

Rabies Exposure and Risk Assessment

This individual chapter is part of the Rabies Prevention and Control in Florida guidance documents. The purpose of this compendium is to provide recommended policies and procedures for rabies prevention and control in Florida. It is intended primarily for use by county health department (CHD) staff, animal control specialists, veterinarians, health care providers and others with related responsibilities or interests. This publication, while produced and distributed by the Florida Department of Health (DOH) Division of Disease Control and Health Protection, has been developed by a multidisciplinary Florida Rabies Advisory Committee that represents the major agencies, institutions and organizations involved with rabies prevention and control in the state. The individual chapters and associated resources are routinely updated and posted on the following website: [*www.floridahealth.gov/diseases-and-conditions/rabies/professionals.html](http://www.floridahealth.gov/diseases-and-conditions/rabies/professionals.html).

A. Definition of Rabies Exposure

A rabies exposure is any bite, scratch, or other situation in which saliva, cerebral spinal fluid, tears, or nervous tissue from a suspect or known rabid animal or person enters an open wound, is transplanted into, or comes in contact with mucous membranes of another animal or person.

Rabies is transmitted by introducing the virus into open cuts or wounds in skin or via mucous membranes or transplanted organs. The likelihood of rabies infection varies with the nature and extent of exposure. Human exposure to rabies virus warrants evaluation for possible anti-rabies treatment. When the assessment indicates the need for treatment, the CHD should ensure that the exposed person's health care provider is made aware of the exposure and the ACIP (Advisory Committee Immunization Practices) / DOH guidelines for rabies post-exposure treatment.

Petting or handling a rabid animal, contact with blood, urine or feces of a rabid animal, ingestion of pasteurized milk or well-cooked meat from a rabid animal, or accidental inoculation with vaccines currently licensed for use in animals does not constitute rabies exposure.

1. Bite exposure:

- a. Any penetration of the skin by the teeth of a known rabid animal necessitates prompt post-exposure treatment.
- b. In recent years, **bats** have been increasingly implicated as wildlife vectors capable of transmitting rabies to humans. Some bat rabies variants may have increased capacity to replicate in epithelial cells compared to terrestrial rabies virus strains, suggesting greater capacity for infection following virus inoculation into a relatively minor skin wound.¹ It is most important to carefully evaluate the circumstances of every incident that involves a bat in close proximity to a person, since bites from bats may be very small and not easily recognized. This is particularly important in cases where interviews with young children or persons with limited recall may not reveal a minor or undetectable injury inflicted by a bat bite. As a general rule, in situations where a bat is physically

¹ Morimoto K, Patel M, Corisdeo S, Hooper DC, et al. Characterization of a unique variant of bat rabies virus for newly emerging human cases in North America. Proc Natl Acad Sci. 1996;93:5653-58.

present and the possibility of a bite exposure or mucous membrane contact is reasonably certain, post-exposure prophylaxis should be given unless capture and testing of the bat has excluded rabies.

2. Non-bite exposures:

- a. Terrestrial animals rarely transmit rabies through non-bite exposure. Contamination of scratches, abrasions, open wounds, or mucous membranes with saliva or other potentially infectious material (e.g., nervous tissue or cerebrospinal fluid) from a rabid animal must be considered an exposure to the rabies virus. On rare occasions, human rabies has been acquired by inhalation of airborne virus. Such exposure occurred in two specific environments, namely, in laboratories working with live rabies virus and in caves with millions of bats.
- b. Provoked **scratches** caused by healthy appearing pet dogs are low risk for rabies and other than appropriate wound care, generally do not need further follow-up. Scratches from moderate or high-risk animals with exposure risk (outside animals) that tend to groom their fur and paws regularly, and that result in a break in the skin are considered a potential rabies exposure (e.g., raccoons, cats, etc.). Moderate to high-risk animals that may hiss or spit when frightened or protecting themselves may also increase risk of saliva contamination of fresh scratches.
- c. Rabies virus is known to have been transmitted between humans on eight separate occasions by corneal transplants, including once in the United States.² In 2004, seven patients (four residing in the U.S.) acquired rabies from organ transplantations of either kidney, liver, arterial blood vessel tissues, lung, or pancreas.^{3, 4, 5} An eighth transplant-acquired infection occurred in a kidney transplant recipient in the U.S. in 2013. Three other recipients who received organs from the same donor in 2011 received rabies PEP following the kidney recipient's rabies diagnosis and survived.⁶

B. Risk Assessment and Investigation

When evaluating the circumstances surrounding a bite or other exposure, consideration should be given to the following: 1) the behavior, health, species, housing status (exposure risk), and other characteristics of the biting animal; 2) vaccination status; 3) type of encounter (e.g., provoked or unprovoked); and 4) current status or disposition of the animal. The Management of Human Patients with Possible Rabies Exposure algorithm and the Decision Tree for Health Care Providers are guidance tools that can assist with review of this information.

² CDC. Human-to-human transmission of rabies via a corneal transplant -- France. MMWR 1980;29:25-6

³ CDC. Investigation of rabies infections in organ donor and transplant recipients---Alabama, Arkansas, Oklahoma, Texas. MMWR 2004;26:586-89.

⁴ Srinivasan, A., et al. Transmission of rabies virus from an organ donor to four transplant recipients. N Engl J Med 2003;352(11):1103-11

⁵ Hellenbrand, W., C. Meyer, G. Rasch, I. Steffens, A. Ammons. Cases of rabies in Germany following organ transplantation. Euro Surveill. 2005;10(2):52-3.

⁶ Vora NM, et al. Raccoon rabies virus variant transmission through solid organ transplantation. JAMA. 2013;310:398-407.

1. Animal behavior, health, and other characteristics - Any animal, wild, domestic, caged, or feral, that shows signs of rabies typical to that species should be considered possibly rabid. Most free-ranging wild animals, not otherwise conditioned by artificial feeding, instinctively avoid humans. Those that approach people or their pets and attack should also be considered possibly rabid. For instance, any squirrel that, unprovoked, lunges at a person, bites them and runs off should be suspected of being rabid, even though most rodents are not considered to be at high risk for infection. All high-risk wildlife species should be considered highly suspect regardless of their health or behavior status. These animals have been shown to sometimes have virus in their saliva for a week or more before becoming ill and may lack reliable signs of the disease, and/or because of their status as a rabies reservoir or a member of a species which is diagnosed with rabies on a regular basis. Animals housed or living outside are at greater risk of exposure than those living in a home or other enclosed buildings.
 - a. High-risk animals: Any exposure inflicted by a raccoon, bat, skunk, coyote, fox, otter, bobcat, or by a stray dog, cat, or ferret should be considered as high risk for rabies infection in Florida. Any wild animal in this group should be considered highly suspect regardless of its health or behavior status, as these animals have been shown sometimes to have virus in their saliva for a week or more before becoming ill. Face and neck bites caused by unvaccinated pet dogs, cats, or ferrets with a history of potential rabies exposure (e.g., opportunities for interactions with rabid, feral, or wild rabies reservoirs) should also be regarded as high risk.
 - b. Moderate-risk animals: Other exposures inflicted by such species as unvaccinated dogs or ferrets maintained as pets should be considered to be moderate risk for rabies infection in Florida.
 - c. Low-risk animals: Provoked exposures inflicted by pet rats, mice, hamsters, guinea pigs, hedgehogs, domestic rabbits, armadillos, opossums, wild rodents, caged monkeys (Herpes B virus should be considered for all macaque monkey exposures), and currently immunized dogs, cats, and ferrets are considered to be low risk for rabies infection and seldom require antirabies treatment of the exposed individual. Provoked exposures by certain previously immunized dogs such as pet animals with a history of multiple rabies vaccines and without a known rabies exposure history or healthy normally aggressive pet dogs are also low risk. Exposure to farm animals while feeding or handling should be individually evaluated and seldom require antirabies treatment.
 - d. **Prompt reporting and consultation is recommended of all exposures involving “macaque monkeys or monkeys in direct contact with macaques” due to possible transmission of life-threatening Herpes B virus** [see Recommendations for prevention of and therapy for exposure to B virus (*Cercopithecine Herpesvirus 1*)⁷ and www.cdc.gov/herpesvirus/index.html.

⁷Guidelines for management can be found in: Cohen, JI, DS Davenport, JA Stewart, S Deitchman, JK Hilliard, LE Chapman and the B Virus Working Group. Recommendations for prevention of and therapy for exposure to B virus (*Cercopithecine Herpesvirus 1*). CIN. 2002;35;1191-203

2. Animal vaccination status

- a. Vaccinations of dogs, cats, livestock, and ferrets play an important role in protecting not only the animal from rabies but also by reducing the risk of human exposure to infection if the animal is involved in a biting incident. It is important to document that vaccinations for rabies are current (within the advertised duration of the vaccine, one, three, or four years) and veterinarian-administered. Vaccination status is important in biting dogs, cats, and ferrets because they can usually be isolated and observed for 10 days at the home of the owner, while animals determined to be unvaccinated may be confined to a secure public facility or veterinary clinic.
- b. Vaccination status will not alter the decision-making process when wolf-dogs, zoo animals, and pet wildlife are involved in rabies exposure incidents.

3. Type of encounter

- a. Provoked exposures are ones in which it was a natural reaction of the animal to bite. Such circumstances might include, in the cases of domestic dogs and cats: 1) threatening or injuring the animal or the pet owner(s); 2) handling or removing the animal's food; 3) disturbing the animal while eating; 4) invading the animal's living space; 5) restraining or handling sick or injured animals; 6) disturbing the animal's offspring; and/or 7) startling a sleeping animal. Under these circumstances, treatment is usually not recommended because the biting animal can be observed for 10 days. However, bites by feral or unidentified cats and dogs that are not available for either observation or testing or other high-risk exposures usually require treatment.
- b. Unprovoked bites are those which are initiated for no apparent reason; e.g., the behavior cannot be explained by any of the circumstances listed above or ones similar to them. Unprovoked bites are usually considered to be suspicious of rabies, although it may be "in character" for some ill-tempered animals to bite for no apparent reason. A history of the animal's usual behavior patterns should be obtained if possible. Any bite from a high-risk species, whether provoked or unprovoked, should be considered a rabies exposure unless proven otherwise by laboratory testing of the animal or observation for 10 days in the case of healthy-appearing stray dogs, cats, or ferrets. While in most instances, bites by squirrels and other wild rodents are associated with provocation by feeding and do not require treatment, bites resulting from unprovoked attacks would require treatment if the animal escaped.

4. Status or disposition of the animal - At the present time, only dogs, cats, ferrets, and livestock can be isolated and observed to determine their rabies status after exposing a person to rabies. Animals killed during attacks, euthanized, or dying after capture should be tested as soon as possible so decisions regarding treatment of the exposed individual is not delayed any longer than necessary. Frozen samples are usually suitable for testing, although results may be delayed and therefore freezing is not recommended. Those buried more than a day or preserved in formalin may not be suitable for testing. Consultation with the DOH Bureau of Public Health Laboratories staff prior to submission can help resolve issues related to specimen quality and expected test results.

C. Key Risk Assessment Questions:

1. Did the bite break the skin (bat bites may not be clearly visible)?
2. When did the exposure occur?
3. What is the animal species (low, medium, or high risk)?
4. What is the animal's rabies exposure risk (housed inside vs. left unattended outside)?
5. If an owned pet, how long have the current owners owned?
6. What is the animal's vaccination status (no history of vaccination, overdue for vaccination, up to date; one previous vaccination, history of two or more vaccinations)?
7. Was the bite provoked?
8. Does the animal currently appear healthy with normal behavior?
9. Did the bite involve the victim's head or neck?
10. If a domestic animal, is it available for observation?
11. If a wild animal or exotic pet is it available for testing (cases involving valuable or rare wildlife/exotic pets may be handled differently)?

D. Additional Resources*

Additional rabies guidance, information, and resource documents can be found at the following website: www.floridahealth.gov/diseases-and-conditions/rabies/professionals.html.