



## **What You and Your Physician Should Know About Rabies**

Rabies is a fatal viral disease transmitted in the saliva of infected mammals that can be prevented by timely vaccination and by avoiding contact with animals that may be rabid.

### **Animals That Transmit Rabies**

- Most animal rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in wild animals such as bats, skunks, raccoons and foxes. In the United States bats are the primary reservoir for rabies. There have been no cases of terrestrial animals (e.g. dogs, cats, skunks, opossums, raccoons, foxes, coyotes) with rabies in Alameda County since 2005, when a skunk tested positive. Since 1980, most of the human rabies cases diagnosed in the United States have come from exposure to bat-variants of rabies virus. Rabies in wild mammals occurs throughout the continental United States; only Hawaii is consistently rabies-free. Domestic animals account for approximately 7% of the reported rabies cases, with cats, cattle, and dogs most often reported rabid. The likelihood of human exposure to a rabid domestic animal in the United States has decreased greatly since the 1950's.
- International travelers to areas where canine rabies is still endemic have an increased risk of exposure to rabies. In most other countries, including most of Asia, Africa, and Latin America, dogs remain the major species with rabies and the most common source of rabies among humans.
- The rabies virus lives in nerve tissue and is present in the saliva of a rabid animal. Rabies can be transmitted from the bite of a rabid animal, or when the animal's saliva contacts a person's mouth, eyes, or an open sore.

### **Symptoms**

- Rabies symptoms in humans usually occur 4 to 6 weeks after exposure but can range from 5 days to 7 years.
- Typical symptoms include a sense of apprehension, headache, fever and malaise. The disease progresses to paralysis, spasm of the muscles used for swallowing (leading to fear of water, or hydrophobia), confusion, convulsions and eventually death.
- Once symptoms have developed, no drug or vaccine will improve the chance for survival. Only a few patients with human rabies have survived with intensive medical care; all other patients have died despite treatment.

### **Evaluating rabies exposure risk and the need for post-exposure prophylaxis**

Rabies post-exposure prophylaxis (PEP) with Human Rabies Immune Globulin (HRIG) and rabies vaccine can prevent disease if administered early and according to established recommendations. Decisions regarding the need for PEP are complex and involve the type of animal, its health and behavior, the type and circumstances of exposure, and the availability of the animal for diagnostic testing or observation under quarantine.

#### **1. The species of mammal involved and if it is commonly infected with rabies in the geographic region where the bite or exposure occurred**

Bats and skunks in California are at very high risk for having rabies. Foxes, feral cats, and raccoons are also at high risk for carrying rabies. Rabies has been found occasionally in other California wildlife such as opossum and coyote. In the United States, rabies is uncommon in pet cats, dogs, horses, cows, or other domesticated animals, but can occur, especially if the animal is not up-to-date on rabies immunizations. Small, wild, free-living mammals such as mice, rats, squirrels, gophers, or indoor pet rodents such as hamsters, gerbils, and guinea pigs are rarely infected with rabies, and in the United States have not been known to transmit rabies to humans. Exposures from mammals that occur outside of the United States or from imported animals require further evaluation.

#### **2. The health, behavior, and vaccination status of the animal**

Rabies may be more likely in animals with abnormal behavior, such as:

- Wild animals that seem unusually unafraid of people
- Nocturnal animals (bats, skunks, opossums, raccoons, foxes) that are active during the daylight
- Bats that are unable to fly or have been caught by a domestic dog or cat
- Pets that have difficulty walking, eating, or drinking, or who have marked changes in personality (such as new viciousness or withdrawal) or voice tone/vocalizing
- Neurologic signs such as paralysis, ataxia (uncoordinated movement), hyper-salivation, choking

A pet dog, cat or ferret that was born in the United States and is documented to be current on rabies immunization is unlikely to be rabid.

### 3. **The type (bite vs. non-bite) and circumstances of the exposure (unprovoked vs. provoked)**

Bite exposures are higher risk than non-bite exposures. A bite is any penetration of the skin by teeth. Bites to bare skin (more salivary contamination), head/neck (shorter incubation period), multiple bites, and severe bite wounds are higher risk. The exception is bat bites, which carry a high risk but which may not cause symptoms or even be recognized because most bats' teeth are tiny, like a 26-gauge needle. It may be impossible to rule out rabies exposure from a bat if the person was asleep, is an unattended child, or had an altered level of consciousness while in the same room with a bat or bats, unless all bats can be captured and tested for rabies by a public health laboratory. Human patients with rabies have been found to be infected with bat strains of rabies virus, even if they did not remember being bitten by a bat. **Rabies PEP may be appropriate in situations involving contact with bats, even if a bite is not apparent.** Non-bite exposures, where open wounds, abrasions or mucous membranes are contaminated by the saliva or neural tissue from a rabid animal, rarely cause rabies.

Unprovoked exposures may be more likely to indicate that the animal was rabid than a provoked exposure. A provoked exposure includes trying to feed an animal, entering its territory, petting or playing with it, handling it, attempting to break up a fight between animals, having contact with an injured animal, or walking, running, or biking close to it. Unprovoked exposures are unusual and typically require an animal to cross a neutral space and attack. If the circumstances of the bite are high risk (e.g., an unprovoked bite to the face by a high risk animal), PEP should be started promptly, and can be discontinued if the results of animal testing or observation reveal no evidence of rabies.

### 4. **Availability of the animal for testing or observation**

Wild animals (including bats) that are promptly captured and euthanized are tested by the Public Health Laboratory, and the results may guide decisions about PEP. If a wild biting animal escapes or cannot be tested, decisions about PEP will depend on evaluation of other risk factors. If the animal was a domestic cat, dog, or ferret, it should be located and quarantined for 10 days. If the animal is healthy at the end of the 10 day quarantine, it does not have rabies and rabies PEP is not needed. If the animal is feral and unavailable for testing, that will also inform the decision on whether or not PEP is warranted.

## **Management of Exposures**

Post-exposure prophylaxis combines wound treatment, passive immunization with Human Rabies Immune Globulin (HRIG), and vaccination with rabies vaccine. It is effective in preventing human rabies. There have been no vaccine failures in the United States (i.e., someone developing rabies) when PEP was given promptly and appropriately after an exposure. Administration of rabies PEP is a medical urgency, not a medical emergency. Systemic prophylactic treatments occasionally are complicated by adverse reactions, but these reactions are **rarely severe**.

- Clean and irrigate wound(s) thoroughly.
- Post Exposure Chemoprophylaxis (PEP)

### **Biologicals used for PEP in US**

There are two vaccines available in the US. If someone has started PEP with one form of vaccine, they can finish with the other if the first becomes unavailable.

- **Human Diploid Cell Culture Vaccine (HDCV):** 1 ml dose given intramuscularly in deltoid muscle in adults and anterolateral aspect of thigh in small children. Do NOT administer in gluteal muscle as decreased immune response is associated with this practice.
- **Purified Chick Embryo Cell Culture Vaccine (PCECV):** 1 ml dose given intramuscularly in deltoid muscle in adults and anterolateral aspect of thigh in small children. Do not administer in gluteal muscle as decreased immune response is associated with this practice.

**In conjunction with the first dose of vaccine, a dose of HRIG should be given.**

- **Human Rabies Immune Globulin (HRIG):** 20 IU/kg body weight, given with first dose of vaccine. It is injected around and in bite/wound site. Never use in the same syringe as the vaccine. If there is any remainder it should be injected IM in a site distant from the vaccine injection site. If HRIG is not given on day 0, it can be administered up to day 7.

*Medications contraindicated during rabies PEP include antimalarials and immunosuppressive agents. They should only be administered concurrently if they are essential for treatment of another condition. If this is the case, postexposure virus-neutralizing antibody values should be checked by Rapid Fluorescent Foci Inhibition Test (RFFIT)\* to ensure adequate antibody response. Public health, the provider, and the patient should discuss before starting PEP.*

**Schedule for PEP**

Day 0 indicates the day rabies PEP has been initiated and is used for reference in scheduling the rest of the series. *For example*, if you received HRIG and your first dose of rabies vaccine on October 1<sup>st</sup>, you will receive subsequent series of rabies vaccine on October 4<sup>th</sup>, 8<sup>th</sup>, 15<sup>th</sup> and 29<sup>th</sup> (if needed).

**Unvaccinated persons in good health – 4 dose schedule**

Biological Agent	Day Given
Rabies Vaccine 1 ml & HRIG (by weight)	0
Rabies Vaccine 1 ml	3
Rabies Vaccine 1 ml	7
Rabies Vaccine 1 ml	14

**Unvaccinated persons with immunocompromising conditions – 5 dose schedule**

*PEP in immunocompromised persons should be followed by post-vaccination serologic testing by RFFIT to ensure adequate antibody response.*

Biological Agent	Day Given
Rabies Vaccine 1 ml & HRIG (by weight)	0
Rabies Vaccine 1 ml	3
Rabies Vaccine 1 ml	7
Rabies Vaccine 1 ml	14
Rabies Vaccine 1 ml	28

**Previously vaccinated persons – does NOT include HRIG**

*Tetanus prophylaxis and measures to control bacterial infection, if indicated. Post-treatment serologic testing is not routinely recommended because antibody response in persons receiving the currently recommended rabies PEP schedule has been satisfactory.*

Biological Agent	Day Given
Rabies Vaccine 1 ml	0
Rabies Vaccine 1 ml	3

\*RFFIT stands for Rapid Fluorescent Foci Inhibition Test. It is a serum neutralization (inhibition) test, which means it measures the ability of rabies specific antibodies to neutralize rabies virus and prevent the virus from infecting cells. These antibodies are called rabies virus neutralizing antibodies.