

Difäm Health Community (DHC)

As of October 2022

Podcast: Vaccines against rabies

Hello together! I am xxx and I work for the health team of the German Institute for Medical Mission, also called Difäm. Today I am herewith my colleague, xxx.

We have prepared a podcast for you about rabies and the possible vaccinations against it. Xxx, can you tell us more about rabies, please?

Sure, welcome to our audience and thank you for the question. Rabies is a viral disease that is nearly always fatal once the patient shows clinical symptoms. The virus is usually transmitted through the bite of an infected animal. The WHO estimates that rabies leads to 59 000 deaths per year. About 40% of victims due to rabies are under 15 years of age. The rabies vaccination can be administered as a preventive vaccine or – more importantly - as post exposure prophylaxis in the case of a bite.¹ As rabies is most often transmitted through dog bites, one of the most important preventive actions is the vaccination of dogs. However, vaccinating humans and having the vaccine at hand in case of a bitten patient, is definitely equally important.

How do you know, if a dog is infected with rabies?

The dog might show aggressive or atypical behaviour. Unfortunately, some infected dogs do not show symptoms at all. In case of suspicion of a rabies infection of a non-vaccinated dog, the animal should be isolated and observed for ten days. If it does not die, it was not infected.

What happens when an animal like a dog becomes infected with rabies?

After a bite, the rabies virus multiplies in the wound and enters the nerves. Then it travels very slowly through the nerves to the brain, where it causes a meningoencephalitis. If the limbic system is affected, the animal shows the typical aggressive behaviour. After multiplication of the virus in the central nervous system, it travels back to other tissues and particularly to the salivary glands.³ When the infected animal bites another animal or a human, the virus is transmitted by the saliva.

How does the disease manifest itself in humans?

As I said before, unfortunately rabies is fatal in most cases. However, there is also good news. After a bite of a human by an infected animal, the incubation period of rabies is long, between 1 to 3 months on average. This means, that we usually have time to immunize a bitten person.

Let us have a look at the symptoms of rabies : 40% of all cases experience itching or numbness in the wound area. This is followed by flu-like symptoms with mild fever, anxiety and sleeplessness. Within the following 7 days, the patient may show two different types of symptoms.

The first type is the encephalitic or ‘furious’ form which 70-80% of all patients show. Here we see sweating, watering of the eyes, saliva production and the typical aggressive behaviour with anxiety, restlessness and hyperactivity. The patient has often an impaired consciousness and sometimes hallucinations. When given fluids to drink, he/she typically refuses; this is called hydrophobia. It can lead to spasms in the oropharynx and even convulsions. Having entered this stage, the patient usually dies after 3 to 7 days.

The second form is paralytic and occurs in 20-30% of cases. We usually observe it in patients bitten by bats. An acute progressive myelitis with flaccid palsy of the lower limbs is characteristic. Paralysis of respiratory muscles follows within 1 to 3 weeks. Hydrophobia is possible towards the end.^{1,4}

How can we diagnose rabies?

The most important point is: We have to ask a patient presenting with neurologic symptoms or an unexplained encephalitis if he or she has recently experienced an animal bite. In resource-limited settings, we have to rely on our clinical diagnosis.

In settings with good laboratory facilities, we can confirm an infection by a laboratory test, e.g. by antigen detection of a corneal imprint or virus isolation in saliva, spinal fluids and urine. An autopsy of the deceased patient confirms the diagnosis. We then have access to the brain and fluorescent antibody testing. This is the gold standard for a post mortem rabies diagnosis.¹

Now that is hard! Can we do anything for the patient, while he/she is alive?

The sad answer is: not much. We have to take care that the patient is isolated in a room where he cannot harm him- or herself or others. We can only treat the symptoms, for example by intravenous fluids and sedation.¹

You said that there is the option of post exposure vaccination. How can we prevent rabies after a bite?

The long incubation period provides an opportunity for highly effective post exposure prophylaxis, which is abbreviated PEP. PEP consists of three parts: the cleaning of the wound or the affected skin parts, the active immunization by giving a rabies vaccine and the passive immunization by infiltrating the rabies immune globulin in short RIG around the wound site.⁴ Thorough washing of the wound or the affected skin with soap and water for 15 minutes reduces the number of virus particles; after cleaning, we disinfect the affected area. Sometimes, we have to conduct a surgical debridement or give antibiotics. We also have to check if the patient is immunized against tetanus.

Then we have to do a risk assessment for a rabies infection:

If the animal was only in contact with intact skin and the patient does not have a wound, nothing needs to be done. If the contact with the infected animal resulted in minor scratches without bleeding or licking of wounded skin, we should start active immunization with a rabies vaccine to reduce the risk that the rabies virus enters the peripheral nerves. If the patient has one or several bleeding bites or contaminated mucous membranes, we have to start active immunization with the vaccine, and passive immunization by additionally inserting the rabies immune globulin, the RIG into the wound.^{1,4}

OK. This means active immunization is done by giving vaccine shots to the patient. Passive immunization means bringing the rabies immunoglobulin right into the wound. Can you tell us more about active and passive immunization?

Of course. In active immunization, we use vaccines to activate our immune system. Triggered by the antigens in the vaccine, the body produces antibodies.

Passive immunization means that we do not use our own antibodies. We use antibodies already produced against an antigen. This saves time: The foreign antibodies can start eliminating the virus while the body is producing its own antibodies after vaccination. The rabies immune globulin RIG is infiltrated around the wound as the third part of PEP. It neutralizes the virus at the wound site. Unfortunately, worldwide less than 2% of patients with a suspected rabies infection receive RIG, as it is very expensive and not easily available. But good news: , the first monoclonal antibodies (mAb) have been licensed in India as an alternative to RIG.

Is it possible to get vaccinated against rabies as a prevention of the disease?

Rabies vaccination before exposure is usually only given to risk groups, like rangers working with mammals or adults and children travelling to places where rabies control among animals is weak.

Why do we not give active immunization to everybody in endemic countries, e.g. within programmes for child immunization?

We do not immunize whole populations, because it costs too much. Rabies preventive measures like health education, leaflet campaigns and above all vaccination of dogs is more cost-effective.¹

After all, deaths by rabies occur mainly in those who do not have access to timely and effective post exposure prophylaxis. Prompt PEP after an animal bite is 100% effective to prevent rabies. However, delay in seeking PEP, improper wound care, unnoticed wounds, and lack of patient compliance with vaccination schedules, among other factors, contribute to PEP failure and subsequent death.^{1,4}

Can we use PEP in pregnancy and for HIV/AIDS patients?

Rabies vaccines and RIG are safe and effective for pregnant and lactating women as well as for immunocompromised patients.

Thank you xxx for this very interesting information. Let me summarize the information given to us: Rabies is a zoonotic viral disease that kills an infected person if this person enters the clinical stage of the disease. An infection with rabies most frequently occurs due to dog bites or bites by other animals like bats. Death can be prevented if a person undergoes post exposure prophylaxis or PEP. PEP consists of a combination of thorough wound cleaning and disinfection, active immunization with a rabies vaccine and passive immunization with a rabies immune globulin or monoclonal antibodies, which are infiltrated into the wound site.

We can see again that immunization – active or passive – helps saving lives. We hope you will listen to our next podcast about vaccinations.

Internet sources as of 14/10/2022

- 1 <https://www.who.int/publications/i/item/who-wer9316>
- 2 www.cdc.gov/rabies/animals/bats/index.html
- 3 <https://www.ncbi.nlm.nih.gov/books/NBK8618/>
- 4 <https://www.who.int/news-room/fact-sheets/detail/rabies>