gestation or premature eye and the birth of weak, non-viable lambs.

The causative agent of the disease – Chlamydophila abortus ovis. All representatives of this genus are antigenically related, have common cultural-morphological and tinctorial properties. Chlamydia are clearly visible under a light microscope. Chl. abortus ovis is easily cultured in the yolk sac of 6-7 day-old chicken embryos, causing their death 8-12 days after infection. Among laboratory animals, white mice, rats, guinea pigs, rabbits are sensitive to the causative agent of sheep abortion, which develop pneumonia upon infection. In pathological material from aborted fetuses, the causative agent remains in an active state at temperatures below -20°C for many months. In the external environment, it dies after a few days, at 100°C - instantly.

Epizootological data. Sheep chlamydia occurs in the form of enzootic disease, with the strongest spread of infection during the lambing period. The source of infection is sick and diseased animals. At the initial manifestation of infection in a healthy flock in the first 2-3 years, the number of abortions and premature births in sheep of various ages reaches 20-30, even up to 60%. Sheep from the second contiguity are most affected. After abortions or premature lambing, most sheep develop immunity, and in the future, the incidence does not exceed 5-10% per year. The main source of the causative agent of the infection is sick animals that came from a dysfunctional farm. Hidden bacterial carriers are especially dangerous. The causative agent is released into the external environment with milk, amniotic membranes, vaginal secretions, feces and urine. The vertical path of transmission of the pathogen is also not excluded. Lambs can become infected immediately after birth from their mothers while sucking.

Mass infection of animals occurs when healthy sheep come into contact with sick sheep during the period of colic, calving and in the next 2 months after it. Contaminated feed, water, animal care items can serve as factors for the transmission of the causative agent of the disease. A significant number of sheep are infected during the mating season. In natural conditions, infection occurs through food and during mating. Breeding rams are easily infected from sick sheep by contact and can later transmit the pathogen to healthy ewes with their semen, although the sexual route in chlamydia is not the main one. The infection spreads especially quickly in conditions of unsanitary placement of sheep, with insufficient control over mating, hunting, as well as over the state of offspring.

Clinical signs. The incubation period in natural conditions lasts from several months to 1 year, and in some cases - longer. The duration of the incubation period

depends on the period of exposure of the sheep, as well as on the virulence and dose of the pathogen. The infection can be latent and typical.

Latent course of the disease is revealed only when examining the blood serum in the complement binding reaction. Labor in latently sick sheep goes normally, but their amniotic membranes and secretions from the genital organs contain chlamydia, so such sheep have long been considered dangerous carriers of the causative agent of the disease. Lambs from such sheep develop relatively poorly and are hidden carriers of chlamydia.

The typical course of the disease is characterized by abortions and premature lambing with the appearance of weak, non-viable lambs. Such lambs, as a rule, soon die. A few days before abortions or premature births, sheep often show such symptoms as increased body temperature, colic, muco-purulent discharge from the genitals. Discharges are also observed after abortion or vomiting. Due to the addition of a secondary bacterial infection, the animal's body temperature rises again and purulent-smelling secretions with an acidic reaction appear. Such allocations are observed within 3-6 weeks. If the abortion does not occur, the fetuses continue to develop, the lambs are born weakened. They usually suffer from arthritis, partial or complete paralysis of the limbs, incoordination of movements and in some cases conjunctivitis.

Ewes are often in a difficult condition after giving birth to a dead offspring and may die suddenly or after a few days. If the fetus dies during the abortion, then the general condition of the sheep, as a rule, deteriorates slightly, but a decrease in fatness and fertility is constantly noted; complete infertility is rarely observed. Sometimes the disease can manifest as interstitial pneumonia, polyarthritis and conjunctivitis.

Pathological changes. In aborted fetuses, hemorrhagic swellings and hemorrhages of varying intensity are found in the subcutaneous and muscle tissues, as well as bloody-serous transudate in the chest and abdominal cavities. Often an aborted fetus is mummified. In some cases, the entire chorion is affected, and in others, only its individual parts. The color of the affected areas of the chorion is from dark red to light brown. As a result of swelling and hemorrhages, limited thickenings are formed on the chorion and its surface becomes bumpy. Affected kotledons lose the color of normal tissue, they become elastic, brown in color. Some catheledons are significantly necrotic, the epithelium and vessels are often completely destroyed by inflammatory exudate. Hemorrhages in the brain and its membranes, stagnant blood supply and liver dystrophy are noted in aborted fetuses.

Diagnosis and differential diagnosis. The diagnosis of chlamydial abortion of sheep is made comprehensively. Of the laboratory methods for diagnosing chlamydial abortion in sheep, the following are mandatory:

1) microscopic detection of inclusions and elementary bodies of chlamydia in utero-vaginal secretions and in the organs of aborted fetuses;
2) detection of specific antibodies in the complement binding reaction or indirect hemagglutination reaction in diagnostic titers in the blood sera of aborted ewes;
3) isolation of the pathogen on chicken embryos, study of its morphological and tinctorial properties by staining preparations according to the Stamp method and carrying out serological identification.

The most reliable method of diagnosing chlamydial abortion in sheep is the isolation of the pathogen on 6-7 day old chicken embryos.

In differential diagnosis, sheep diseases such as brucellosis, salmonellosis, campylobacteriosis, listeriosis, leptospirosis, Ku-fever, and toxoplasmosis are excluded. The results of laboratory studies play a decisive role in differential diagnosis.

Immunity, specific prevention. Chlamydia have weak immunogenic activity, they are able to induce both humoral and cellular immune response. For the specific prevention of chlamydia, an inactivated emulsin vaccine against chlamydial abortion of sheep has been developed.

Treatment. It's economically justified to use antibiotics for prophylactic purposes during the period of insemination or mating of ewes, when individual cases of abortion in sheep are observed in the farm. The best results are obtained from the use of tetracycline, spiramycin, reverine and other antibiotics of the tetracycline series.

Prevention and control measures. For prevention, the following complex of veterinary and sanitary measures is recommended:

- purchased sheep are allowed on the farm or in the flock of prosperous farms only if there are no abortions or premature vomiting in the very first vomiting period and no hidden chlamydia carriers are detected during special microscopic and serological tests;
- carry out farrowing in isolated rooms, strictly observing all veterinary and sanitary rules;
- systematically research rams, using artificial insemination of sheep and timely disinfection on the sheep farm.

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When a diagnosis of chlamydia is established, the farm is declared unhealthy and restrictions are introduced. A general serological examination of blood sera of positively reacting and aborted ewes, rams and rams is isolated, treated or sent to slaughter. Negatively reacting animals are vaccinated before insemination. In general, measures are carried out in the same way as for chlamydia in cattle.

Carrying out the specified special veterinary-sanitary and medical-preventive measures makes it possible to eliminate diseases in sheep and to remove restrictions from dysfunctional farms 30 days after their completion.

Chlamydiosis of pigs

Chlamydiosis in pigs (Chlamydiosis suum) –a chronic disease of pigs of all age groups, which is characterized by abortions in sows, the birth of dead or non-viable offspring, in boars by orchitis and balanoposthitis, in piglets by pneumoenteritis, encephalomyelitis, arthritis.

The causative agent of the disease – Chlamydiae psittacci var. Suis – belongs to the genus Chlamydia. They are reproduced in the cytoplasm of sensitive cells by binary fission of initial particles, which are transformed into initial elementary bodies. Cultivated in the yolk membrane of 6-7 day old chicken embryos, as well as in the body of white mice with intracerebral or intraperitoneal infection. Stable in the external environment. In a lyophilic state, they remain viable for more than 3 years, in a frozen state - up to one year, at room temperature - up to 10 days, in water - up to 17 days, in livestock premises in dried excrement - up to 6 months. They are inactivated at 80°C after 30 min, at 70°C – after 45 min, under the action of ultraviolet radiation – after 30 s. They quickly die under the influence of a 2% solution of caustic soda, a 1% solution of hydrochloric acid, and 75° ethyl alcohol. Sensitive to tetracycline antibiotics.

Epizootological data. Chlamydia affects pigs of all age groups. The main source of the causative agent of infection in pigs is infected breeding boars and sows, in whose bodies chlamydia persists practically all their lives. The causative agent is released from the body of infected pigs with feces, semen, bronchial mucus, amniotic fluid, and aborted fetuses. Infection occurs through alimentary and aerogenous routes, as well as through infected sperm during mating. Factors of transmission are secretions of sick animals, bedding, care items, milk of sick cows and pigs, as well as ticks, mealybugs, and flies. In pigs, chlamydia manifests itself seasonally, the largest number of abortions and stillborn piglets occurs in the winter-spring period.

Clinical signs. At the initial outbreak of infection in the farm, mass abortions are observed in single sows, which occur at the end of gestation and can reach 80-100% of cases. Abortions and the birth of dead and non-viable piglets are also noted in parts of the main sows. Abortions are registered only in one-time sows in permanently dysfunctional farms. At the same time, there are no deviations in the state of health of aborted animals, with the exception of a slight increase in body temperature and a decrease in appetite, sometimes - agalactia, metritis.

In adult boars, the disease is chronic, without obvious clinical signs, orchitis, arthritis, and decreased sexual activity are sometimes observed. However, in young boars, which have entered the center of infection for the first time, chlamydia is acute

and is accompanied by damage to the respiratory, digestive and reproductive systems. They experience depression, refusal to feed, an increase in body temperature to 40.5-41.0°C, a deep and frequent cough, diarrhea, constipation, vomiting, depression, and sometimes death. As a result of damage to the joints, some boars limp. After 8-10 days, the clinical signs of the disease disappear, the animals begin to recover slowly. In sick boars, swelling in the foreskin area, enlargement of the testicles, and acceleration of urination are noted (Fig. 2).

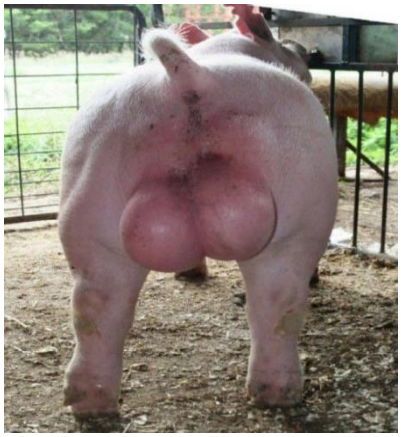

Fig. 2. Chlamydial orchitis.

Newborn piglets are lethargic, with a weak sucking reflex, their skin is hyperemic, with a bluish tint, the mucous membranes are pale and dry. Such piglets usually die on the 5-7th day of life. When piglets 3-4 days old are sick, there is an increase in body temperature up to 41-42°C, cyanosis of the mucous membranes, catarrhal rhinitis, in 3-5% of sick piglets serous, eventually purulent conjunctivitis, short-term diarrhea. In the future, rapid exhaustion of sick piglets occurs, the skin acquires a yellow-brown color, and dark brown crusts form on it. Some piglets show signs of damage to the central nervous system. Up to 20-60% of piglets may die during 2-3 weeks of enzootic disease. When piglets over 2 months old are sick, damage to the respiratory organs, conjunctivitis, short-term diarrhea, and weight loss are observed. In most animals, limited necrotic lesions of the skin in the areas of the ears, trunk, and tail are detected, in some piglets polyarthritis.

During the chronic course of chlamydia, pigs of all age groups develop arthritis, enteritis, conjunctivitis, and pneumonia. In boars, the chronic course of the disease is most often registered, without clearly expressed clinical signs. Weight loss, decreased sexual activity, orchitis and arthritis are observed.

Pathological changes. Endometritis, sometimes localized necrosis of the uterine mucosa, as well as edema and infiltration of the placenta are found in sows that have aborted. In dead boars, an increase in the size of the epididymis by 1.5-2 times, hemorrhagic inflammation of the vas deferens, balanoposthitis, orchitis is observed. In aborted fetuses and piglets that died in the first days of life, edema of the

subcutaneous connective tissue in the head, chest, shoulder blades, diffuse hemorrhages in the parietal part of the head and on the limbs, accumulation of exudate in the chest and abdominal cavities, pericardial sac, subpleural spaces, blood filling and hemorrhages in the liver, foci of inflammation in the lungs. When joints are affected in piglets, an increase in the amount of synovial fluid, roughness and redness of the capsule of the inner surface of the joints are noted. During the pathohistological examination, significant lymphoid-histiocytic and neutrophilic infiltration of the mucous membrane of the uterus, perivascular lymphoid-cellular infiltrates, foci of necrosis and necrobiosis in the liver of aborted fetuses, significant blood filling and necrotic foci in the center of individual seminiferous tubules are established.

The *diagnosis* is made on the basis of a clinical and epizootological examination of livestock, pathomorphological data and the results of laboratory studies.

Laboratory diagnostics. It provides for the microscopy of smears-imprints from the affected organs of slaughtered sick sows, as well as aborted fetuses; isolation of the pathogen on chicken embryos and its identification; biological test on white mice; detection of anti-chlamydial antibodies in blood serum. Rennet, pieces of placenta, aborted fetuses, vaginal mucus taken from slaughtered sows that have aborted are sent to the laboratory in a thermos with ice. From dead or aborted piglets - pieces of liver, lungs, spleen, lymph nodes, bladder, synovial fluid. In case of suspicion of diseases of the testicles - fresh or frozen sperm, and in case of slaughter - testicles, parts of parenchymal organs, lymph nodes. Blood serum of suspected animal diseases, as well as those sows that have aborted, are sent for serological tests.

For microscopic examination, smears and smear-imprints are prepared from pathological material, which are fixed with methanol, stained according to Romanovsky-Giemza and Macchiavello, Stamp, as well as by direct and indirect methods of immunofluorescence. With the help of immersion microscopy, colored elementary bodies and cytoplasmic inclusions are detected, and under a fluorescent microscope - their specific bright green glow. In order to isolate chlamydia, infection with pathological material is carried out in the yolk sac of 6-7 day old chicken embryos. With positive results, the death of 70-80% of infected chicken embryos is observed. Microscopy of smears from the yolk membranes, sometimes from the chorionallantoic membrane reveals elementary bodies of chlamydia. To conduct a bioassay, the pathological material in a volume of 0.5 ml is injected into three white mice intranasally, intracerebrally or into the abdominal cavity. With positive results, infected mice die in 3-5 days or 1-3 weeks. At their autopsy, a significant increase in the spleen is revealed, and at the microscopy of smears-imprints, elementary bodies of chlamydia. Serological studies involve the use of diagnostic group or species-

specific chlamydial antigen. Serum titers in a dilution of 1:8-1:16 indicate a latent infection or the beginning of the disease, 1:32 and above - a transferred disease.

Differential diagnosis. Chlamydia is differentiated from brucellosis, leptospirosis, salmonellosis. The results of the isolation of the causative agent of the corresponding disease from the pathological material and the detection of specific antibodies in the blood sera are of decisive importance for this.

Treatment. Not conducted. Sick and suspected animals with chlamydia disease are slaughtered at a sanitary slaughterhouse.

Specific prevention. For specific prevention, an inactivated emulsin vaccine against chlamydial abortion of cattle, sheep, goats and pigs is proposed. The vaccine is intended for use in disadvantaged and chlamydia-threatening farms. Animals are vaccinated subcutaneously once, once a year in doses: pigs aged 1 to 6 months - 1 ml, over 6 months - 2 ml. Immunity is formed 20-25 days after vaccination and lasts for 12 months.

Prevention and control measures. They include strict observance of veterinary sanitary and zoohygiene rules during the collection and breeding of pigs. Special attention should be paid to the protection of the farm against the introduction of the causative agent of the disease from the outside. In this regard, breeding farms that are stationary with regard to chlamydia are particularly dangerous. Therefore, it is necessary to carry out chlamydia serological tests in advance in supplier farms. During the 30-day preventive quarantine, 10% of imported pigs must be examined for chlamydia by serological method. At the same time, even a low titer (1:4) of indicators of the complement binding reaction indicates the presence of chlamydia and the infection of livestock. At the same time, a thorough clinical examination of the pig herd and all suspicious animals with the manifestation of conjunctivitis, orchitis, rhinitis, local skin necrosis, and chlamydia are checked serologically. For preventive purposes, at stations and points of artificial insemination, all breeding boars are examined for chlamydia serologically once every 6 months, and when introducing new livestock, they are examined during their quarantine period.

When pigs are transferred to the main farm, their skin and limbs are treated with 1% formaldehyde solution or 0.5% sodium hydroxide solution. General preventive measures are carried out on the farm. In order to timely detect chlamydia in the event of abortions, the birth of a dead, non-viable offspring, the death of piglets in the first days of life, as well as other clinical signs characteristic of chlamydia, complex laboratory tests are immediately carried out.

When chlamydia is detected, the farm is declared unhealthy for this disease, appropriate restrictions are introduced in it, first of all, a ban on the export and import of pigs, their regrouping, and health measures are carried out. Aborted fruits, fruit membranes, corpses of dead animals are collected in moisture-proof containers and disposed of. Machines and premises where sick animals were kept are thoroughly

cleaned and disinfected. All premises, as well as equipment, animal care items are disinfected every 7-10 days. All sick pigs with clinical signs of chlamydia and suspected animal diseases are slaughtered at a sanitary slaughterhouse. Healthy pigs that have had contact with sick pigs are put to fattening and then sent to slaughter. They stop pairing pigs, getting sperm from boars. All boars are serologically examined for chlamydia, which react positively to the RZK or in the semen of which chlamydia is detected, are slaughtered. Sperm obtained from them earlier are destroyed by boiling for 10-15 minutes. Boars that gave negative results during the research for chlamydia, but were in contact with patients, as well as sows and repair pigs are treated with oxytetracycline or dibiomycin. Oxytetracycline is administered intramuscularly twice a day for 5 days at 5,000 units/kg; dibiomycin is used in the form of an oil mixture intramuscularly, twice, with an interval of 10-12 days, 10-15 thousand units per 1 kg of weight. The treatment course is considered completed 7 days after the last administration of the drug. Sows are inseminated only artificially, using sperm from boars from prosperous farms.

For disinfection of premises and machines, use a 2-3% hot solution of caustic soda, a 2% solution of formalin, a clarified solution of chlorinated lime containing 3% active chlorine, a 5% hot solution of soda ash, a neutral solution of calcium hypochlorite for at least 3 hours of exposure . Manure is disinfected by the biothermal method.

Gradually, the entire pig population of the farm is replaced by healthy pigs raised on an isolated farm. The farm is recognized as cured of pig chlamydia if no sick pigs have been registered for three years with negative results of serological tests.

Chlamydiosis of cattle

Chlamydiosis of cattle (lat. – Chlamydophila abortus; chlamydial or enzootic abortion of cows) – mainly a chronic disease of cows, which is characterized by damage to the amniotic membranes, abortions, premature birth of dead or non-viable calves.

The causative agent of chlamydia – Chlamydophila abortus has typical features of chlamydia. It can be isolated from the placenta, uterine secretions, parenchymal organs and rennet contents of aborted fetuses. The causative agent actively multiplies in the yolk sac of 6-7-day-old chicken embryos, causing their death 4-6 days after infection. Characteristic elementary bodies, which have a red color, are found in preparations from the yolk sac of dead chicken embryos, stained according to Stamp and Machiavelli. Pathogenic for white mice and guinea pigs.

In tap water, the causative agent remains viable and virulent for 17 days, in snow - 18, under snow - 29, in pasteurized milk - 23 days. On pasture, in infected

objects it remains viable for several weeks, in livestock premises - for 5 weeks. Boiling kills the pathogen within 2-10 minutes.

Epizootological data. The main source of the causative agent of the disease is patients and carriers, from whose bodies chlamydia is released in various ways, especially during abortion and calving, with secretions from the birth canal, amniotic fluid, as well as with feces, urine, milk, semen, etc. Infection of healthy animals is also possible in many ways: alimentary, aerogenous, contact during sexual intercourse or artificial insemination with sperm from breeding farms that are unfavorable for chlamydia. Cows fertilized with such sperm often develop infertility, intrauterine infection of the fetus occurs, which causes abortions and stillbirths. In infected herds, the share of premature calving or the birth of weak calves with various pathological changes is quite high (up to 50%). Most often, pneumoenteritis occurs between the 15th and 40th day after calving. It has been established that after an abortion, animals become immune to re-infection and, in the absence of changes in the genital organs, are able to reproduce full-fledged offspring. The percentage of abortions in dysfunctional herds, especially among firstborns, can reach 70 or more. Young animals from such animals are infected at birth. Chlamydia has a stationary character, and the largest number of patients is registered in winter and spring, which is explained by closer contact of animals during the winter-stall period and mass calving of cows.

Clinical signs. In cattle, chlamydia is characterized by a wide range of clinical manifestations that depend on age, sex, physiological and immune status of the organism, as well as on virulence and the received dose. In cows, the main clinical sign is abortion, which usually occurs at 7-9 months of pregnancy, but it is also possible at 4 months. The disease begins suddenly, and cows before abortion do not show any clinical signs, except for an increase in body temperature up to 40.5oC. Sometimes progressive exhaustion of animals is noted. In aborted animals, more often in first-borns, litter separation is delayed, metritis, vaginitis develop, and infertility may finally occur. Chlamydial abortion often occurs against the background of bacterial or parasitic diseases (salmonellosis, brucellosis, vibriosis, streptococcosis, trichomoniasis, etc.). In these cases, general septicemia and death of adult animals are possible.

Depending on the route of infection and age, the main signs of chlamydia in young cattle are gastroenteropancreatic colitis, polyarthritis, bronchopneumonia, keratoconjunctivitis, and encephalomyelitis. These signs do not appear simultaneously. Diarrhea, liquid stools with impurities of mucus and blood are noted in newborns. Dehydration of the body occurs, eyes become sunken, calves are very depressed, refuse feed. The body temperature rises to 41.5ºC, leukocytosis and neutrophils are detected in the blood. In addition to diarrhea, polyarthritis is observed in calves 3-10 days old. The carpal and metatarsal joints are most often affected, they

are swollen and painful. Sick calves develop fever, conjunctivitis, weakness, short-term diarrhea, they quickly lose weight and die 2-10 days after the first signs of the disease appear.

Chlamydia in the form of keratoconjunctivitis acquires the character of enzootic among young cattle of different age groups (hbc/ 3). In some calves from 20-30 days to 5-6 months of age, signs of damage to the respiratory organs are more pronounced. Decreased appetite is noted, body temperature rises to 40.5oC. Discharges appear from the nasal cavity, on the 3rd-5th day - cough, wheezing in the lungs. Often the disease is complicated by secondary autoinfection, sometimes occurs in association with adenoviruses, causative agents of parainfluenza-3.

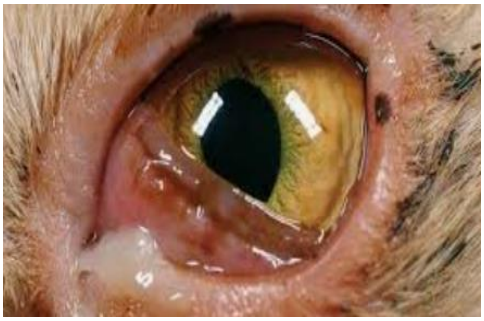

Fig. 3. Chlamydial conjunctivitis.

In bulls, chlamydia is characterized by orchitis (Fig. 4), balanoposthitis, urethritis.

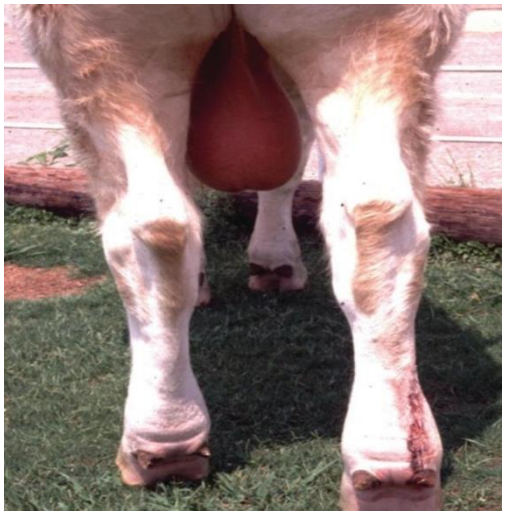

Fig. 4. Chlamydial orchitis.

In sick bulls, the testicles are slightly enlarged, painful, immobile. Animals are restless when urinating, shift from foot to foot, thick exudate is released from the foreskin. In one-year-old bulls, the disease proceeds practically without pronounced clinical signs, but the quality of sperm significantly deteriorates (decrease in sperm concentration and mobility, aspermia, necrospermia). In smears of sperm from sick

bulls, a large number of cellular elements with a predominance of neutrophils are detected.

Pathological changes. Macroscopic changes in the genital organs of cows with chlamydia cannot be considered specific. The intensity of pathological changes in aborted fetuses and placentas of cows depends primarily on the term of pregnancy. Fetuses of cows aborted before 6 months of age do not have pronounced lesions. Only an increased amount of reddish liquid in the pleural and abdominal cavities, as well as subcutaneous reddish edema, is noted. When examining the fetuses of cows aborted at 7-9 months of gestation, a number of pathological changes can be detected that have diagnostic value. This is pallor of the mucous membranes, swelling of the skin and subcutaneous tissue, especially in the head area, very often clearly visible hemorrhages on the skin, on the mucous membrane of the oral cavity and tongue. Lymph nodes in the fetus are enlarged and swollen. The liver is enlarged, granular, loose consistency, from light yellow to red-orange color. Foci of inflammation in the myocardium and in the cortical layer of the kidneys are also specific. Changes are detected in placentas, the degree of expression of which also depends on the term of pregnancy and the duration of infection until the moment of abortion.

At autopsy of calves, signs of catarrhal gastroenterocolitis are noted, the mucous membrane of the rennet is swollen, dotted with multiple hemorrhages, pericarditis, pleurisy, and pneumonia are observed. Dystrophic, necrotic changes in the parenchyma are clearly visible in the liver. The joints contain a grayish-yellow fluid, the joint capsule is dotted with hemorrhages, sometimes necrosis of the cartilage and its detachment from the bone tissue are possible. In bulls, multiple necrotic foci are visible in the testicular parenchyma.

Diagnosis and differential diagnosis. The diagnosis of chlamydia is made comprehensively, taking into account epizootological data, clinical signs, patho-anatomical changes and laboratory test data. The presence of stationary dysfunctional farms due to the enzootic course of abortions in cows, changes in the placenta and fetuses, as well as the detection of elementary bodies and inclusion bodies in smears-imprints of tissues of the affected parts of the placenta make it possible to make a preliminary diagnosis. To clarify the diagnosis, the following are sent to the laboratory of veterinary medicine: blood serum from aborted or suspected animals, taken twice: during the clinical manifestation of the disease and again after 14-21 days; pathological material from dead or slaughtered animals (pieces of placenta, lymph nodes, parenchymal organs.

Laboratory studies include:

1) detection of specific antibodies in blood serum of patients in RZK, RNGA, IFA;

2) detection of chlamydia and their antigens in pathological material by light or fluorescent microscopy;

3) isolation of chlamydia on chicken embryos, in cell culture.

Chlamydial bronchopneumonia of young cattle must be differentiated from viral respiratory diseases (infectious rhinotracheitis, pustular vulvovaginitis, parainfluenza-3, viral diarrhea, adenovirus infection), as well as mycoplasmosis, pasteurellosis.

Treatment. Treatment of sick animals should be complex and include etiotropic, symptomatic and measures aimed at preventing possible complications from endogenous microflora. Antibiotics of the tetracycline series, to which the causative agent is highly sensitive (tetracycline, biomycin, oxytetracycline, etc.) are mainly used as etiotropic therapy for chlamydia. Sulfonamide drugs do not work on chlamydia.

Immunity, specific prevention. Chlamydia in the body of infected animals induce both humoral and cellular immunity. Immunity is non-sterile. Specific prevention of chlamydia in cattle has been developed in many countries. Vaccination is a mandatory measure for the recovery of farms from this disease. Emulsin vaccine is used for specific prevention of cattle.

Prevention and control measures.

In order to prevent the disease, it's necessary:

a) farms are stocked with clinically healthy animals;

b) do not allow animals of different species to be kept together, as well as limit their contact with domestic and wild birds as much as possible;

c) create an optimal microclimate in the premises, adhere to the principle "everything is free - everything is occupied";

d) breeding bulls in all categories of farms should be tested serologically for chlamydia twice a year (in spring and autumn).

When a disease is detected, the farm is declared unhealthy and restrictions are imposed. In patients with chlamydia of cows, in which retention of droppings and inflammatory processes in the genital organs, general treatment is combined with local treatment. Calves with increased body temperature, swelling of the joints, cough and eye damage are treated with antibiotics of the tetracycline series. For the treatment of calves suffering from chlamydial bronchopneumonia, the most effective use of drugs in the form of aerosols in special chambers. Treatment of sick breeding bulls is carried out by giving tetracycline hydrochloride or oxytetracycline inside for 10 days. When a disease is detected, the farm is declared unhealthy and restrictions are imposed. In patients with chlamydia of cows, in which retention of droppings and inflammatory processes in the genital organs, general treatment is combined with local treatment. Calves with increased body temperature, swelling of the joints, cough and eye damage are treated with antibiotics of the tetracycline series. For the treatment of calves suffering from chlamydial bronchopneumonia, the most effective use of drugs in the form of aerosols in special chambers.

Treatment of sick breeding bulls is carried out by giving tetracycline hydrochloride or oxytetracycline inside for 10 days. 2 months after the course of therapy, bulls are examined for the presence of antibodies in blood serum and the quality of semen. A repeated positive serological reaction and the presence of chlamydia sperm in smears serve as grounds for culling this animal. In breeding farms, where cases of bulls with chlamydia are registered, in parallel with the serological examination, a microscopic (immunodiffusion reaction) examination of the ejaculate is carried out in order to detect chlamydia. Animals that have specific antibodies in their blood and chlamydia in their ejaculate are sent to slaughter, and the sperm collected from them is destroyed.

The premises are subject to mechanical cleaning and disinfection. Aborted fruits, fruit membranes, corpses are collected in moisture-proof containers and taken away for disposal. Manure and litter are piled up and disinfected biothermally. For disinfection of livestock premises, walking areas, corrals, use a 4% solution of sodium hydroxide, a 4% solution of chloramine, a 3% solution of phenosmolin after exposure for 3-4 hours, a solution of chlorinated lime with a content of 3% active chlorine. The forced slaughter of animals is carried out at a sanitary slaughterhouse. The carcass and unchanged organs are released after cooking, the changed organs are sent for disposal. Skins obtained from the slaughter of animals clinically sick with chlamydia are released after disinfection. Milk from seronegative animals is used without restrictions, from aborted and seropositive cows - it must be boiled for 30 minutes. and can be used in the farm only for feeding animals.

Restrictions from the unfavorable point are removed 30 days after the recovery of sick animals and the completion of final measures.

Questions and tasks for control.

1. By what cultural and morphological, pathogenic, toxigenic and antigenic properties do chlamydia differ from rickettsiae and mycoplasmas?

2. Reveal the manifestation of the symptom complex of chlamydia in animals of various species.

3. List currently used means and methods of specific diagnosis and immunoprophylaxis of chlamydia.

4. How to prevent chlamydia in animals of different species?

5. What means are recommended for etiotropic and symptomatic treatment of chlamydia?

6. Name the main measures for the elimination of chlamydial abortion of sheep, chlamydia of cattle, and pigs.

Rickettsioses

*(*Q-fever, *infectious hydropericarditis, infectious keratoconjunctivitis)*

Rickettsioses are a group of acute infectious diseases of animals and humans, which are caused by microorganisms - rickettsiae (Fig. 1).

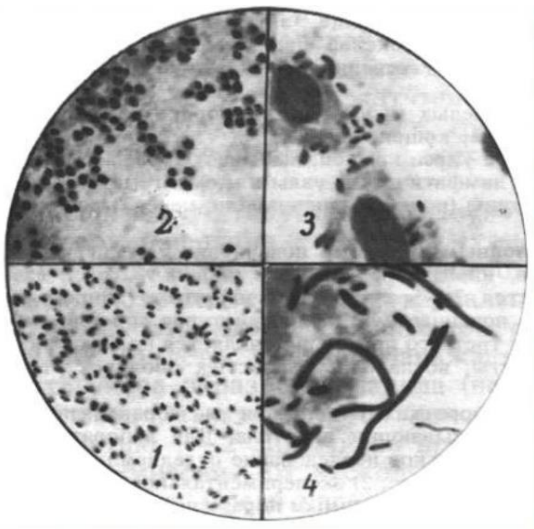

Fig. 1. Morphological types of rickettsia:
1. cocciform rickettsiae; 2. rod-shaped rickettsiae;
3. bacillary rickettsiae; 4. filamentous rickettsiae.

Rickettsiae parasitize the body of various insects (fleas, lice) and ticks. Infected fleas and ticks can store rickettsiae for a long time. Under natural conditions, rickettsioses occur in various wild mammals. In humans, rickettsiosis occurs in the form of febrile diseases of varying severity. The disease begins acutely, proceeds with high temperature, headache, muscle pain and skin rash.

Q-fever

Q-fever (*Q-Febris, rickettsiosis, coxiellosis*) –a naturally-occurring infectious disease of many species of farm and wild animals, caused by rickettsiae and mostly asymptomatic, sometimes with signs of fever, pleurisy, pneumonia. Human is susceptible to disease.

It belongs to a group of diseases called rickettsioses. In humans, this disease is registered on all continents except Scandinavia. Q-fever has been found in farm animals in Australia, Africa, Asia, America and Europe, as well as in many Central Asian republics of the former Soviet Union. This disease is not registered in Ukraine. Economic losses due to Q-fever are insignificant due to its benign course in animals. However, it is necessary to take into account the great danger of sick animals as a source of infection for humans.

The causative agent of the disease – Coxiella burneti (Rickettsia burneti) belongs to the Rickettsiaceae family and is a small, polymorphic immobile cocoon-like bacillus that is inside the cells of various organs and tissues and passes through bacterial filters (Fig. 2).

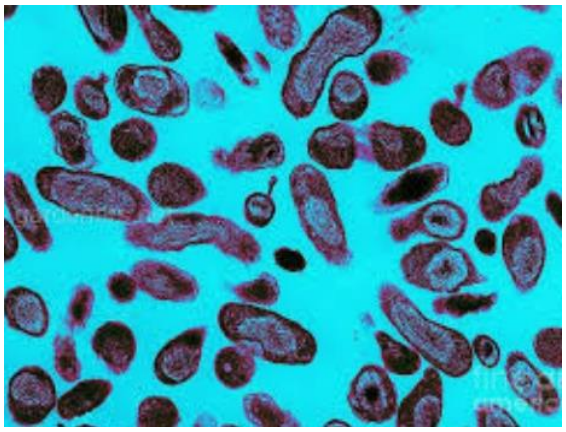

Fig. 2. Coxiella burneti.

It's painted according to Romanovsky-Giemza and Zotov-Blinov. Cultivated in chicken embryos and cell cultures. Among laboratory animals, guinea pigs, white mice and gophers are susceptible to rickettsiae. Rickettsiae are extremely stable in the external environment and can be stored in dried feces of vector ticks for up to 1.5 years, dry blood for 5-6 months, urine for several weeks, and manure prepared for biothermal disinfection for at least 32 days. Does not destroy when heated to 60°C for 1 hour, does not disinfect in milk during pasteurization. It's stored in cheeses for 25 days, in butter made from the milk of sick animals, at 5°C it survives up to 41 days, in fresh meat at 4°C – 30 days, in salted meat – up to 90 days, in water at room temperature - up to 16 days. Dies under the action of 3% chloramine solution, 3% phenol solution, 3% caustic soda solution, 3% creolin emulsion.

Epizootological data. Cattle, sheep, goats, pigs, horses, camels, buffaloes, dogs, chickens, geese, pigeons are susceptible to the disease. The source of the causative agent of infection is sick animals and carrier animals that secrete rickettsiae with milk, saliva, urine, feces, nasopharyngeal mucus, with infected fruit membranes and amniotic fluid. Carriership of the causative agent in conditions of natural infection lasts up to 2 years. Infection occurs mainly through the bites of vector ticks, alimentary, aerogenous, as well as by direct contact. Factors of transmission of the pathogen can be fodder, litter, skins, wool, meat, clothing of service personnel, care items contaminated with secretions of sick animals. Ixodes ticks play a significant role in the preservation and spread of the causative agent of the disease, in the body of which rickettsiae can persist for 670 to 979 days. Susceptibility to infection of wild rodents and ticks that parasitize them lead to the formation of natural foci of the disease. In the case of an initial

outbreak of infection in previously prosperous farms, the disease can cover 40-50% of the herd within 2 months. The fatality rate reaches 20%.

Clinical signs and course of the disease. Q-fever in domestic and wild animals is asymptomatic and is diagnosed only with the help of serological, allergic and biological studies. Some animals may experience short-term fever (41-41.8°C), depression, decreased appetite, serous-catarrhal conjunctivitis and rhinitis, swelling of the joints during an exacerbation of the disease. Pregnant females have abortions, birth of non-viable offspring (Fig. 3), mastitis, males have orchitis. Sick animals may have a periodic increase in body temperature, decrease in milk production, and excretion of rickettsiae in milk, urine, and feces for 5-8 months. Bronchopneumonia develops in dogs, and the spleen is enlarged.

Fig. 3. Birth of a non-viable fetus in cow with Q-fever.

Pathological changes. They are not specific and insignificant, therefore they have no diagnostic value. In complicated cases, damage to the pleura, lungs, fetal membranes, uterus, and foci of fibrinous mastitis is observed.

Diagnostics. The diagnosis is based on epidemiological, epizootological, data and results of laboratory studies. Affected lungs, spleen and placenta, preserved with 50% glycerin solution, as well as blood and secretions of sick animals are sent to the laboratory for research. Paired blood sera are sent for serological studies.

Laboratory diagnostics involves direct microscopy of smears from blood, milk, the surface of cotyledons, placenta, stained according to Romanovsky-Giemsa (Fig. 4), examination of blood sera by complement binding reaction, and conducting a biological test on guinea pigs and chicken embryos. During the serological examination from the 7th to the 13th day of the disease, specific antibodies are detected in diagnostic titers of 1:16 and higher. Milk from suspected infected animals can be tested for the presence of rickettsiae using a guinea pig bioassay. To obtain a pure culture of rickettsiae, pathological material from dead infected guinea pigs is passaged on chicken embryos.

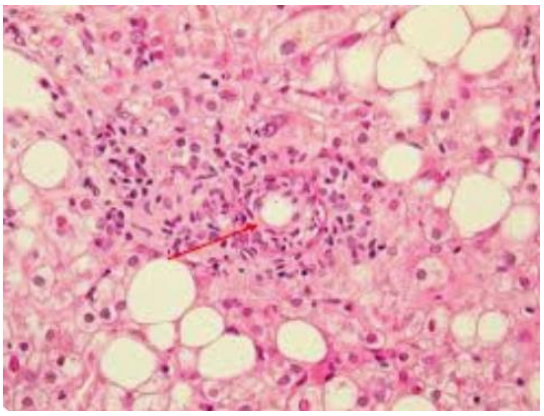

Fig. 4. Coxiella burneti in a smear from pathological material.
Staining according to Romanovsky-Giemsa

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Differential diagnosis. Presupposes the need to rule out brucellosis, listeriosis and rickettsial monocytosis with the help of bacteriological and serological studies.

Treatment. No specific therapy has been developed. Antibiotics of the tetracycline series, symptomatic agents are used.

Specific prevention. Immunity has not been studied. There are no specific means of prevention of Q fever in animals. In medical practice (USA, Czech Republic) inactivated emulsion vaccines are used.

Prevention and control measures. Aimed at preventing the introduction of disease from disadvantaged countries, which is constantly carried out by the border veterinary control service. In the event of Kou fever, appropriate measures are taken immediately. All animals of the disadvantaged group are slaughtered, thorough disinfection, disinsection, deratization and anti-tick measures are carried out in the places of their temporary stay. For disinfection, a 2% solution of caustic soda, a 2% solution of formaldehyde, a 3% solution of creolin, and a 20% suspension of freshly slaked lime are used. Manure is burned.

Infectious hydropericarditis

Infectious hydropericarditis (*hydropericarditis rickettsiosa*, koudriosis, infectious dropsy of the heart) –a transmissible, mostly acute septic disease, mainly of ruminants, as well as omnivorous animals. It is accompanied by fever, damage to the central nervous system and accumulation of exudate in the pericardial sac. Widespread in many African countries, where it causes significant economic damage to livestock; also registered in Jordan, Lebanon, Syria, Madagascar, Yugoslavia and the USA.

The causative agent of the disease – R. (Cowdria) Ruminantum – has a coco-like shape. Can be dyed with all aniline dyes (Fig. 5).

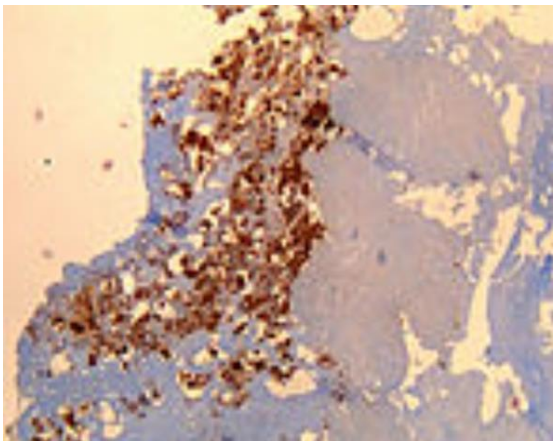

Fig. 5. Rickettsia Cowdria on a heart valve.
Staining with hematoxylin.

5-day-old chicken embryos are cultivated in the yolk sac, which die 4-7 days after infection. It's localized in the plasma of the endothelium of vessels of the cerebral cortex, aorta, jugular veins, and kidneys. It appears in the blood of animals on the 2nd-4th day of the disease and retains its virulence sometimes more than 45 days after the fever and 6 days after the death of the animal. In the brain tissue at the temperature of the refrigerator, rickettsiae remain viable for up to 12 days, and in the corpse they die relatively quickly. In defibrinated blood at room temperature, rickettsia retain virulence for no more than 20 days. At room temperature, they survive no more than 12 hours.

Epizootological data. In natural conditions, large and small cattle, pigs, South African gazelles and antelopes are susceptible to the causative agent of hydropericarditis from wild animals, and rabbits, guinea pigs, ferrets and white rats from laboratory animals with artificial infection. Merinos and sheep of English breeds are most susceptible to the disease. Young animals (calves in the first 3-4 weeks of life and 7-day-old lambs) are resistant to the disease. With age, resistance decreases (it disappears in calves 2 months after birth). The main source of the pathogen is sick and sick animals (in the body of which the pathogen persists for up to 100 days), as well as its vectors - ixod ticks of the Amblyomma family, in their organism it remains viable for up to 3 months. The causative agent circulates through the phases of its development, but is not transmitted through the egg and is localized in the epithelium of the esophagus and intestine of the tick. The disease is more often manifested in low-lying, wet and wooded areas, mainly in the warm season, spreads slowly and does not stop as long as there are susceptible animals in the herd. The mortality of sheep, goats and cattle is about 60%.

Course and symptoms. The incubation period is 5-35 days, most often 10 days. Rickettsia, multiplying in the endothelium of vessels, destroy it, and blood plasma enters the abdominal, thoracic cavity and pericardium, hemorrhages occur. Penetration of rickettsia into the blood and cells of the central nervous system causes

fever and symptoms of encephalitis. Lightning, acute and subacute course of the disease are distinguished; more often it lasts 6-8 days. One of the first signs of the disease is fever (body temperature up to 40°C and above). With a lightning-fast course, sometimes convulsions are observed, involuntary movements of the limbs (as when running at a gallop), diarrhea occurs, the body temperature sometimes reaches 42°C. Often the animal dies suddenly.

In the acute course of the disease, the body temperature is about 41°C, there is weakness, a decrease and lack of appetite, constipation or diarrhea, unsteady gait, excitement and timidity, rapid breathing, coordination of movements is impaired - animals fall, stretch their limbs, throw their heads back, convulsions cause yawning and teeth grinding In addition, movement in a circle and attacks of violence are noted. In some animals, exanthemas in the form of small pink spots appear, mainly on the skin of the abdomen. Then comes a comatose state: foamy liquid flows from the mouth and nose. The duration of the disease is from 2 to 6 days. The subacute course is characterized by the slow development of symptoms of the disease (lasts about 12 days). Signs of damage to the nervous system are often absent or unclear. They recover slowly, and some die. The abortive form of the course of the disease appears more often as a result of re-infection, is manifested by slight depression and a short-term increase in body temperature.

Pathological changes. Pathological changes in all ruminants are of the same type and characteristic, but the degree of their manifestation varies significantly depending on the form and course of the infection. In general, they represent an acute hemorrhagic diathesis with the formation of abundant effusions in various cavities and degenerative changes in parenchymal organs. An autopsy reveals a large amount (often several liters) of lemon or yellowish-red exudate in the abdominal, thoracic, and pericardial cavities, hemorrhages on the endo- and epicardium, dystrophic changes in the myocardium, liver, kidneys, and spleen; swollen lymph nodes (Fig. 6).

Diagnosis. The diagnosis is based on the analysis of epizootological, clinical data, patho-anatomical changes and the results of laboratory tests. When carrying out laboratory tests, detection of rickettsia is carried out in blood smears and tissue sections; smears are also made from the cortex of the large hemispheres of the brain, scrapings of the endothelium from the aorta and jugular veins. When selected, 5-day-old chicken embryos are infected. When dead embryos are dissected 4-7 days after their infection, swelling and hemorrhages are found in the skin of the embryos, and in some - fibrinous pericarditis.

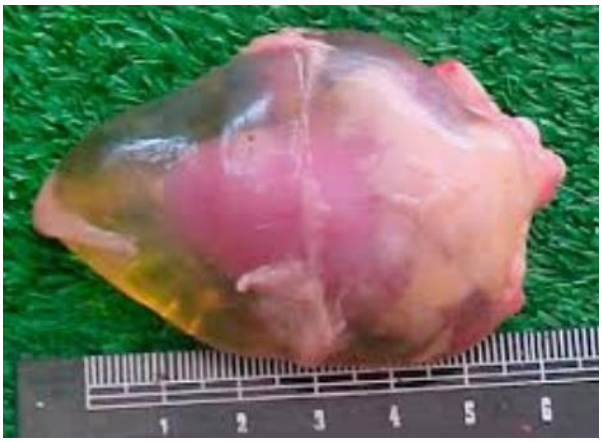

Fig. 6. Hydropericarditis.

The diagnosis is based on the analysis of epizootological, clinical data, patho-anatomical changes and the results of laboratory tests. When carrying out laboratory tests, detection of rickettsia is carried out in blood smears and tissue sections; smears are also made from the cortex of the large hemispheres of the brain, scrapings of the endothelium from the aorta and jugular veins. When selected, 5-day-old chicken embryos are infected. When dead embryos are dissected 4-7 days after their infection, swelling and hemorrhages are found in the skin of the embryos, and in some - fibrinous pericarditis.

Differential diagnosis. Differentiation excludes helminthiasis, piroplasmidoses, trypanosomiasis, eimeriosis, anaplasmosis, bluetongue, malignant catarrhal fever, plague, anthrax, tetanus, botulism, traumatic pericarditis, poisoning with mineral poisons (especially strychnine and arsenic) and poisonous plants.

Specific prevention. Means of specific prevention have not been developed.

Treatment. Sick animals are placed in darkened rooms, they are provided with rest and full nutrition, intravenous injections of sulfonamide drugs (disulfamide, sulfapyridine, sulfamethazine, sulfadimidine, sulfadimezin, etc.) are prescribed, as well as antibiotics (intravenously, intramuscularly, or with drinking water) tetracycline series (biomycin, oxytetracycline, soluble teramycin). At the same time, symptomatic treatment is carried out.

Prevention and control measures. They destroy ticks, protect healthy animals from their attack, organize veterinary supervision of the importation of ruminant and omnivorous animals (especially African ones to zoos, circuses), possible rickettsial carriers. They are kept in quarantine for at least 30 days. When the disease is established, animals are killed or isolated and treated using antibiotics of the tetracycline series and sulfonamide drugs. Some researchers recommend immunizing animals by injecting virulent citrated blood of sick animals in doses: 10 ml for calves up to 3 weeks of age, and giving sulfonamide drugs to adult animals at the same time as blood. Sick animals are kept in isolation for 105 days. The import and export of animals is prohibited after the last case of the disease within 4 months.

Infectious keratoconjunctivitis

Infectious keratoconjunctivitis *(Keratokonyunctivitis rickettsiosa)* –acute infectious disease of animals with damage to the eyes, development of catarrhal conjunctivitis and keratitis.

The causative agent of the disease. Rickettsia conyunctivae is a small, polymorphic (coccidial-like) microorganism from the Rickettsiaceae family (Fig. 7). It is dyed according to Romanovsky-Giemsa in blue color, cultivated in the yolk sac of 6-7 day old chicken embryos. The resistance of the pathogen is insignificant. In conjunctival secretions and physiological sodium chloride solution at room temperature, rickettsiae are destroyed after 24 hours, on the wool coat of sheep - within 4 days.

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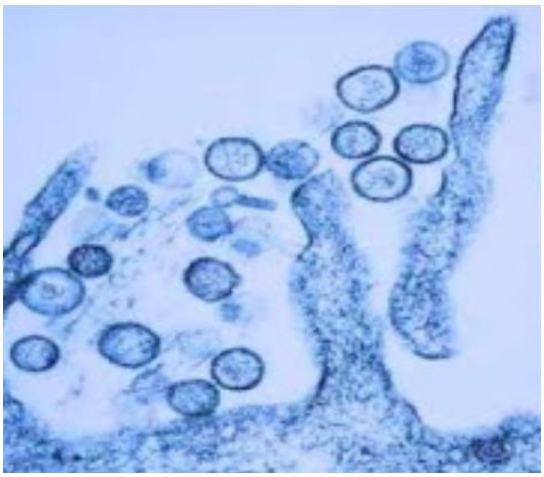

Fig. 7. Rickettsia conyunctivae.

Epizootological data. Cattle, sheep, goats, pigs, camels, chickens are susceptible to the disease. The most sensitive are calves aged 5 months to 1.5 years, lambs 150 days old and older. The source of the causative agent of infection is sick animals and rickettsiae, which secrete it with conjunctival secretions, nasal secretions, and drops of mucus during coughing and sneezing. Infection of healthy animals occurs through direct contact with sick animals, as well as through air contaminated with the pathogen. The possibility of mechanical transmission of the pathogen by insects has been proven. Sick females can infect newborn calves and lambs by licking them after giving birth. The disease is observed mostly in spring and summer, it almost never occurs in winter. It spreads rapidly in the herd, affects a significant number of animals, and tends to be stationary. Enzootics of rickettsial keratoconjunctivitis are registered in many countries of Africa, America, Europe.

Clinical signs and course of the disease. The incubation period lasts 10-12 days. The course of the disease is acute and subacute. Fever, general depression, lack of appetite are observed in sick animals. Subsequently, photophobia, swelling of the eyelids, conjunctivitis, keratitis, mucous-purulent discharge from the eyes are noted.

Granular lesions, sometimes ulcers, are found on the surface of the conjunctiva. More often, keratoconjunctivitis is unilateral (Fig. 8). The disease lasts 8-10 days and usually ends with the recovery of the animal.

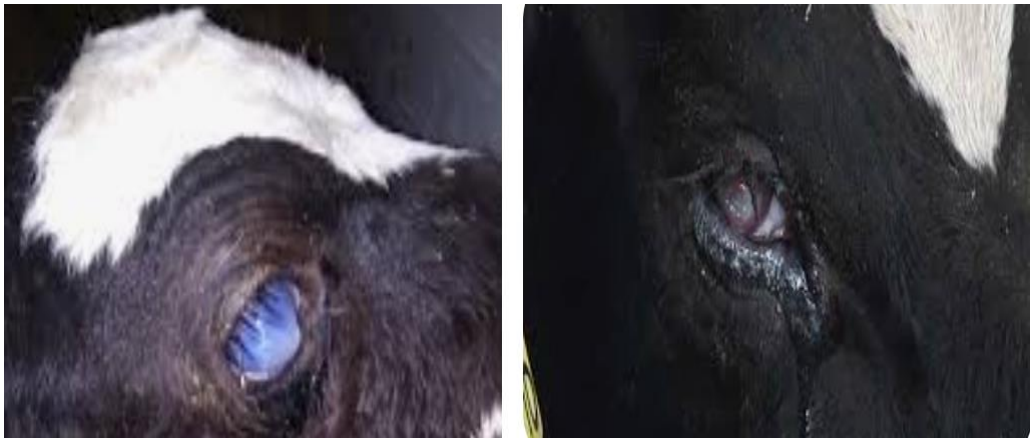

Fig. 8. Rickettsia keratoconjunctivitis in cattle.

Diagnosis. They are put on the basis of epizootological and clinical data, as well as the results of microscopic studies of smears - scrapings from the surface of the affected conjunctiva or impressions from the affected cornea of the animal's eye on the 2nd-5th day of the disease. At the beginning and during the course of the disease, rickettsiae are found in erythrocytes, polymorphonuclear neutrophils, and epithelial cells. With the weakening of the inflammatory process, the number of neutrophils decreases, at the same time, the content of the pathogen in the epithelial cells decreases.

Differential diagnosis. Rickettsial keratoconjunctivitis must be distinguished from diseases caused by chlamydia and thelasia, as well as from traumatic eye injuries by microscopic determination of the causative agent of the corresponding disease or exclusion of its infectious etiology. In telaziosis, live mobile telasia are found under the third eyelid. Conjunctivitis of non-infectious etiology is observed in single animals, they do not have a tendency to spread, during examination the causative agent of the disease is not detected.

Treatment. They use antibacterial substances in the form of ointments and liniments with antibiotics. A dry mixture of equal parts of penicillin and synthomycin is recommended, which is blown into the eyes first after one day, and then after 3 days, 3-4 times a day.

Immunity. Diseased animals develop stable, long-term immunity that persists for one year.

Prevention and control measures. Precautionary measures against the introduction of rickettsial keratoconjunctivitis include quarantine and examination of all animals arriving from outside, isolation and treatment of sick animals detected during examination. When the diagnosis of rickettsial ceraconjunctivitis is

established, the sick animals are destroyed. Mechanical cleaning and disinfection of the territory of temporary stay of imported animals is carried out.

Questions and tasks for control.

1. Reveal the pathogenic spectrum, epizootological significance and relationship of rickettsiosis of blood-sucking arthropods, wild, agricultural and domestic animals; epidemiological significance of rickettsioses.

2. Q-fever: describe epizootological features, diagnosis, treatment and control measures.

3. Rickettsial keratoconjunctivitis: give epizootological characteristics, name clinical signs, principles of differential diagnosis, treatment and prevention.

4. Infectious hydropericarditis: describe the epizootic process, differential diagnosis, treatment and measures to eliminate the disease.

5. How to prevent rickettsiosis in human?

Trichophytia

(diagnosis, prevention, control measures)

Trichophytia (trichophytosis, ringworm) –a chronic fungal disease of animals and humans, which is characterized by itching, the formation of hairless, sharply limited round spots on the skin, covered with yellow-gray scales and loose asbestos-like crusts, or severe purulent inflammation of the skin and the formation of thick bran-like crusts.

Causative agents of the disease –pathogenic microscopic fungi belonging to the genus Trichophyton, including Tr. verrucosum, which causes ringworm in cattle, Tr. Egwinum - in horses, Tr. Gypseum - in pigs, fur animals, cats, dogs, wild rodents (mice, rats), rarely - in horses and cattle. In preparations from affected hair and skin scales under a microscope at a magnification of 400-500 times, all pathogenic fungi have the appearance of thin branched threads (vegetative form), which are placed in rows along the length of the hair, on the surface of the skin and skin scales, and chains of round or oval spores localized inside and outside hairs in the form of a cover around their root. Among laboratory animals, guinea pigs and rabbits are susceptible to trichophytosis. Fungi are easily grown at a temperature of 26-28°C on Sabouraud's medium, wort-agar, Litman's agar, where they form characteristic colonies and pigments of different colors for 5-30 days. Tr. Verrucosum - 15-20 days after sowing, white-gray colonies are formed, they have a folded or bumpy appearance, raised above the surface or flat, with smooth or jagged edges. The mycelium is branched, the microconidia are oval or pear-shaped. Macroconidia are elongated. Arthrospores have a rounded shape. Tr. Eguinum - characteristic white, velvety, flat, smooth colonies with even edges are formed 14-16 days after sowing. Microconidia are oval or pear-shaped. Macroconidia club-shaped, septate. Arthrospores are absent. Tr. Gypseumna - white, cream, dark yellow, velvety, smooth or folded colonies form 5-6 days after sowing. Mace-shaped macroconidia. Microconidia are round or oval. Arthrospores are absent. The causative agents of trichophytosis are extremely persistent in the external environment. In affected hair and skin scales, they are preserved for 7 years, in pathological material - 1.5 years. They remain viable for 4-8 years in contaminated premises, animal care items, feed, in manure and manure - 3-8 months, in soil - 3-4 months. Resistant to freezing, drying and the effects of solar radiation. When boiling, they are inactivated after 2 minutes, when heated to 80°C - after 7-10 minutes. Destroyed by alkalis (1-3% solution), formaldehyde (1-3% solution), sulfur-carbolic mixture (5% solution), iodine chloride (10% solution) - after 15-30 minutes.

Epizootological data. Trichophytosis affects all types of domestic animals, but the most susceptible are cattle, horses, and carnivores. Small cattle and pigs rarely get sick. Ringworm is also observed among wild rodents - mice and rats. Young animals

with thin and delicate skin are more prone to the disease, where fungi can easily penetrate and multiply when the integrity is broken. The source of the causative agent of the disease is sick and sick domestic animals, sometimes mouse-like rodents, gophers, which secrete the causative agent into the external environment with infected scales, crusts and hair. Healthy animals are infected by direct contact with sick animals during copulation, licking of affected areas of the skin, mutual touches in the case of close confinement. Dogs and cats become infected during sniffing, licking, fighting. The factors of transmission and spread of the disease can be contaminated fodder, pastures, premises, care items, clothes and hands of service personnel. Spores of the fungus can be transmitted through the air, as well as with dust and water droplets. The spread of the disease is facilitated by zoohygienic violations in the keeping of animals, untimely treatment, lack of necessary skin care. The disease of fur animals can appear after feeding slaughterhouse waste from animals with trichophytosis. In dogs and cats, trichophytosis is usually observed among homeless, stray animals, which often become a source of the pathogen for indoor animals. The disease spreads rapidly, affecting large numbers of domestic animals, especially in densely populated urban areas, and poses a major threat to humans. Trichophytosis is registered at different times of the year, but more often in the winter-spring period, before cattle are driven to pastures, especially in the case of insufficient or substandard feeding. In dysfunctional farms, the disease can also appear in the fall, when animals are housed in insufficiently disinfected premises. Less often, the disease is observed in the grazing period as a continuation of the winter disease. Untimely detection of the disease, delayed and incorrect treatment, joint maintenance of sick animals with healthy ones, incomplete implementation of preventive measures can lead to the creation of a persistent and long-term focus of the disease. Trichophytosis occurs sporadically or in the form of enzootic disease. In sick animals, productivity decreases, they lag behind in development, and with significant damage to the skin, they even die.

Pathogenesis. After penetrating the skin, the spores germinate, the fungus rapidly multiplies in the stratum corneum of the epidermis and hair follicles, causing inflammatory reactions of the skin and hair loss. Due to the fact that the hair roots are mostly not destroyed, new hairs grow in their place. In those cases when fungi penetrate deep into the skin and destroy hair follicles, bald cells form at the affected areas. Inflammation of the skin is usually accompanied by a slight discharge of exudate, the formation of small nodules and vesicles, followed by the development of crusts and their peeling. Sometimes fungi penetrate deep into the skin and lead to the formation of scab-like crusts soaked in sticky exudate that adhere tightly to the skin. Possible spread of the pathogen in the body by lymphogenic and hematogenous routes, the formation of disseminated mycotic processes in the lungs, liver, spleen and other organs, disruption of metabolic processes, which leads to exhaustion and even death of the animal.

Clinical signs and course of the disease. The incubation period is 6-30 days. The course of the disease is chronic. In cattle, the skin is affected in the area of the head, neck, base of the ears, less often - on the side of the chest, back, buttocks, tail. There are superficial (spotted), deep (follicular) and atypical (erased) forms of the disease. The superficial form is observed in adult cattle and is characterized by the formation of small, pea-sized nodules on the skin, in the place of which sharply limited round spots appear, which gradually increase in size, are covered with yellow-gray asbestos-like crusts up to 1 cm thick and turn into scabs. Hair on the affected areas loses its luster, becomes dry, breaks off easily. After 1-2 months, crusts and scabs fall off, revealing bare hairless areas of the skin, which over time become overgrown with hair (Fig. 1). In case of untimely treatment, new foci of lesions appear along with old spots, as well as on other parts of the body. The skin in certain areas thickens significantly, acquires folds. Itching appears, sometimes very strong. With a deep form of the disease, sharply expressed inflammatory phenomena of different areas of the skin are characteristic, which often merge, spread, and cover large surfaces. Purulent folliculitis, abscesses, formation of thick crusts from dried pus, severe itching are observed. Healing of such cells lasts 2 months or more, often ends with the formation of scars. Sick calves lose weight, are significantly behind in development.

Fig. 1. Trichophytia.

The atypical form is manifested by the formation of characteristic round-shaped trichophytic foci without signs of inflammation on the scalp and other parts of the body. After peeling off the crusts, a smooth surface of the skin is exposed, on which hair grows for 7-14 days. In dairy calves, the skin is often affected in the area of the lips and the front part of the head. As a result of the formation of thick crusts, the face appears to be smeared in dough - "dough face". Soreness of the affected skin, itching appears. Calves grow slowly, lose weight, and in the absence of treatment can die. In horses, the skin is affected mainly in the area of the head, neck, sides, back, croup, around the tail, sometimes - limbs and belly. As in cattle, there are three forms of the disease, which are accompanied by severe itching. The superficial form of the disease is characterized by damage to the hair, which loses its luster, becomes

disheveled, gradually breaks off and falls off together with the crusts. Areas of skin devoid of hair have a rounded or oval shape, covered with grayish scales, often coalesce, forming spots with a diameter of 1 to 5 cm, on which barely noticeable vesicles appear, then scabs, and later loose asbestos-like crusts form in their place. Soon, the affected areas are freed from the crusts, new hair of a darker color appears in the center of the spots. A deep form of the disease is accompanied by the development of skin inflammation, damage to follicles, and the formation of abscesses. Affected areas can merge, spread to the lower part of the abdomen and limbs. The atypical form of the disease is the most benign. In the area of the croup, the head, small abrasions of the skin, sores, and baldness are noted. In sheep, trichophytosis is registered up to 2 years of age. Skin lesions are localized in the back, chest, shoulder blades, neck. The fur in such places is easily pulled out, and due to itching and continuous scratching, it falls out, exposing large rounded areas covered with grayish-white crusts that adhere tightly to the skin. Pigs rarely get sick. The course of the disease is benign, characterized by the formation on the skin of the head, chest, back, abdomen of a few red rounded spots covered with dry, thin brown crusts. There is no itching. The disease often ends with self-healing. Clinical signs of the disease are very similar in dogs and cats. The skin of the head, neck, at the base of the tail and on the limbs is affected. The spots are initially small, rounded, gradually increase in size, covering large areas of the skin, covering it with thick, dense crusts. The hair becomes brittle, easily pulls out and falls out, exposing dense affected cells of red-brown or grayish color. As a result of scratching, the skin becomes exposed, becomes painful, and loses its elasticity. Sometimes the disease of dogs with ringworm is accompanied by the formation of round painful foci on the cheeks, which protrude above the bald areas of the skin.

Diagnosis is made on the basis of characteristic clinical signs of the disease and microscopy of the affected hair and crusts. Microscopic examination is carried out directly in the affected household or in the laboratory, where scrapings from the affected skin and hair, as well as crusts and scales, taken from the edges of the affected area that did not lend themselves to treatment, are sent in test tubes with stoppers or in small cellophane bags. During the study, the crusts are carefully split with a dissecting needle. Isolated hair, crusts are transferred to a glass slide in a drop of 10% caustic potassium solution, carefully heated over the flame of an alcohol burner. After adding a drop of a 50% aqueous solution of glycerol, the drug is examined under a microscope. With positive results, straight hyphae of the mycelium of the branched fungus Trichophyton are detected, which are placed in regular rows along the entire length of the hairs, or in the form of chains of rounded spores located both outside and inside the hairs (Fig. 2).

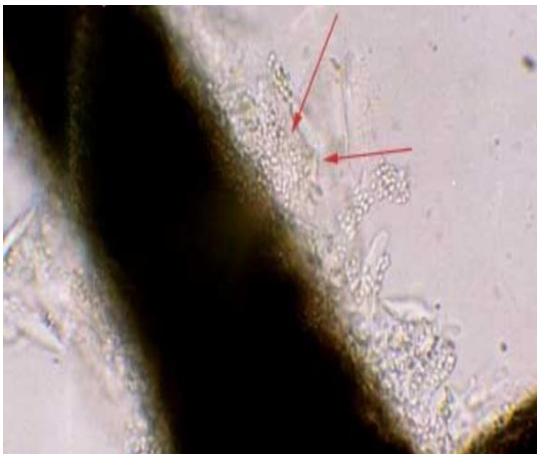

Fig. 2. Localization of the trichophyton fungus.
Native microscopy.

Differential diagnosis. Trichophytosis should be differentiated from microsporia, scabies, scabies, eczema and dermatitis of non-infectious etiology. With microsporia, there is no itching, the skin on the affected areas is smooth, the spots have an irregular shape, the hair breaks off at some distance from the skin. During microscopic examination, only the mycelium of the fungus is found inside the hair, and small spores are arranged in a mosaic in the form of a cover on the outside of the hair, near its base. When examined by luminescence in a darkened room, hair affected by the microsporia fungus gives a bright green emerald glow, which is not observed in trichophytosis. With scabies, the affected hair is placed in groups among healthy hairs and does not break off, but falls out. The crucibles have a characteristic "saucer" or "shield" appearance with a depression in the center. Scabies is accompanied by severe itching, there are no limited rounded spots characteristic of trichophytosis, scabies mites are detected under a microscope. In case of eczema and dermatitis, there are no limited spots, the hair does not break off, the results of mycological studies are negative.

Treatment. All animals with trichophytosis are isolated and treated with vaccines that are administered intramuscularly, twice, with an interval of 10-14 days in doses: lyophilized vaccine. Systemic antifungals include fluconazole, itraconazole, nystatin, amphotericin B, and griseofulvin in the following doses:

– 5 mg/kg fluconazole – 5 mg/kg every 24 hours;
– itraconazole every 24 hours;
– nystatin – 100,000 units every 8-12 hours;
− amphotenricin B - 0.25-1 mg/kg every 24-48 hours;
− griseofulvin - 25 mg/kg every 12 hours.

Skin lesions are treated with preparations containing povidone-iodine, 4% chlorhexidine, clotrimazole, 10% salicylic acid solution, 3-5% iodine monochloride solution, 5-10% phthalan, fucorcin, ichthyol. Treatments are carried out in a specially designated place, which is disinfected every time; hair and crusts affected by the

fungus are burned.

Immunity. After getting sick with trichophytosis, animals develop a long-lasting strained immunity. Vaccines are used for the specific prevention of trichophytosis in cattle. Immunity is formed 21-30 days after the second injection of the vaccine and lasts for at least 7 years, in horses - after 30 days and lasts for 6 years. In rabbits and fur animals - after 20-30 days and is stored for at least 3 years.

Prevention and control measures. In order to prevent trichophytosis in all livestock farms, it is necessary to observe zoohygienic and veterinary-sanitary rules for keeping and caring for animals, to provide animals with good quality and complete feed. In unfavorable and threatening cattle trichophytosis farms, all the young born are vaccinated from the age of 1 month; all young animals imported from other farms and all cattle arriving from abroad are vaccinated regardless of age. Animals belonging to the population living in the given territory must be vaccinated. When a diagnosis of trichophytosis is made, the farm is declared unfavorable for trichophytosis, restrictions are introduced, in which it is prohibited to enter and remove animals from the farm, except for those intended for slaughter. Regrouping of animals in the farm is not allowed; the introduction of healthy animals into the premises where sick animals were previously kept, until final cleaning, sanitary repair and disinfection. All susceptible animals are subjected to a clinical examination once every 10 days. Sick and suspected animal diseases are immediately isolated and treated, healthy animals are vaccinated. Litter, leftover feed and manure from sick animals are burned. The manure removed from the premises where sick animals were located is subjected to biothermal disinfection, after which it is used only as fertilizers. The farm is carrying out a set of measures to improve care and fodder ration. All work on the farm is carried out in compliance with personal prevention measures. Medical personnel should be notified of the appearance of ringworm. The farm is considered to be free from trichophytosis 2 months after the last case of clinically sick animals, as well as after mechanical cleaning of the premises and final disinfection. An alkaline solution of formalin containing 5% formaldehyde and 1% caustic soda is used to disinfect livestock premises; a hot 10% solution of a sulfur-carbolic mixture with two application of the solution with an hourly interval; hot formalin-kerosene emulsion, which consists of 10 parts of formalin, 10 parts of kerosene, 5 parts of creolin and 75 parts of water. An alkaline solution of formaldehyde is used for final disinfection.

Questions and tasks for control.

1. What is the specific susceptibility of animals to trichophytosis and what are the ways of infection?

2. Describe the course and forms of clinical manifestations of trichophytosis in animals of different species and ages.

3. What diagnostic methods are used for ringworm?

4. What vaccines are used against ringworm and how to explain their not only prophylactic, but also curative effect?

5. Describe the methods and means of general and local treatment of animals with ringworm.

6. What are the main directions of preventive and health measures for trichophytosis of agricultural and domestic animals?

7. What are the measures to prevent infection of people from infected animals with trichophytosis?

Microsporia

(diagnosis, prevention, control measures)

Microsporia (microsporosis) –chronic highly contagious fungal disease of cats, dogs, fur animals and horses, which is characterized by focal superficial inflammation of the skin and breaking off in its affected areas of the hair cover, and sometimes claws. The disease is registered in all countries of the world. A person is sick with microsporia.

The causative agent of the disease – pathogenic fungi of the genus Microsporum: in horses - M. eguinum, in dogs, cats, rabbits, pigs, fur and predatory animals, guinea pigs, deer, monkeys - M. lanosum (M. canis, M. pelineum), in cats, dogs, horses, calves, guinea pigs, rats, mice – M. gypseum (Achorion gypseum, M. lanosum Bodin), pigs – M. nanum. In the pathological material, microsporums are found inside the affected hair in the form of septated mycelium and rounded single-celled spores, which are arranged mosaic-like in the form of a cover near the base of the outer side of the hair. Fungi are easily cultivated in laboratory conditions on Sabouraud glucose agar and wort agar at 26-28°C. The growth of M. eguinum is observed 6-7 days after sowing in the form of folded, grayish-yellow colonies that tightly adhere to the medium and are covered with gray-white aerial mycelium. During the microscopic examination of the colonies, branched septate mycelium, single pear-shaped multichambered microconidia are revealed. Macroconidia are multicellular, oval or spindle-shaped with 2-3 partitions. Chlamydospores are intercalary, rarely terminal. M. lanosum on the 3-5th day after sowing forms rounded grayish-white or yellow colonies with concentric circles with a floury center, which are covered with loose mycelium. During the microscopic examination of the colonies, a branched septate mycelium is revealed, as well as microconidia, which have an oval-pear-shaped shape. Macroconidia are numerous, spindle-shaped, villous or with a spike-like two-contour wall, multi-chambered, narrowed at both ends. M. gypseum forms flat, later floury colonies of yellow-brown color, with a small depression in the center (Fig. 1).

During the microscopic examination of the colonies, even septated rocket-like mycelium is revealed, as well as pear-shaped or elongated microconidia. Macroconidia are multi-chambered, thick-walled, oval or spindle-shaped. Hair affected by the fungus fluoresces, which is associated with the production of the fluorescent pigment interidin. M. nanum forms yellowish or dark red, loose in the center of the colony. During microscopic examination, septate rocket-like mycelium is revealed, microconidia are single, oval or elongated. Макроконідії рясні, грушоподібної або овальної форми, багатокамерні. Spores of all microsporia fungi are extremely stable in the external environment. In affected hair and scrapings from the skin, they are stored for 2-5 years, in wool - 2-7 years, pus and manure - up

to 8 months, in paper bags at room temperature - 3-4 years. Resistant to freezing, drying and exposure to direct sunlight. Under the action of dry steam at 110°C, spores are destroyed in 30 minutes, at 80°C in 2 hours, and when boiled, they are inactivated in 2-3 minutes. Vegetative forms of fungi are destroyed by 1-3% formaldehyde solution for 15 minutes, 5-8% alkali solution - 20-30 minutes.

Fig. 1. M. gypseum.
Native microscopy.

Epizootological data. Cats, dogs, horses, fur animals, rabbits are most often affected by microsporia; less often - sheep, goats, pigs, deer, monkeys, guinea pigs, rats, mice, carnivores. Young animals are more susceptible. The source of the causative agent of infection is sick animals and carriers, which release the causative agent with affected hairs and skin scales after drying and contaminate environmental objects for a long time. Especially dangerous are stray cats and dogs, as well as rodents, which have been found to be long-term carriers of M. gypseum. Infection occurs when sick animals are kept together with healthy ones, as well as through infected feed, water, litter, care items, clothes and shoes of service personnel. Dogs and cats become infected during sniffing, licking and fighting. The disease occurs sporadically or in the form of minor enzootics. In densely populated urban areas, microsporia can become widespread among stray dogs and cats, affect a large number of animals, including domestic animals, which become infected during walks. A characteristic feature of microsporia is high contagiousness, constant circulation of the causative agent of microsporia in infected cells among stray dogs and cats, long-term preservation of fungi in the external environment. The largest number of patients is registered in autumn. The duration of the disease is from 3 to 10 weeks. It is believed that about 85% of human cases are due to infection from cats.

Clinical signs and course of the disease. The incubation period is 22-47 days. There are superficial, deep, erased and hidden forms of the disease. A hidden form of the disease, sometimes superficial, is registered in dogs and cats. With the hidden form of the disease, hair damage can be detected only with the help of luminescent

and microscopic examination. The superficial form often occurs in kittens (Fig. 2).

During the clinical examination of the skin of the paws, muzzle, and tail, rounded spots covered with scales, sometimes whitish-gray crusts with sparsely placed hairs that break off easily are revealed. In some areas, complete baldness of the skin is observed. In dogs, numerous foci of damage are observed on the face, back, trunk, rarely on the paws (Fig. 3).

Fig. 2. Superficial skin lesions.

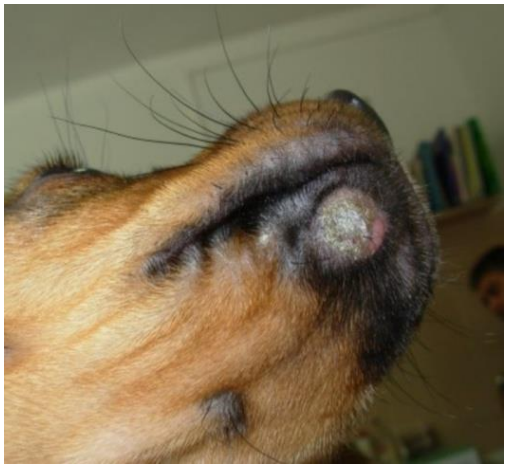

Fig. 3. Lesions in dogs.

In fur-bearing animals, microsporia have a hidden form and can be detected only by the luminescent method. Puppies have spots with small blisters and grayish-yellow crusts in the superficial form around the eyes, at the base of the ears, on the forehead, front and hind legs. In horses, lesions are localized in the head, neck, withers, shoulder blades, back, croup, and sometimes limbs. The superficial form of the disease is more often observed, which is characterized by the formation of hairless spots of various shapes with a diameter of 34 cm, hair breakage near the upper layers of the skin, and the absence of itching. With a deep form, a clearly expressed inflammatory process develops, the formation of crusts from dried exudate

on the surface of the skin, spots of different sizes and shapes with broken hair. In the atypical form, hairless areas of the skin, focal desquamation of the surface layer of the skin are found. In piglets, fungal lesions are localized on the ears, neck, back, sides. There is mainly a deep form, which is manifested by the formation of oval, sharply limited spots of a reddish color, covered in places with thick brown crusts, loss of bristles, baldness.

The diagnosis is made on the basis of epizootological data, clinical examination of sick animals, microscopic examination of hair and crusts from affected areas of the skin. In the case of suspicion of microsporia in dogs and cats, the method of luminescent diagnostics is used.

Laboratory diagnostics. Includes luminescent and microscopic research methods. Hair, scales, crusts, as well as scrapings from the edges of various affected, untreated skin areas are sent to the laboratory in tubes with stoppers or in small cellophane bags. The luminescent method involves examining the hair coat of a sick animal or affected hair in a darkened room, during which a specific emerald-green glow of microsporum-affected hair is detected (Fig. 4).

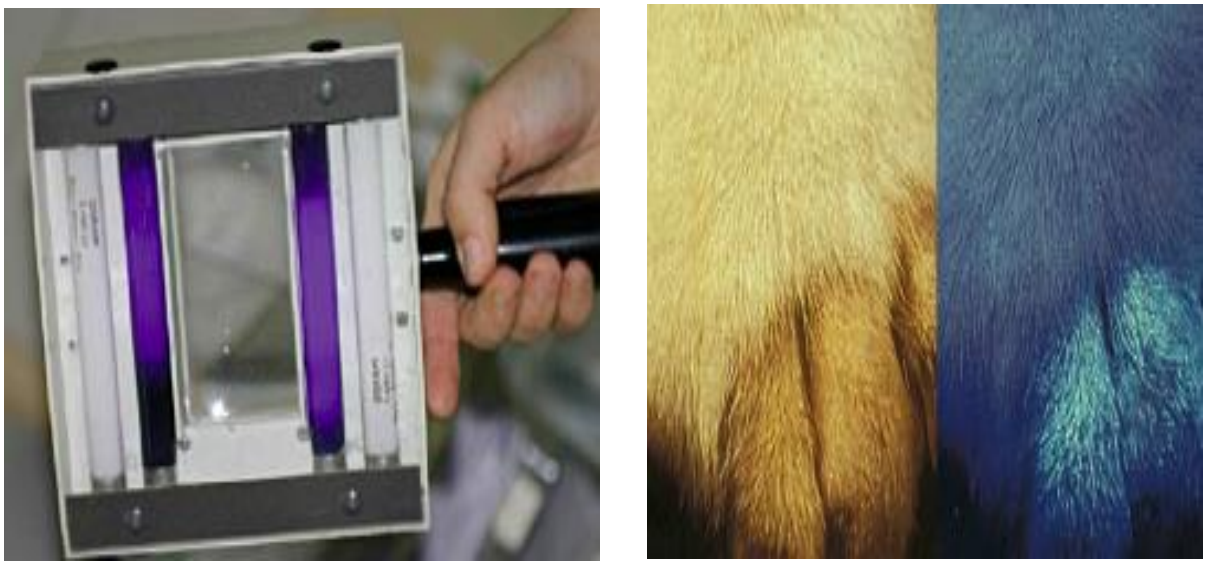

Fig. 4. Fluorescent diagnostics.

With trichophytosis, the glow of the hair is not observed. The hair of black animals affected by the microsporia fungus also does not luminesce. As a source of ultraviolet radiation, mercury-quartz lamps with light filters are used, which are able to retain the visible part of the spectrum and pass ultraviolet. Research is conducted before treating animals with various drugs, as some of them (salicylic acid, rivanol, petroleum jelly, etc.) fluoresce. Microscopic studies to detect the fungus are carried out directly in the farm or laboratory. The selected samples of hair, scales, scrapings of the affected skin are crushed with dissecting needles, poured for 5-10 minutes with 1-2 drops of a 10% solution of caustic soda or potassium. Then, a drop of 50% aqueous solution of glycerin is transferred to a glass slide, heated a little over an

alcohol burner, examined under low and high magnification of a microscope. In positive cases, a characteristic branched mycelium of the fungus with liquid partitions is found, as well as a mosaic arrangement of small (2-3 μm) spores inside and on the surface of the hair.

Differential diagnosis. Presupposes the need to distinguish microsporia from trichophytosis and scabies. With trichophytosis in horses, severe itching is observed and there is no glow of the affected hair during a luminescent examination. Microscopy reveals regular rows of hyphae with partitions inside the hair, chains of large spores on the hair and at its base. With scabies, severe itching is always observed, ticks are detected by microscopy.

Treatment. Patients with microsporia are isolated and treated. Systemic and local antimycotics are used to treat microsporia. Fungicides can delay the growth of the fungus. For a mild course of the disease, local treatment is used. Products containing povidone-iodine, 4% chlorhexidine, clotrimazole, 10% salicylic acid solution, 3-5% iodine monochloride solution, 5-10% phthalan, fucorcin, ichthyol are recommended. The drugs are used in the form of creams, ointments, solutions, aerosols and shampoos for bathing. The preparations are applied to the affected areas 1-2 times a day for at least 14 days, or bathing is carried out 2 times a week. Treatment is continued until two negative results are obtained during culture.

In case of severe and chronic course, the only method of treatment is a combination of local therapy with systemic antimycotics: fluconazole, itraconazole, nystatin, amphotericin B, griseofulvin in the following doses:

– 5 mg/kg fluconazole – 5 mg/kg every 24 hours;

– itraconazole every 24 hours;

– nystatin – 100,000 units every 8-12 hours;

− amphotenricin B - 0.25-1 mg/kg every 24-48 hours;

− griseofulvin - 25 mg/kg every 12 hours.

Along with antifungal treatment, such drugs as vitamins, immunostimulants, and antihistamines should be used.

Immunity. After becoming ill with microsporia, horses become immune to re-infection for 2 years. Vacderm, Microderm, Biofel M, Biokan M vaccine are used for specific prevention.

Prevention and control measures. Due to the lack of effective means of prevention of microsporia, special attention should be paid to the implementation of general veterinary and sanitary rules, which provide for the stocking of horse farms and animal farms with animals from safe farms, compliance with the prescribed quarantine measures, systematic disinfection and deratization, mass preventive inspections using luminescent diagnostics. In the case of microsporia due to the appearance of the disease, the farm is declared unfavorable for microsporia and restrictions are introduced. Sick animals are isolated and treated. Permanent

veterinary supervision is established for the rest of the livestock. Prohibit regrouping of animals, improve housing and feeding conditions. Cats and dogs suffering from microsporia are destroyed. The farm is considered healthy 15 days after the recovery of the last sick animal and the final disinfection. To disinfect the premises, use an alkaline solution of formaldehyde containing 2% formaldehyde and 1% caustic soda, a hot 10% solution of a sulfur-carbolic mixture when applied twice with an hourly interval; hot formalin-kerosene emulsion, which is made from 10 parts of formalin, 10 parts of kerosene, 5 parts of creolin and 75 parts of water. In order to prevent microsporia disease, people should catch and destroy stray cats and dogs. When caring for sick domestic animals, it is necessary to observe the rules of personal hygiene and prevention.

Questions and tasks for control.

1. What is the specific susceptibility of animals to microsporia and what are the ways of infection?
2. Describe the course and forms of clinical manifestation of microsporia in animals of different species and ages.
3. What diagnostic methods are used for microsporia?
4. What vaccines are used against microsporia and how to explain their not only prophylactic, but also curative effect?
5. Describe the methods and means of general and local treatment of animals with microsporia.
6. What are the main directions of preventive and health measures for microsporia in farm and domestic animals?
7. What are the measures to prevent infection of people from infected animals with microsporia?

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