

## Rabies

Rabies, an acute and deadly viral infection of the central nervous system, is one of the most terrifying diseases known to man. Although rabies in humans is rare in this country, as many as 18,000 Americans receive post-exposure treatment each year because of contact with animals suspected of being rabid. The U.S. Centers for Disease Control and Prevention (CDC) reported that in 1997, four people died of rabies in this country. In other parts of the world, however, many people and countless wild and domestic animals die of rabies each year.

Caused by a virus that is present in the saliva of infected animals, rabies is usually transmitted by bites. All warm-blooded animals are susceptible to rabies, and some may serve as natural reservoirs of the virus.

Rabies is found in all of the United States, except Hawaii, and in many other countries around the world, including Canada and Mexico. The disease may be absent from large areas for many years, and then reappear suddenly or gradually by invasion from bordering countries or by the introduction of an infected animal.

Rabies can affect wildlife such as raccoons, skunks, and bats, as well as dogs and cats. Vaccination of pets and livestock is the most effective control measure to prevent the disease in these animals and subsequent human exposure. In fact, in the United States, such programs have largely eliminated canine rabies. In 1995, wild animals accounted for 92 percent of the 7,247 reported animal rabies cases in the United States and Puerto Rico. Rabies in raccoons accounted for more than 50 percent, skunk rabies for 22.5 percent, bat rabies for 10 percent, and fox rabies for 6.5 percent of the cases. Rabies is found rarely in rabbits, squirrels, rats, and opossums. Rabies in raccoons is of particular concern because raccoons are often in close contact with household pets such as dogs and cats. Increasingly, bats are implicated as important transmitters of rabies to humans.

The disease is usually contracted from the bite of a rabid animal. Also, if broken skin, e.g., in a scratch, comes in contact with virus-laden saliva, infection may be transmitted. But rabies also can be spread in the air, as has occurred in caves inhabited by infected bats.

### Incubation Period

Although the bite of a rabies-infected animal does not cause disease

every time, a person should call a doctor immediately after being bitten. When symptoms do appear, it is usually 30 to 50 days following exposure. There is a direct relationship between the severity and location of the bite, and the length of the incubation period. For example, if a person's head is severely bitten, symptoms may appear in as few as 14 days. Under rare circumstances, illness may not develop for a year or longer after exposure.

### Symptoms in Humans

Rabies is suspected if, weeks or months after possible exposure to the virus, an individual experiences symptoms such as a short period of mental depression, restlessness, abnormal sensations such as itching around the site of the bite, headache, fever, tiredness, nausea, sore throat, or loss of appetite. Other early symptoms include muscle stiffness, dilation of pupils, increased production of saliva, and unusual sensitivity to sound, light, and changes of temperature. As the disease progresses, the patient experiences episodes of irrational excitement alternating with periods of alert calm. Convulsions are common. Most dramatic of all are the severe and extremely painful throat spasms suffered by the person when trying to swallow – or even upon seeing – liquids. This reaction to water, sometimes viewed as a fear of it, is characteristic of people with rabies and gives the disease its medical name, *hydrophobia*.

Death from cardiac or respiratory failure usually occurs within a week after the appearance of rabies symptoms, while the excited state is still predominant. If the patient survives this stage, muscle spasms and agitation stop, only to be replaced by progressive paralysis leading to death. In human rabies resulting from the bite of a rabid vampire bat, excitement and hydrophobia are typically absent and the disease is characterized by paralysis progressing from the legs upward.

Once symptoms appear, the only treatment is vigorous supportive measures to help the patient feel more comfortable by controlling the respiratory, circulatory, and central nervous system symptoms. Patients do not recover and eventually die from the infection.

### Rabies in Animals

Early signs of rabies in animals include altered disposition, fever, loss of appetite, and often, altered phonation, such as a change in tone of a dog's bark. These signs are often slight, however, and may escape notice. A few days after infection, marked restlessness and agitation may develop, along with trembling. An affected dog may growl and bark constantly, and will viciously attack any moving object, person, or animal it

encounters. This excited state usually lasts three to seven days, and is followed by convulsions and paralysis.

In some instances, signs of excitement and irritability are slight or absent, and paralysis develops within a few days of disease onset. In cases of this type, an early sign is often paralysis of the lower jaw, accompanied by increased drooling and foaming of saliva. The animal may appear to be choking on a foreign object, constituting a dangerous trap for humans, who, in attempting to be helpful, may unwittingly expose themselves to infection.

### **Procedure after Contact with an Animal**

After being bitten or scratched by any animal, the person should clean the wound immediately with soap and water to remove saliva from the area, and should call a doctor right away. If soap is not available, e.g., when hiking, the person can use water alone, but wash with soap and water as soon as possible. After washing, the wound should be allowed to bleed, which also will help to clean it. In addition, the state or local health department should be notified.

Because of reports that rabies can be spread in the air by infected bats, CDC now recommends that people seek medical assistance even without a demonstrable bite, scratch, or mucous membrane exposure in situations in which there is reasonable probability that they have had contact with a bat, e.g., when a sleeping person awakens to find a bat in the room.

Although the possibility of rabies transmission from rodents, including squirrels, is small, a person who has been bitten by one should still consult a doctor. In fact, it is best for people to avoid contact with any wild animal.

### **Diagnosis**

Clinical diagnosis of rabies in humans is based on the patient's history of exposure and development of characteristic symptoms. To confirm the diagnosis (usually not possible until late in the disease), rabies virus must be seen in saliva or brain tissue. The doctor must use sophisticated laboratory tests to demonstrate rabies or evidence of rabies virus.

### **Anti-Rabies Treatment**

If a physician determines that a person probably has been exposed to rabies, post-exposure treatment should begin at once, preferably within 24 to 48 hours of exposure. In fact, many experts recommend that

treatment should be started even if the delay is much longer than that.

The initial treatment, sometimes called passive immunization, provides immediate but temporary protection by injecting antibodies (disease-fighting proteins or immunoglobulins) into the patient. Currently, CDC recommends treating a patient immediately with one dose of human rabies immunoglobulin (HRIG).

After the initial treatment, CDC recommends that patients be immunized with killed rabies virus vaccine, which stimulates the body to produce its own antibodies. It takes some time for the body to produce the antibodies, but these antibodies provide longer-lasting protection. Because rabies has an unusually long incubation period, however, the body has time to respond to the vaccine and produce protective antibodies.

There are now three types of rabies vaccines – human diploid cell vaccine (HDCV), rabies vaccine adsorbed (RVA), and purified chick embryo cell culture (PCEC). Post-exposure immunization with one of these vaccines requires five injections into the upper arm muscle over a four-week period. The vaccines can cause mild reactions such as swelling or redness at the vaccine site, headache, fever, nausea, muscle aches, and dizziness.

Pre-exposure immunization with a rabies vaccine is recommended for persons with a high risk of rabies exposure, such as veterinarians, animal caretakers, laboratory workers, cave explorers, and forest rangers, and should be given in three injections over four weeks. This regimen also is recommended for people traveling to areas where rabies is not well-controlled, such as parts of Africa, Asia, and Central and South America, and where the vaccine for post-exposure treatment might not be readily available. If a person who has been vaccinated prior to exposure does come in contact with the rabies virus, then the post-exposure regimen would require only two booster injections. People with continuing risk of exposure should receive a booster about every two years (or sooner if the number of antibodies drop below a protective level).

More detailed information on pre- and post-exposure rabies immunization can be obtained from your local health department or from the CDC.

## **Prevention of Rabies in Humans**

Control of rabies in animals and avoiding contact with possibly rabid animals are the best methods of preventing transmission of the virus to

humans.

- Immunize domesticated animals, including dogs, cats, sheep, cattle, and horses, regularly with animal rabies vaccine.
- Keep dogs on leashes when outside of the yard and do not chain them inside the yard.
- Avoid contact with wild or unfamiliar animals, and don't touch them even when they are dead.
- Seal basement, porch, and attic openings and cap chimneys to prevent animals from entering the home.
- Report strays or animals acting strangely or sick to local animal control authorities.

### **For More Information**

Centers for Disease Control and Prevention  
Mail Stop A-26  
1600 Clifton Road, N.E.  
Atlanta, GA 30333  
1-888-232-3228

Food and Drug Administration  
5600 Fishers Lane  
Rockville, MD 20857  
1-800-532-4440  
<http://www.fda.gov>

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NIAID, a component of the National Institutes of Health, supports research on AIDS, tuberculosis, malaria and other infectious diseases, as well as allergies and immunology.

Prepared by:  
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Bethesda, MD 20892

Public Health Service  
U.S. Department of Health and Human Services  
**July 1998**

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