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## What You and Your Physician Should Know About Rabies

### Animals That Transmit 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.
- 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 San Francisco, all animal rabies cases in the past 60 years have occurred in bats. 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 3% 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 appear an average of 3 to 8 weeks after exposure but can range from 9 days up to 7 years.
- The typical symptoms include a sense of apprehension, headache, fever and malaise. The disease progresses to paralysis; spasm of the muscles used for swallowing, which leads to fear of water (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. Clinicians who request release of rabies vaccine for PEP will be asked to describe these factors, as outlined below.

#### 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 (skunks, foxes, bats, raccoon) 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)
- hypersalivation, 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 nonbite) and circumstances of the exposure (unprovoked vs provoked)

Bite exposures are higher risk than nonbite 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.** Nonbite 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 an animal's 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 the animal. 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, such as an unprovoked bite to the face by a high risk animal, PEP should be initiated as soon as possible, 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.

## 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**.

1. Clean and irrigate wound(s) thoroughly.
2. For previously unvaccinated persons: administer passive plus active immunization.
  - Administer HRIG and the 1<sup>st</sup> dose of human rabies vaccine on the same day, and as soon as possible following exposure. (HRIG must be given within 7 days of the first dose of vaccine.)
  - Passive Immunization: Infiltrate the full dose of HRIG 20 IU/kg body weight, into and around the wound(s), if anatomically feasible. Inject any remaining volume of HRIG intramuscularly (IM) at an anatomical site distant from vaccine administration. If there is no wound, give HRIG at a site distant from vaccine administration.
  - Active Immunization:
    - On March 19, 2010, the Advisory Committee on Immunization Practices (ACIP) released recommendations for a reduced (4-dose) vaccine schedule for PEP to prevent human rabies (previously ACIP recommended a 5-dose rabies vaccination regimen). The reduction in doses recommended for PEP was based in part on evidence from rabies virus pathogenesis data, experimental animal work, clinical studies, and epidemiologic surveillance. These studies indicated that 4 vaccine doses in combination with rabies immune globulin (HRIG) elicited adequate immune response and that a fifth dose of vaccine did not contribute to more favorable outcomes.
    - These new ACIP recommendations differ from current rabies vaccine label instructions, which still list the 5-dose series for PEP. Alterations of current product labels for HDCV and PCECV are not anticipated by the producers of human rabies vaccines licensed for use in the United States.
    - Give 4 doses of rabies vaccine (1- mL IM in the deltoid) on days 0, 3, 7, and 14. Children should receive the same vaccine dose (e.g., vaccine volume) as recommended for adults. The deltoid is the only acceptable site of vaccination for adults and older children. For younger children, the anterolateral thigh muscle may be used. Vaccine should not be administered in the gluteus muscle because this results in lower levels of neutralizing antibody.
    - **NOTE:** The number of doses recommended for persons with altered immunocompetence has not changed; for such persons, PEP should continue to comprise a 5-dose vaccination regimen (on days 0, 3, 7, 14, and 28) with 1 dose of HRIG.
3. For previously vaccinated persons: administer active immunization only. Previously vaccinated persons are those who have completed either a pre-exposure (3 doses of rabies vaccine) or post-exposure vaccination series (4 doses of rabies vaccine).
  - Active Immunization: give 2 booster doses of rabies vaccine (1-mL in the deltoid) on day 0 and day 3. The deltoid area is the only acceptable site of vaccination for adults and older children (see #2 above).
4. Tetanus prophylaxis and measures to control bacterial infection, if indicated.
5. Post-treatment serologic testing is not routinely recommended because antibody response in persons receiving the currently recommended rabies PEP schedule has been satisfactory.

**Recommended Schedule:**

Scheduled dose:		Date due
Day 0	HRIG	
	Rabies Vaccine	
Day 3	Rabies Vaccine	
Day 7	Rabies Vaccine	
Day 14	Rabies Vaccine	
Day 28	Rabies Vaccine	Immunosuppressed patients only*

\* When rabies pre- or postexposure prophylaxis is administered to an immunosuppressed person, one or more serum samples should be tested for rabies virus-neutralizing antibody by the RFFIT to ensure that an acceptable antibody response has developed after completing the series. If no acceptable antibody response is detected after the final dose in the pre- or postexposure prophylaxis series, the patient should be managed in consultation with their physician and appropriate public health officials.