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SCIENTIFIC RISK ASSESSMENT OF RABIES

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Abstract. Rabies is a particularly dangerous, natural, infectious disease of animals and humans, characterized by encephalomyelitis with severe disorders of the nervous system. Rabies is a zoonotic virus in mammals that are present on all continents except Antarctica. According to the World Health Organization (WHO), rabies causes about 70,000 deaths each year. In Europe, dogs (canis) are the main reservoir and vector of red foxes (*Vulpes vulpes*), the main cause of most rabies cases in countries such as Ukraine, Belarus and the Russian Federation, as well as in Africa, Asia and the Middle East. Recent statistics provide evidence that both foxes and dogs in Turkey can play a role in rabies reservoir. In Azerbaijan, rabies is a disease that must be reported and is endemic throughout the country. The characteristic (density, growth dynamics) of dogs population, which is the main source of rabies disease, is unknown. There is a large population of stray dogs in Azerbaijan.

Keywords: Rabies, risk assesement, virus, RNA

Rabies is a zoonotic disease that affects mammals on all continents except Antarctica. Close contact with saliva from an infected animal transmits the rabies virus (Aliyev E.A., 2013; Dorujan C., 2013). The virus can also be transmitted by scratching or licking damaged skin or mucous membranes (Şenbil O., 2000).

World Health Organization (WHO) estimates that rabies kills approximately 70,000 people each year. In European countries, red foxes (*Vulpes vulpes*) are the main reservoir and vector of rabies, while dogs (canis) are the most common cause of rabies cases in countries such as Ukraine, Belarus, and the Russian Federation, as well as Africa, Asia, and the Middle East. Dogs and foxes are both thought to act as reservoirs of rabies in Turkey, according to recent statistics (CDC, 1991).

Information about virus.

The causative agent of rabies is a neurotropic RNA-containing virus belonging to the Lyssavirus genus of the Rabdoviridae family. It is shaped like a bullet, and its size is 90-170 nm, and 110-120 nm. Their reproduction (in vitro and in vivo) leads to the formation of Babesh-Negri bodies, special derivatives of various shapes (big, oval, thread) in the cytoplasm of neurons, 0.5-2.5 nm in size, stained red with acid dyes. Two variants of the virus are known: a) street or "wild" variant - which circulates among animals under natural conditions, b) Fixed variant - obtained by infecting rabbits by L. Pasteur. Since fixed viruses are not excreted in saliva, they cannot be transmitted during a bite (Tenzin, 2012; Pal, 1999; NCAH, 2014). Neuronal proliferation is not accompanied by the formation of Babesh-Negri bodies. Fixed viruses are used to obtain an antirabies vaccine, and their administration forms permanent immunity against the street variant virus. This indicates that both variants have the same antigenic structure. Rabies viruses have two - S and V antigens. The S antigen is the same as for lyssaviruses and induces the formation of complement-binding and precipitating antibodies. V-antigen (surface antigen) causes the synthesis of neutralizing antibodies and participates in the formation of immunity. Wild viruses are pathogenic to humans, warm-blooded animals, and birds. High sensitivity to the virus is noted in foxes and Siberian mountain mice (Hampson, 2015).

Throughout Azerbaijan, rabies is a reportable disease. There is little known about the characteristics (density, growth dynamics) of the dog population, which is thought to be the main source of rabies. Therefore, there is a need to conduct scientific and epidemiological studies in this regard. There is a large population of stray dogs in Azerbaijan. Current management of these animals consists of neutering and vaccination programs, and culling is prohibited (Tenzin, 2016).

Risks of rabies in humans. In general, people are considered to be susceptible to rabies at an average level. An average incubation period of rabies is 3-6 weeks but can range from a few days to a year. Depending on the type of animal, age, resistance, the amount and virulence of the incoming virus, the location of the bite and the characteristics of the wound, the duration of this period can vary. There is a rapid progression of the illness. There are similar clinical signs in all species of animals, but dogs typically exhibit rabies symptoms. They usually suffer from rabies in a frenzied, paralyzed, or calm state. A prodromal, awakening (aggressive), and paralytic phase of rabies in dogs occurs in approximately 50% of patients (Owoyele, 2012; Tshedup, 2020).

A prodromal period lasts for 2-3 days. The bitten area is frequently licked and suffers from behavioral disorders, fever, and feverish symptoms.

The aggressive period lasts for 2-4 days. At first, the animals show timidity and timidity, and then aggressiveness. Increased interest in foreign objects, loss of appetite, fear of water, and light, memory loss and loss, loss of ability to listen to the owner

The period of paralysis lasts for 2-4 days. First, the spread of symptoms of paralysis is noticeable in the bitten area and then in all tissues, that is, the animal becomes paralyzed (Mosleh, 1988).

Prophylaxis measures. In the case of animal bites, the wound should be washed with boiled hot water, and soap (or without soap). Then it should be wiped with 70% alcohol or a solution of iodine in alcohol. It is not allowed to make incisions and sutures in the wound because it shortens the incubation period by causing additional injuries. Then anti-rabies serum or anti-rabies immunoglobulin is injected around the wound. The earlier the measures mentioned above and vaccinations against rabies are carried out, the more effective they are. Observations show that the vaccine is effective only if it is administered up to 14 days after the bite (Scholz, 2007). If it is clear that the animal is sick - rabies or if the biting animal is unknown, then vaccination is carried out unconditionally. If the biting animal is known and it is possible to observe it for a period of 10 days (veterinarian supervision), at the same time, if the animal does not have any signs of rabies, vaccination is mandatory. During conditional vaccination, vaccination is stopped if the bitten animal does not die within 10 days. If the biting animal cannot be traced, then vaccination is considered unconditional and should be continued until the end. The dose and duration of the vaccine are determined individually, depending on the area where the bite is located, the width and depth of the injury, and the duration of the injury (Zepeda-Sein, 1998; Tenzin, 2012).

Persistence of the virus. The rabies virus can survive at +56°C for 15 minutes and at boiling temperature for 2 minutes. They are sensitive to ultraviolet and direct sunlight and drying. They are resistant to low temperatures. Rabies viruses are not at all resistant to external environmental influences.

Important information about rabies:

- Rabies is a viral infection that mainly affects the central nervous system, with a high mortality rate.
- Cases of rabies infection have occurred in 150 countries around the world.
- In 95-99% of cases of infection, the virus was transmitted to humans through dogs. In the United States, bats are an important source of disease, and in European countries and Australia, there has been an increase in cases of bat-borne infections. In addition, the source of infection is wild animals - foxes, wolves, jackals, etc. displayed.
- Vaccination is preventable.
- 40% of suspected animal bites occur among children 15 years of age and younger.
- A total of 15 million vaccinations are carried out every year in the countries of the world, which prevents thousands of deaths.

Rabies risk assessment

Prophylactic vaccination after the bite of rodents such as mice, squirrels, hamsters, and rabbits.

In fact, this is a mistake, and there is no need to shave after the bite of such animals.

Although the Center for Disease Control and Prevention (CDC- Central of Disease Control and Prevention) recommends protective vaccination after any contact with bats, this situation in our country is mainly related to bats living in caves (Table 1).

Is preventive vaccination important after feeding an animal at risk of rabies, or contact with the animal's blood or urine?

– If there is no violation of the integrity of the skin, if there was no contact with the mucous membrane, there is no need for preventive measures in these cases. At the same time, the conditions mentioned above are the same according to the medical staff who take care of a sick person infected with rabies (Table 2).

Risk of infection by rabies:

If an animal at risk of rabies is alive for 10 days after a human bite, there is no need for protective vaccination.

– This information is not wrong, but it is considered suspicious. Although this information is considered true for cases of dog and cat bites, vaccination should be carried out only in case of bites from other high-risk animals (OIE, 2004).

– Individuals with a history of vaccination due to a previous bite do not need to be revaccinated in the event of a suspected bite (Roche, 2015).

– In fact, there is a need to be vaccinated, but the schedule to be selected for vaccination is different. At this time, only two doses of vaccination are recommended; on days 0 and 3.

Table 1

Risk assessment in certain animals

Source	Reason	Probability of occurrence	Risk level
<i>Bites of rodents such as mice, squirrels, hamsters, rabbits</i>	Often people are concerned about contracting rabies after an animal bite like this	Very low	Very low

Table 2

Risk assessment of rabies transmission

Source	Reason	Probability of occurrence	Risk level
<i>Prophylactic vaccination of people after feeding an animal at risk of rabies, contact with the animal's blood or urine</i>	The presence of people who mainly feed or care for stray animals	low	low

Information that people in close contact with animals need to know:

When does a dog bitten by a rabid animal become infected? What is the incubation period of the disease between dogs and humans?

– For the disease to start spreading, the virus must enter the tooth wound, multiply and multiply in this part, and move towards the central nervous system (the virus moves from the wound site at a speed of 8-10 mm/h) and, as a continuation of this process, reach the salivary glands (usually 3 -within 7 days). Since the virus is not found in any tissue fluid other than oral fluid, oral fluid is indicated as the only source of infection. However, despite this, the detection of the virus in mouthwash is possible in 60-70% of cases (3). After the virus reaches the central nervous system, it causes an inflammatory process, as a result of which clinical signs characteristic of rabies appear. When this happens, the dog dies on average within 2-7 days (first 10 days). The incubation period of the disease in dogs varies between two weeks and three months. In humans, the incubation period is generally estimated to be 3-8 weeks, but as in dogs, this period can vary. However, in exceptional cases, this period can be shortened or extended. The reasons for the variability of the incubation period include the fact that the area of the bite is covered by protective means (clothing, etc.), the amount of virus in the saliva that comes into contact during the bite, the virulence of the virus, the abundance of nerve cells in the area of the bite and nearby parts, the size of the bite wound and its proximity to the central nervous system (Dufour, 2015; Tenzin, 2012).

How is the rabies virus transmitted from dog to human or from dog to dog?

The virus found in the saliva of an animal suffering from rabies can pass through a tooth wound or other intact skin, or even rarely, saliva containing the virus can pass through the mucous membranes of the eyes, under the eyelids, inside the mouth and nose, which are rich in nerve tissues. Transplantation such as cornea can be transmitted by tissue or by breathing in caves where blood-sucking bats are numerous [9].

All contact between dogs, including mating, contact with rabid dog urine and faeces, consumption of rabid meat after cooking, touching, petting, riding a rabid dog, etc. cases do not cause rabies.

Should dogs be vaccinated against rabies every year?

– By law, dogs must be vaccinated against rabies every year! It is not necessary to vaccinate every year, especially for dogs that are kept indoors or in closed areas. In areas where rabies does not occur, older dogs may not be vaccinated annually or maybe vaccinated every two years (Gustafson, 1973).

Diseases similar to rabies in dogs:

– Infectious diseases affecting the nervous system such as plague, tetanus, Aueski, strychnine, phosphorus and lead poisoning, hypoglycemia, low or high calcium levels in the blood, vitamin A deficiency, acute acidosis, brain trauma and other brain diseases, inner ear inflammation, intestinal in children Symptoms similar to rabies can be observed even during oral cavity injuries and other diseases (Crotta, 2016; NCAH, 2015).

Can a rabies-vaccinated dogs be guaranteed not to be infected if bitten by a rabid dog?

No guarantee is given. It is not possible to be certain that all vaccinations administered will produce enough antibodies to protect animals from the rabies virus. The failure of a vaccine to induce sufficient antibody production depends on the quality of the vaccine and the species of animal to which it is administered (Gustafson, 1973; Gale 2010). At the same time, if the animal develops another disease that weakens the immune system at the same time, the body may not produce any level of antibodies against the rabies vaccine. For this reason, the vaccine should be administered only to healthy animals, and a vaccinated dog bitten by a rabid dog should be revaccinated (Table 3).

Table 3

Risk assessment of rabies in vaccinated animals			
Source	Reason	Probability of occurrence	Risk level
<i>Rabies-vaccinated dog bitten by a rabid dog</i>	It is generally believed that if a dog is vaccinated against rabies, it will not get rabies in any case if bitten by a rabid dog.	low	low

High risk group of people concerning rabies

Veterinarians, people engaged in catching stray (street) animals, employees of animal shelters and centers, people who prepare samples for rabies examinations, employees of relevant laboratories, and people belonging to professional categories with a high risk of rabies infection should be vaccinated regularly (Gale, 2010; Larr?ch?, 1983; NCAH, 2014). In addition, people who are living in areas with a lot of stray animals are included in the high-risk group due to rabies (Table 4).

Table 4

Assessing the risk of contact with street animals for people			
Source	Reason	Probability of occurrence	Risk level
<i>People who make up the risk group</i>	Veterinarians, laboratory workers, cave explorers, dog center workers, dog shelter workers, people living in an area with a lot of stray animals.	High	High

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НАУКОВА ОЦІНКА РИЗИКУ СКАЗУ

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Резюме. Сказ – це особливо небезпечна природна інфекційна хвороба тварин і людини, що характеризується енцефаломієлітом з важкими ураженнями нервової системи. Сказ — це зоонозна хвороба ссавців, яка поширена на всіх континентах, крім Антарктиди. За даними Всесвітньої організації охорони здоров'я (ВООЗ), сказ спричиняє близько 70 000 смертей щороку. У Європі собаки (*canis*) є основним резервуаром і переносником червоних лисиць (*Vulpes vulpes*), основною причиною більшості випадків сказу в таких країнах, як Україна, білорусь і російська федерація, а також в Африці, Азії та Середньому сході. Останні статистичні дані свідчать про те, що як лисиці, так і собаки в Туреччині можуть відігравати певну роль у збудниках сказу. В Азербайджані сказ є захворюванням, про яке необхідно повідомляти, і є ендемічним по всій країні. Характеристика (щільність, динаміка росту) популяції собак, які є основним джерелом захворювання на сказ, невідома. В Азербайджані мешкає велика популяція бродячих собак.

Ключові слова: сказ, оцінка ризику, вірус, РНК

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