Vaccination of Rabies in Dogs to Protect the Population

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Abstract. Rabies is a disease that affects the nervous system. The causative agent is a virus of the rhabdovirus family. It is resistant to low temperatures, but begins to break down when heated (more than 60 degrees). The main danger of the disease is that it is transmitted from an infected animal to any mammal, including humans. Timely vaccination of a pet is the best preventive measure to protect against the virus. Throughout the world, man and animals coexist with each other in the same environment. Rabies in dogs is transmitted from them to humans after being bitten. Dogs with rabies are a huge danger to society. To prevent infection and the spread of this disease, it is timely vaccination of animals. With timely medical care, the disease will not develop. Prevention of rabies in humans includes primary immunization and post-exposure prophylaxis. Rabies vaccination is given to healthy people of certain professions - veterinarians, hunters, foresters, taxidermists, dog catchers. For this, the rabies vaccine is used. In this article, we will analyze the signs of rabies in humans and dogs and methods of protecting the population from this disease.

1 Introduction

The word “mad” is a synonym that characterizes the furious, inappropriate behavior of people or animals. This linguistic phenomenon has roots in medicine, since rabies is a formidable disease that is dangerous both for representatives of the fauna and for humans. This is an ancient disease, therefore it is well studied by scientists all over the world. Rabies is caused by an aggressive RNA virus from the rhabdovirus family. The infection affects the nervous system and is always fatal, since there is no cure for this disease [1].

The disease is widespread throughout the world. The exceptions are the island countries of Japan, Australia, and the United Kingdom. This situation is explained by the fact that planned preventive measures were taken there for a long time at the state level to prevent the spread of infection. Within the framework of the state program, vaccination of domestic and wild animals was carried out, and the number of individuals likely to carry the virus was artificially reduced. The most vulnerable countries today are considered to be the countries of Asia and Africa, where the weak level of economic development of states does not always allow for effective prevention. In Russia, 2-3 thousand cases of rabies in animals are registered annually. In this case, in 80% of cases, foxes are infected. About 40,000

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people in the Russian Federation annually receive rabies vaccines due to potential infection [2].

Rabies is an acute infectious disease of the nervous system, causing irreversible changes and in 100% of cases leading to death. All warm-blooded animals, including dogs, are susceptible to the virus caused by rabies.

Rabies has a dangerously long incubation period. The virus that causes the disease moves rather slowly through the nerve cells. Until it reaches the brain or spinal cord, whole weeks can pass, and until that time no signs of rabies will be noticeable [2].

Rabies is a contagious disease that affects all mammals and humans. The disease is characterized by damage to the central nervous system, aggressive behavior, salivation and paralysis. The natural reservoir of many infections, including rabies, are wild animals. Migration of wild animals leads to the spread of diseases. The cause of the disease is the rabies virus. In 99% of cases, it is transmitted through saliva during a bite. For a dog to develop rabies, it must be bitten by an already infected animal. And it doesn’t have to be a dog either. The virus is transmitted by the bite of any other carrier animal (rats, mice, foxes, raccoons, etc.).

A special risk group includes stray and hunting dogs. This is due to the fact that they are more likely to come into contact with animals that may be infected with rabies [2].

WHO statistics are sad - every year 59 thousand people die from rabies in the world. True, 95% of deaths occur in Africa and Asia, however, we should not relax either - we are in the middle of the list of countries in terms of the number of cases. According to Rospotrebnadzor, in Russia every year about 400,000 people seek medical help - all of them were bitten by animals. Of these, 250 thousand need treatment, that is, they are vaccinated against rabies, since the likelihood of infection is high.

Most often, rabies is infected in the Central Federal District - 52% of the total number of cases. In second place is the Volga District - 17%. Then follow: Ural - 8%, Southern and Siberian - 7% each. Rabies is dangerous because the first symptoms of infection do not appear immediately. And by the time they appeared, it is no longer possible to save a person - in such cases, the lethality is 100%.

The disease is caused by a pathogen from the rhabdovirus family. When bitten by a sick animal, it quickly penetrates the brain cells, causing inflammation. Especially often hunters, foresters and people of other professions associated with being in the wild suffer [1].

There are also urban foci of the disease, so you can not come close to stray dogs and cats. When visiting the forest, you need to remember that healthy wild animals are afraid of people. If an animal, such as a fox, goes out to people, enters villages, it almost certainly has rabies.

As soon as there is a suspicion of rabies, it is necessary to immediately hospitalize the patient. The rabies virus causes a fatal form of the disease in humans.

Rabies is one of the infections that affects all kinds of animals and humans. This is an acute viral disease caused by a microscopic virus from the Rabdovirus family. Its representatives can infect all living creatures on the planet: plants, insects, birds, mammals. Therefore, rabies is ubiquitous, with the exception of some regions and countries, such as the UK, where a lot of work has been done on the rules for importing and quarantining animals. In Russia, Europe, America and Africa, this disease occurs, which is associated with a large territory and natural reservoirs of infection - wild animals.

Even in ancient times, people knew about rabies as a dangerous disease of humans and animals. It was then that they established the presence of one of the frequent signs of the disease - rabies. The first rabies vaccine was invented by the French scientist Pasteur. Before the introduction of vaccines and vaccination rules against rabies, not only animals, but also people often fell ill with this disease.

The purpose of the work is to immunize dogs and protect society from rabies.


2 Research Methodology

The practical part of the work was carried out on the territory of the city of Grozny together with employees of the Republican Veterinary Station and animal volunteers, the theoretical part was continued at the Department of Veterinary Medicine and Zooengineering of the Agrotechnological Institute, Chechen State University. A.A. Kadyrov.

The material used was 50 dogs of different ages and sexes, including puppies, the Rabix dog rabies vaccine, intended for preventive immunization of the canine family. The vaccine was injected intramuscularly into the thigh area at a dose of 1.0 ml.

3 Results and Discussions

Rabies is a viral natural focal disease of warm-blooded animals and humans, leading to irreversible damage to the nervous system, followed by death.

The causative agent of rabies belongs to the family of rhabdoviruses (Rabies virus). Bats become its carriers (reservoir hosts). It is they who ensure the spread and outbreaks of the virus around the world, transmitting the disease to warm-blooded people at the time of the bite. A bite is any damage to the skin with the penetration of saliva into the tissues.

With the bite of a rabid animal, the virus is introduced through damaged skin into peripheral nerves, and then spreads along the nerve trunks to the spinal cord and brain. The speed of the virus moving through the victim’s body is about 3 mm/h [4]. Having reached the central nervous system, the rabies virus infects neurons, and then spreads in the opposite direction along the autonomic nerve fibers to the periphery. Also, the virus can spread throughout the body of the victim through the bloodstream. This is evidenced by cases of rabies infection of fetuses in pregnant females.

Reproducing in the nervous tissue, the virus causes a specific meningoencephalitis, which provokes the development of an inflammatory process in the brain and its edema.

Death occurs as a result of suffocation and cardiac arrest against the background of damage to the respiratory and vasomotor centers. To date, the symptoms of clinically developed rabies are considered incurable.

The appearance of a dog in the house is not only a responsibility for the pet, but also a careful attitude to your health and the health of loved ones. A domestic dog brings a lot of joy, but sometimes it can be a source of problems for households. There are a number of dangers associated with living a dog in a family, one of them is diseases common to humans and animals [3].

The main source of rabies in dogs is the reservoir of the virus in nature. Most often, foxes, wolves, stray dogs and cats, rats and mice, hedgehogs infect a domestic dog with rabies, and bats in southern countries.

Meeting a dog with representatives of the wild fauna often leads to bad consequences. While injuries and bites can be cured, there is no cure for rabies [2].

A dog becomes infected with rabies through the bites of sick animals, as the virus is contained in saliva. Sometimes it is enough to get saliva on damaged skin or mucous membranes. That is, for the spread of the virus in the body, it is necessary that it penetrate the muscles and blood of an animal or person.

Dogs are social creatures by nature. Their desire to get acquainted or find out the relationship, to protect the owner will always prevail, as a result of which the pet can get bitten and become infected with rabies.

When leaving the city, the owners want the pet to run freely and take a walk in nature, swim in the river [1]. However, there is a risk of encountering a wild animal and contracting rabies not only in the forest, but also in the garden, because it is almost
impossible to restrict the movement of moles, mice, hedgehogs, and stray cats. Therefore, dogs that are not vaccinated against rabies are always at risk.

**Symptoms.** Rabies in dogs is one of the infectious diseases, which is accompanied by a change in the behavior of a sick dog. The insidiousness of the disease is that a sick animal becomes contagious when the virus is in saliva. At the same time, bright clinical signs in a dog with rabies may be absent. A sick dog may have drooling, aggressiveness or excessive affection, lack of coordination, anxiety, whining. That is, such non-specific signs by which it is problematic to suspect rabies. Some of them are even characteristic of healthy animals. At an early stage of the disease, the animal may appear healthy or have minor behavioral abnormalities.

When bitten, the virus penetrates into the muscles of the dog, where its amount increases, then along the peripheral nerves it moves to the central nervous system of the dog - the spinal cord and brain. Much less often, the virus enters the brain with blood. Here the rabies virus multiplies and then enters the eyes and salivary glands along the nerve fibers and begins to be excreted with saliva [8].

Sometimes the rabies virus in dogs is excreted with mucus from the nose, with excrement. The rabies virus persists in the environment for some time. That is, if a sick animal leaves contaminated saliva on any surface or in water, the dog can become infected through contact.

When it enters the gastrointestinal tract of a dog, the infection usually does not develop, but antibodies in the blood to the rabies virus may increase.

Since the virus needs to spread and multiply in the body for clinical signs to appear, it can take some time between infection and the appearance of changes in an infected dog. This is the incubation period or latent phase of the disease.

The incubation period for rabies can vary and depends on the amount of the virus, the site of the bite, and the immunity of the animal. On average, the incubation phase of rabies is 4-6 weeks, while it can vary from 12 days to 1 year. That is, signs of rabies can appear in a dog even 12 months after the bite. They are mainly associated with impaired coordination and paralysis. There are several forms of canine rabies that differ in clinical signs.

**The violent form** of the disease is also called encephalic. This name is associated with the development of inflammation of the meninges and peripheral nerves.

The first signs of rabies in dogs are harbingers that appear between infection and the appearance of clinical symptoms of rabies, such as fever, nervousness and irritability, inappropriate behavior, and itching at the bite site.

Later, at the stage of excitement, other signs of violent rabies develop - aggressiveness, attacks on other animals and humans, wandering movements, dogs with rabies run away and cover long distances, voice change, hoarse barking or howling, change in sexual behavior, eating foreign objects, impaired reception water and food, salivation, photophobia, incoordination, epileptic seizures.

At the end of the disease (the paralytic stage of rabies in dogs), loss of voice, depression, and paralysis are added to the symptoms of rabies. There comes a coma, and then - the death of the dog. Each stage can take from 1 to 4 days [1].

Another name for the silent form of canine rabies is paralytic. In this case, there is no stage of excitation, so it is difficult to suspect rabies in a dog [2]. Clinical signs of a silent form of dog rabies, behavioral disorders: the dog is lethargic, hides in dark places, shy or very affectionate, but even in this state, a sick animal can bite, the dog saliva flows from the mouth and the lower jaw sags, hoarse voice and hoarse barking, the dog cannot swallow food, it seems that it is choking on something (this symptom of rabies often causes the pet to go to the clinic), the dog with rabies moves aimlessly, its consciousness is disturbed, the animal has an indifferent look, different pupils and the third eyelid falls out. At the final stage of rabies, the dog develops general paralysis, followed by the death of the animal.
Return form. From the name, you can understand that with this form of rabies in a dog, signs appear and disappear. In the intervals between attacks of excitement, aggression, violence, a dog with rabies is lethargic, hides in dark places, refuses food. Repetitions of the stages of arousal can occur after 2-8 weeks, and each time the signs appear more and more strongly. The disease progresses and ends in death.

Abortion form. Not all bites from rabid animals lead to the development of rabies in the dog. In some cases of infection in a pet, the following clinical symptoms appear: minor behavioral disorders, fever, and disruption of the intestines. They pass and the animal recovers. Improvement in the condition of the pet occurs during the second stage. But such cases are poorly studied, therefore it is impossible to rely on them if rabies is suspected in a dog. As a rule, there is a return of the disease, which leads to death.

Atypical form. Violation of rabies vaccination schedules or exposure of a dog to a small amount of the virus causes the formation of an insufficient amount of antibodies in the blood - protective proteins against the virus. Anti-rabies antibodies do not completely block the virus, and then rabies proceeds in a chronic form, which lasts up to 3 months.

The danger of this form is that uncharacteristic symptoms appear, which make it difficult to assume rabies. In this case, a sick dog is able to infect humans and other animals with a virus.

The peculiarity of the manifestation of signs in a dog with rabies in an atypical form is the frequency [3]. They sometimes disappear, then reappear with a deterioration in the general condition, but eventually lead to the death of the animal. Atypical forms of rabies are more common in middle-aged and older dogs.

Rabies has another problem - it is diagnostics. Accurate diagnostic tests can only be performed after the death of a sick animal. All intravital methods of diagnosing rabies are not reliable.

Of great importance for the diagnosis of rabies in a dog is the anamnesis: whether there have been cases of bites or contact with wild animals or animals with disturbed behavior. In this case, the dog is quarantined for 14 days, and the owner is advised to consult a doctor.

Clinical signs of aggressive behavior, drooling and impaired food and water intake in dogs with a possible infection with rabies or stray dogs are direct indications for isolation and quarantine.

Rabies in humans. Rabies is a viral infection that mainly affects wild animals. At the same time, their saliva contains a large amount of the pathogen. How rabies is transmitted: when a sick animal bites, the virus enters the human blood, into its cells and begins to multiply there. In the absence of timely treatment, the disease is fatal, and vaccination is necessary to prevent it. The disease is caused by a pathogen from the rhabdovirus family. When bitten by a sick animal, it quickly penetrates the brain cells, causing inflammation. Especially often hunters, foresters and people of other professions associated with being in the wild suffer.

There are also urban foci of the disease, so you can not come close to stray dogs and cats. When visiting the forest, you need to remember that healthy wild animals are afraid of people. If an animal, such as a fox, goes out to people, enters villages, it almost certainly has rabies.

As soon as there is a suspicion of rabies, it is necessary to immediately hospitalize the patient. The rabies virus causes a fatal form of the disease in humans.

The cause of the disease can be both a bite and contact with the skin of the saliva of a sick animal. In nature, the virus circulates among foxes, wolves, dogs, cats, bats, horses, sheep, cows and many other animal carriers.

Medical personnel can become infected from a patient if their saliva, tear fluid or other secretions come into contact with damaged skin or mucous membranes. Therefore, it is possible to work with such patients only in a protective suit and mask.
The incubation period for rabies is 1 to 3 months, but sometimes it lasts less than a week or even more than a year. At this time, the person feels healthy.

The symptoms of rabies depend on the stage of the disease. The onset of the disease is gradual. The patient is concerned about itching of the skin at the site of the bite, pain that spreads along the course of the nerves. There is a headache, anxiety, irritability, fear, insomnia. The temperature rises, the patient does not tolerate sounds and bright light, appetite worsens, rabies develops - the inability to swallow water.

There is no drug that can kill this virus. Therefore, the treatment of rabies is symptomatic, designed only to improve the patient’s condition. Whether he survives or not depends on the severity of the disease and the state of the organism.

The patient is placed in a dark, quiet room, a tracheostomy is performed, a urinary catheter is inserted, and tube feeding is established [4]. The following groups of medicines are used: anticonvulsants and sedatives, supporting the work of the heart, replenishing the volume of fluid in the blood and eliminating intoxication. If necessary, artificial ventilation of the lungs is carried out.

Post-exposure prophylaxis - measures after a bite or saliva of a sick animal on damaged human skin: immediate washing of the wound with water and soap for 15 minutes, then treatment with 70% alcohol, all victims are given a rabies vaccine.

In addition, some groups of patients are given rabies injections containing anti-rabies immunoglobulin [5]. These are specific antibodies that immediately begin to resist the pathogen that has entered the bloodstream. Immunoglobulin is administered for percutaneous bites or scratches, contact with saliva from broken skin or mucous membranes, and for lesions from bats. If the skin is not bitten, there are only small scratches, then such an immunoglobulin is administered only to patients with immunodeficiency.

The rabies vaccine was developed in 1885 by Louis Pasteur.

The only way to prevent the development of rabies is to vaccinate your dog on time.

The first rabies vaccination was given to puppies at 3-4 months. This must be indicated in the veterinary passport. Further vaccination is carried out every year - this is necessary to protect the dog from the virus that causes rabies.

Carefully track the date of vaccination according to the passport - do not break the schedule and do not neglect vaccinations. First of all, it is a concern for the health of the dog and the people around it.

The most dangerous disease that pets can face, incl. dogs are mad. It always leads to death, because it provokes irreversible consequences. Moreover, not only other animals, but also people can get rabies from a dog [6].

Even if the dog does not go out and always stays at home, it must be vaccinated against rabies. And there are at least several reasons for this. First, a person on the soles of shoes or on outerwear can bring the pathogen home. Secondly, unvaccinated animals are constantly at risk (they can become infected by accidentally running out into the street or on the way to the veterinary clinic). And thirdly, vaccination is necessary to avoid problems in case of possible trips or if a pet bites you or your guests [7].

In order for the vaccination to be successful, it is necessary to properly prepare the dog. First of all, we got rid of possible parasites and carried out deworming - 10-14 days before the procedure, dogs were given Prazitel plus tablets at the rate of 1 tablet per 10 kg for adult animals, puppies weighing 2-3 kg - 1/4 tablet, weighing 4-5 kg - 0.5 tablets, to severely affected animals again after 10 days and carried out preventive treatment for fleas with Frontline spray. This is necessary to restore the dog’s immunity and prevent complications after vaccination.

Together with zoo volunteers and students, we prepared a place for ourselves to fix the animals and administer the vaccine. 10-14 days before the start of work, we dewormed
animals from fleas and lice, especially those infected were given Prazitel plus tablets after
10 days.

Of the 50 dogs we vaccinated, 10 were puppies 2-6 months old. We injected the vaccine
intramuscularly into the thigh region of all animals. Revaccination was carried out after 21
days. The work took 1 month.

The vaccine “Rabix” is made from an inactivated production strain of the rabies virus
“ERA-CB-20M”, grown on a culture of BNK-21 cells, and an adjuvant AbISCOR
(Isconova, Sweden) at the concentration recommended by the manufacturer.

Followed all the recommendations for preparing a dog for a rabies vaccination:
A prerequisite for vaccination is the excellent health of the pet. If you suspect that the
dog is ill (for example, he does not have an appetite or behaves lethargically), then it is
better to postpone the procedure until the condition of the animal is fully restored [8].

Provided quarantine. Before the first vaccination, it was ensured that the dogs did not
come into contact with other animals. Do not forget about the special risk group, which
includes stray animals. They kept the animals in a clean room, where they did not go in
street shoes and outerwear.

Monitored the condition of the dogs. They monitored body temperature, did not
introduce new foods into the diet. Give the dogs more water.

The rabies vaccine is usually given subcutaneously (in the withers), but some drugs can
be administered intramuscularly. Before vaccinating the dog, the veterinarian performed an
examination [9]. Only disposable syringes were used for the procedure. After the session in
the veterinary journal, marks were made. It indicated the date of vaccination and the drug
used.

Rabies vaccination contraindications.
It is strictly forbidden to vaccinate a dog that is sick or has not been dewormed. If the
pet has chronic diseases, then be sure to undergo a preventive examination before the
procedure and take tests (if necessary, they are prescribed by a veterinarian).

Contraindications Pregnancy (a pregnant bitch against rabies can only be given a
vaccine called Rabizin - it is believed that it does not affect the development of pregnancy
and the fetus), a weakened body, a rehabilitation period (for example, after an injury),
insufficient body weight.

After vaccination, the dogs remained under observation for about 20-30 minutes. The
pet needs peace and time so that he can fully relax. In this case, the vaccinated dog must be
provided with free access to food and water.

The recovery period after vaccination lasts 10-14 days. During this time, excessive
water procedures, intense exercise, hypothermia or overheating of the pet, communication
with other animals are undesirable.

Within 3-5 days after vaccination, the condition of the animals was carefully monitored.
At first, the dog may experience a slight malaise. Usually animals become less active,
appetite decreases, temperature increase is possible. The area where the vaccine was given
may be slightly swollen. All this is a normal reaction to the action of the vaccine, so you
should not be afraid of this [10].

Different veterinary clinics offer different vaccines. Usually drugs of both Russian and
foreign production are used. But we used the Swedish-made Rabix vaccine.

4 Conclusions

Rabies is dangerous not only for dogs, but also for humans. Unfortunately, the sick animal
is absolutely uncontrollable. This is no longer your affectionate and devoted dog, but only
an aggressive dog that has lost the instinct of self-preservation. Neither attempts to stop her,
nor physical impact will help.
Vaccination of a dog against rabies is mandatory. Data that the animal is vaccinated and safe for others may be required when transporting or crossing the border, as well as in the event of an attack on another animal or person.

10-14 days before vaccination, be sure to deworm your pet with specialized veterinary preparations.

References

9. S. G. Shmatko, L. V. Agarkova, T. G. Gurnovich, I. M. Podkolzina, Problems of increasing the quality of raw material for wine in the stavropol region, 7(2), 725-730 (2016).