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<p style="text-align: center;">HESIS</p> <p style="text-align: center;">Fact Sheet</p>	<p style="text-align: center;">Occupational Exposure to Rabies Virus</p>

This fact sheet is for workers who may be exposed to the rabies virus on the job, and their employers. Three main groups are at risk: those who work with animal species that can transmit the virus, workers whose jobs may incidentally expose them to carrier animal species, and lab workers who use live rabies virus in research or vaccine facilities, or perform diagnostic tests. Human rabies is now very rare, due to the development of domestic animal control programs. In 1997, only four cases of human rabies were reported to the Centers for Disease Control (CDC). In the United States today, wildlife accounts for more than 90% of the reported cases of animal rabies. In California, rabies is well established in the skunk and bat populations. Humans can be infected when an infected animal's saliva gets through an open wound (usually the animal's bite) or through a mucous surface such as the eyes, nose, or mouth. A new vaccine is being used that has fewer side effects than the previous vaccines. If you think you may have been exposed to a rabid animal, retrieve and quarantine or euthanize the animal for testing, see a physician as soon as possible, and contact animal control authorities.

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A Case Study

In September 1995, a 27-year-old farm worker in California died of rabies from a suspected occupational exposure. He

worked in a packing shed where a colony of bats lived on the roof and entered the packing shed through an opening in the wall. Daily, the worker was exposed to bats by walking through the packing shed. On one occasion, a bat actually landed on the worker's chest. The worker's first symptoms included a sudden onset of nausea, vomiting, and headache, and later a fever. Soon he became agitated and delirious, requiring restraints. He went into a coma and died a short time later. Because of his known exposure to bats, rabies was suspected from the beginning, but he was not given post-exposure rabies prevention measures because such treatment is not effective once clinical symptoms have started.

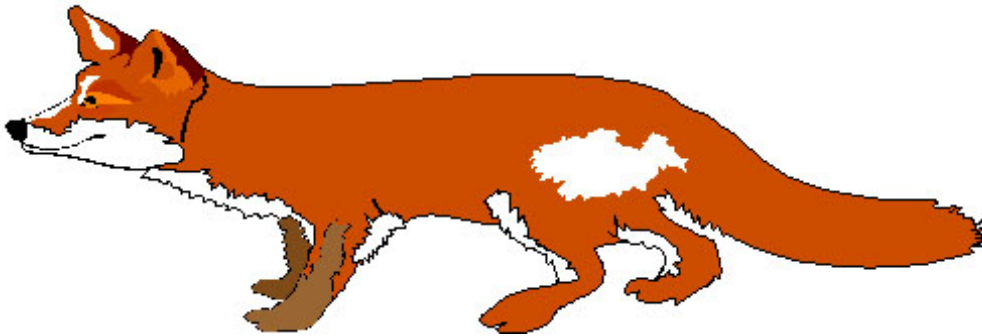
Who is at Risk?

Rabies is a deadly viral disease of the central nervous system (CNS) that can affect most mammals. Some workplaces create a risk of exposure to the rabies virus. Three main groups of workers are at risk: (1) workers whose jobs require frequent exposure to animal species that can transmit the virus. This includes veterinarians, veterinary technicians, animal control officers, and wildlife workers. (2) workers whose jobs may incidentally expose them to a carrier animal species. This includes spelunkers (cave explorers) and some construction workers (for example, performing bridge-retrofitting jobs). (3) research laboratory and vaccine facility workers who work with live rabies virus, and other lab workers such as those performing rabies diagnostic testing. Other jobs may also pose some risk, as shown in the case described above.

Health care workers caring for infected patients may also be at risk, although there are no documented cases of transmission of rabies from a patient to a health care worker.

Which Animals Carry Rabies?

Most wild mammals can get infected with rabies. The most susceptible animals include bats, raccoons, skunks, coyotes, foxes, and wolves. Rabies in domestic animals can be prevented by a vaccine. However, dogs, cats, and livestock can be infected if they are not vaccinated. Cats currently make up most of the reported cases among domestic animals in the United States.



Corel Graphic

Who Gets Rabies?

Human rabies has been decreasing in the United States since the early 1950s, due to the development of domestic animal control programs, and is now very rare. In 1997, only four cases of human rabies were reported to the Centers for Disease Control (CDC). In the United States today, wildlife accounts for more than 90% of the reported cases of animal rabies. In California, rabies is well established in the skunk and bat populations. The number of reported cases of animal rabies in the United States has increased since 1966.

Only the saliva or the brain tissue of an infected animal is thought to be infectious. Humans can be infected when an infected animal's saliva gets through an open wound (usually the animal's bite) or through a mucous surface such as the eyes, nose, or mouth.

Very rarely, humans can be infected with rabies through non-bite exposures in workplaces with high concentrations of rabies virus. These include vaccine facilities, research labs, and labs performing diagnostic lab work that require working with infected tissue or airborne virus. Caves in which airborne rabies virus from bat secretions is present can also be a source of non-bite exposure to rabies.

Symptoms of Rabies in Humans

It takes some time (the "incubation period") before a person exposed to rabies develops symptoms. The incubation period for rabies can vary. It can be anywhere from a week to over a year. An incubation period as long as 19 years has been reported. However, it usually lasts about one to two months. The incubation period varies, depending on the amount of virus introduced into the body and the distance the virus has to travel from the site of exposure to the central nervous system (CNS). The closer the bite is to the CNS, the shorter the incubation period. Bites to the head and neck are usually associated with an incubation period of less than one month.

Rabies generally progresses through four clinical stages: 1) prodrome, 2) acute neurologic period, 3) coma, and 4) death, or in extremely rare cases, recovery.

The prodrome can last from one to four days. Symptoms are most often nonspecific and consist of fever, headache, fatigue, loss of appetite, nausea, vomiting, sore throat, and nonproductive cough. The first rabies-specific symptom may be pain or paresthesia (abnormal burning sensation) at or around the site of exposure. This occurs in about 50-80% of patients.

The first acute neurologic symptoms may include hyperactivity, confusion, hallucinations, seizures, anxiety, agitation or other bizarre behavior, neck stiffness, or paralysis. Other symptoms and signs seen during the acute neurologic stage are fever, rapid breathing, excessive salivation, twitching, and convulsions. The acute neurologic phase lasts about two to seven days. During this phase the mental status gradually progresses from confusion to disorientation, stupor, and finally coma.

Comas may last anywhere from hours to months. Death during coma usually occurs as a result of respiratory failure or a variety of other complications. Recovery from presumed rabies has only been reported in three cases, all of which had received either pre-exposure prophylaxis or post-exposure prophylaxis before the onset of symptoms.

How Can We Tell If Someone Is Infected With Rabies?

There is currently no test to diagnose rabies in humans before clinical symptoms appear. The most helpful information in the diagnosis of rabies is history of exposure to an animal. However, rabies should be suspected in any patient who develops rapidly progressive encephalitis (inflammation of the brain), even if there is no history of animal exposure.

Post-exposure prophylaxis (PEP)

Each year, animals bite over a million Americans. Each of these cases involves a decision whether to start post-exposure rabies prevention measures (Post-Exposure Prophylaxis or PEP). PEP used to be painful and required many injections, but with modern vaccines, fewer injections are required and there are fewer side effects, so the decision concerning treatment is easier. Major deciding factors include (see decision tree, [Figure I](#)):

1. Whether there was direct physical contact with saliva or other material known to transmit rabies.
2. Whether the species of animal is known to carry rabies, and whether rabies is known to be present in the animal population in the geographic area where the exposure occurred.
3. The exposure situation (for example, whether the animal was provoked or attacked without being provoked).
4. Whether the animal, if it is a domestic dog or cat, remains healthy after being quarantined for ten days and watched for signs of rabies.

Domestic dogs and cats that bite humans must be placed in quarantine and watched for signs of rabies for ten days, or else be killed immediately and tested for rabies, at the discretion of the local health officer. If an animal develops signs of rabies, the animal should be humanely killed and post-exposure prophylaxis should be given to the person who was bitten. It is not known how long the virus is present in the saliva of infected wild animals before they show signs of rabies. Therefore, quarantine of animals other than domestic dogs and cats is useless and they should be killed and tested for rabies immediately.

According to the US Centers for Disease Control (CDC), 21 cases of human rabies associated with bats have been reported since 1980. Only one of these had a definite history of a bat bite. PEP is now recommended for situations where contact with a bat occurred (for example, sleeping person awakening to find a bat in the room, or adult finding a bat in a room with a previously unattended child or mentally disabled or intoxicated person).

Immediate treatment of the wound is important. Wash thoroughly with 20% soap solution and rinse with large amounts of water. Soaps that contain quaternary ammonium compounds have been recommended to inactivate the rabies virus. [Use 1-4% benzalkonium chloride or 1% cetrimonium chloride solutions.] Tetanus toxoid booster and antibiotic treatment are usually indicated.

PEP, if given in time and as recommended, almost always prevents the development of rabies. In the rare case where human rabies does occur, further treatment is merely supportive, and almost never successful. PEP usually requires both Human Rabies Immune Globulin and the complete series of rabies vaccinations, unless the person has been previously immunized (see following section). PEP should be given according to the latest guidelines from the California Department of Health Services, Veterinary Public Health Section, phone (916) 327-0332. The guidelines are also available in their publication, California Compendium of Rabies Control.

Preventative immunization (Pre-exposure prophylaxis)

Some workers should get preventative immunization as a precaution. This is most important for people who might get exposed to the rabies virus without knowing it (for example, laboratory workers). Also workers with high likelihood of exposure to rabid animals should receive preventative immunization. This group includes veterinarians, veterinary technicians, animal control officers, wildlife workers, other animal handlers, cave explorers and some construction workers. Persons who travel to and spend more than 1 month in foreign countries where canine rabies is endemic should also be immunized. It also offers protection for those who may face delay in accessing post-exposure immunization. This is particularly a problem associated with remote work in areas where the vaccines may not be readily available. The benefits of preventative immunization are that it simplifies and shortens post-exposure immunization, reduces the risk of side effects and costs less.

Preventative immunization consists of three vaccinations with the rabies vaccine. These are usually given once per week. Blood testing should be done immediately after completing the series of vaccinations, and every 2-6 years thereafter. Single booster doses should then be given if the protection becomes ineffective. If a previously immunized person is later exposed to rabies virus, two additional doses are given. Additional immunization is not necessary in such previously immunized individuals.

Potential side effects of vaccines

Side effects are much less common than with earlier vaccines. Pain and low-grade fever may occur after post-exposure treatment. Preventative immunization causes pain, redness, and swelling at the site of injection in 30-74% of patients. Systemic reactions, including headache, nausea, abdominal pain, and muscle aches, occur in 5-40%. About 6% of patients have a more severe reaction involving a skin rash, sometimes accompanied by arthritis, nausea, vomiting, and fever. There have been no reported fatalities due to the vaccines. Many of these reactions may be caused by exposure to the preservatives used in the vaccines. A preservative-free preventative vaccine has recently been approved that may have fewer side effects.

Prevention and Control

Preventing exposure to rabid animals and providing appropriate pre- and post-exposure prophylaxis can prevent human rabies. Rabies control programs are required for every city and county in California. Animal licensing, rabies immunization of dogs and cats (both at three months of age), public education, stray animal control, animal bite investigation, and quarantine of animals coming into the US are all important rabies control tools. Because of the risk of rabies, laws prohibit the importation, distribution, relocation or keeping of wild animals such as raccoons, skunks, coyotes, foxes and bats. Rabies vaccines have not been tested for their effectiveness in hybrid animals such as dog-wolf hybrids.

Wild animal rabies is more difficult to control. Skunks and bats are the main targets for control, through exclusion of animals from dwellings and surrounding structures. Once animals are excluded, structures should be made bat-proof by

sealing entrances used by bats. Untrained and unvaccinated persons should never handle bats.

Health care workers could be exposed while caring for rabies patients, particularly during the time before recognition of a case as rabies. Strict adherence to universal precautions procedures has been recommended to minimize the number of health care workers who would otherwise need post-exposure prophylaxis because of mucous membrane exposure or exposure of non-intact skin to potentially infectious body fluid.

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