

## CHAPTER 2: HUMAN EXPOSURES

Rabies is a viral disease and is zoonotic, meaning it normally affects animals but is capable of being passed to humans. Humans can get rabies if virus-containing saliva from an infected animal enters the body of a human or other animal via a bite, a scratch, a break in the skin, or a mucous membrane exposure. Because rabies virus is also present in the nervous tissue of infected animals, humans can also be exposed in laboratory or taxidermy environments, or other contexts where they are exposed to nervous tissue.

Except in rare, solid organ transplant situations, only saliva and central nervous system (CNS) tissue (brain and spinal cord) are considered to be infectious. Blood, urine and feces do not serve as sources of infection.

Once the virus enters the human body, it undergoes a latent period of variable duration and then begins to replicate at the site where it entered the person. It then enters a peripheral nerve and travels along the nerve to the central nervous system. There is no standard treatment for rabies once the person has developed symptoms.

In humans, the incubation period of rabies is usually 31 to 90 days, but in rare cases can be as short as 10 days or longer than a year. Because the virus has to travel through nerve cells up to the brain, the site of the exposure and its distance from the CNS partially determine the incubation period. A bite to the face requires a shorter incubation time than one to the hand. The strain of the rabies virus also plays a role in the incubation period.

### **Activities to prevent rabies in humans include:**

- Prevention of human exposures to potentially rabid animals;
- Ensuring that persons who are exposed to a rabid or potentially rabid animal receive post-exposure prophylaxis in a timely manner; and
- Promotion of pre-exposure prophylaxis for persons who are at high risk for exposure to rabid or potentially rabid animals.

### **A. Risk Reduction and Education**

More than eighty percent of animal bites to humans are preventable. Over two-thirds of bites occur when humans are petting or feeding wildlife or domestic animals that they do not know. Education for the general public, health professionals, and veterinary professionals can help prevent human exposures to potentially rabid animals. Local health departments should disseminate information prepared by Massachusetts Department of Public Health (MDPH), Massachusetts Department of Agricultural Resources (MDAR), Massachusetts Department of Fish and Game (DFG), Massachusetts Veterinary Medical Association (MVMA), Massachusetts Society for the Prevention of Cruelty to Animals (MSPCA) and other agencies, to the residents in their town.

Education for the general public should emphasize the following steps to decrease human exposure to rabies:

- Do not pick up, touch or feed wild or stray animals of any kind. This includes leaving pet food outside for your own animals or other animals.
- Avoid sick or strange-acting animals.
- Vaccinate all cats, dogs, ferrets and livestock against rabies.
- Fasten trash can lids tightly. Garbage attracts raccoons and other wild mammals.
- Cap chimneys and seal openings into houses, garages, etc., to prevent raccoons and other animals from entering or building dens.
- If you are bitten or scratched by any animal you should promptly wash the wound(s) with soapy water and consult a healthcare provider immediately.

- If your pet is bitten or scratched by another animal, wear gloves when handling or cleaning your pet. Afterwards, wash your hands thoroughly.
- Teach children to avoid wildlife and strays.

## B. Obtaining Baseline Information and Local Wound Management

When a human exposure has occurred, the local health officer or designee should obtain in writing baseline information and advise exposed humans about the importance of immediate local wound management.

Baseline information should include:

- The name, telephone number, and address of the victim;
- The date, time, and location of the incident;
- The rabies immunization status of the person and animal;
- The name, address, and telephone number of the animal owner, if one exists;
- The location of the wound; and
- Whether the exposure was provoked.

NOTE: A bite is considered provoked if it is within the normal range of behavior for the type of animal under the circumstances. The presence of provocation should be evaluated based on the presumed perspective of the animal, not the intention of the person. Examples of provoked bites would be (1) a dog biting a person entering its territory; (2) a feral cat or a wild animal (e.g., squirrel) biting someone feeding or petting it; and (3) a wounded animal biting someone trying to lift it or care for it.

Local wound management is critical as it can actually prevent disease by killing the recently introduced virus before it has a chance to invade local nerves. Local wound care should include:

- Vigorously and thoroughly washing the wound with plenty of soap and water;
- Use an antiseptic and other measures to control bacterial infection; and
- Immediate referral to a health care provider for further evaluation, treatment and a tetanus booster if indicated.

## C. Evaluating Risk of Exposure and Need for Post-Exposure Treatment

### 1. Evaluating Risk of Exposure

When a human exposure has occurred, the local health officer or their designee should provide advice about the need for post-exposure prophylaxis according to the most recent recommendations of the Advisory Committee on Immunization Practices (ACIP).

**The final decision on whether or not to administer rabies post-exposure prophylaxis rests with the patient and their medical provider.** When deciding whether or not rabies prophylaxis is indicated the following information should be considered:

- The extent/severity of the exposure;
- Circumstances surrounding the exposure, e.g., provoked or unprovoked;
- Whether the animal was wild or domestic;
- If a wild animal, which species;
- If a bat, whether it may have been alone in the room with a sleeping or otherwise incapacitated adult or child;
- If a wild animal, whether it is available for testing;
- If a domestic animal, whether it is available for quarantine or testing; and
- Whether the animal was showing neurological or behavioral signs compatible with rabies.

A table summarizing the above ACIP approach to evaluation of a human exposure is enclosed (Attachment 1). The ACIP statement is available in its entirety on line at: <http://www.cdc.gov/MMWR/preview/mmwrhtml/00056176.htm>.

[NOTE: As of this writing, the most current version of the ACIP statement is from 1999. A new version is scheduled to be published in March, 2007.]

The MDPH algorithm for “Management of Human Exposures to Suspect Rabid Animals” (Attachment 2) also summarizes this approach to decision making and includes information for evaluating human exposures, initiating prophylaxis and submitting specimens for testing.

### **Categories of exposure**

There are two categories of direct (primary) exposure: bite and non-bite. Bite exposures are exactly what they sound like. Saliva from the rabies suspect animal is directly introduced into the body through a bite by that animal. Non-bite (primary) exposures include scratches, abrasions, and open wounds or mucous membranes contaminated with saliva or other potentially infectious material, such as brain tissue. These exposures to rabies can occur when saliva, or other infectious material (i.e., nervous tissue) from a rabid animal, enters a fresh cut (a wound that has been bleeding in the past 24 hours), a scratch, or a mucous membrane (eye, nose, or mouth). However, if the material is dry, it can be considered non-infectious; sunlight, ultraviolet (UV) light, and detergent also inactivate the virus.

Indirect exposures occur when infectious material from a rabid animal (saliva or nervous tissue) contaminates an object or surface. Viable infectious material from this secondary object or surface must then enter a fresh cut (a wound that has been bleeding in the past 24 hours), a scratch, or a mucous membrane (eye, nose, or mouth) for a secondary (indirect) exposure to occur. For example, people handling a dog or cat within a short time after it has encountered a rabid animal may have been indirectly exposed to rabies, **if** saliva from the rabid animal was on the dog or cat’s fur, the saliva was still wet, and the person had a fresh (bleeding within the last 24 hours) cut on their hands or splashed the saliva in their eye or mouth.

Evaluation of indirect (secondary) exposures can be more difficult than the evaluation of direct exposures. Although there has never been a documented case of human rabies resulting from an indirect (secondary) exposure, the factors that should be considered include the time since the pet’s exposure to the potentially rabid animal, the ambient weather conditions (temperature and humidity), and whether the contact of the domestic animal with the human involved a fresh wound or mucous membranes. The rabies virus is fragile. Common environments do not provide conditions conducive to the survival of rabies viruses, and survival times in the natural environment, while variable, are short.

### **Situations with little or no risk**

Petting a rabid animal or coming into contact with an animal’s blood, urine, feces, or skunk spray does NOT constitute an exposure or require prophylaxis. However, if the abovementioned body parts/secretions are mixed with saliva, the exposure should be evaluated accordingly.

## **2. Risk of Rabies Associated with Different Animals**

### **Domestic animals and livestock**

Domestic animals and livestock are of significant concern because they can serve as the bridge between rabies in wild animals and humans. From September 1992, when raccoon rabies entered Massachusetts, through September 2006, 131 cats, 14 cattle, 8 dogs, 3 horses and 3 pigs have tested positive for rabies in the state. After a domestic dog, cat, ferret or cow exposes a person, these animals (for which there are scientific studies on shedding time of the rabies virus), regardless of their vaccination status, should be quarantined for ten days if they are healthy and available. If the animal is

healthy at the end of the ten-day quarantine period, post-exposure prophylaxis is not recommended. If the animal exhibits signs of rabies or dies within the ten-day quarantine period, it should be submitted for rabies testing and if found to be rabid, the need for post exposure prophylaxis should be evaluated. Rabies vaccinations in domestic animals and livestock are not 100% effective, and rare cases of vaccinated domestic animals and livestock developing rabies have occurred, so these animals need to be quarantined just like unvaccinated ones.

## **Bats**

Exposures or potential exposures to bats should be carefully evaluated. Bats are considered to present a high risk for human exposure to rabies. Although estimates are that less than 1% of wild bats are rabid, the size of bites or scratches from bats may be very small. Thus, bat bites may go unnoticed or be mistaken for an insect bite or sting and individuals may not recognize that an exposure has occurred. Post-exposure prophylaxis should be given in any situation in which a bat is physically present and a bite, or any other exposure or contact, cannot be ruled out. In situations in which there is reasonable probability that such contact occurred (e.g., a sleeping individual awakes to find a bat in the room, an adult witnesses a bat in the room with a previously unattended child, mentally challenged person, intoxicated individual, etc.), post-exposure prophylaxis is appropriate, even in the absence of a demonstrable bite or scratch. If the bat is available and can be tested promptly, prophylaxis may be postponed pending test results.

If a bat was physically present in a room and the first responder or animal control officer cannot rule out that a person was bitten, scratched, or had a mucous membrane exposure to the bat, the MDPH recommends safely capturing the bat and testing it for rabies. Health officers, animal control officers and first responders should develop a protocol for responding to citizen calls when a bat is found in a home. First responders should be trained not to release a bat until a careful evaluation has excluded the potential for human exposure to the bat. Information on how to safely capture a bat is available by following the “Bats & Rabies” link at the CDC web site at <http://www.cdc.gov/ncidod/dvrd/rabies/>.

## **High risk wild animals**

Wild animals considered to be high risk for carrying rabies include raccoons, bats, skunks, foxes, and coyotes. In addition, woodchucks accounted for 2% of all rabies positive animals and 93% of all rabies positive rodents in Massachusetts between 1992 and 2001. For this reason, contact with woodchucks should be evaluated no differently than contact with other high-risk species.

If a person is bitten or otherwise exposed to one of these animals, the animal should be tested for rabies as soon as possible. If the animal tests positive for rabies, or is unsatisfactory for testing for any reason, the individual should begin post-exposure prophylaxis (PEP). If the animal tests negative, PEP is not recommended. Although PEP should begin as soon as possible after exposure, it is reasonable to wait for test results before beginning. If there are questions regarding a delay in testing, call the MDPH Division of Epidemiology and Immunization for advice at (617) 983-6800. If the exposing animal is not available for testing, it should be assumed to be rabid, and post-exposure prophylaxis decisions should be made accordingly.

## **Small wild mammals**

Small wild rodents (squirrels and chipmunks), insectivores (shrews and moles) and lagomorphs (rabbits and hares) present a very low risk of transmitting rabies to humans. When these animals bite people, prophylaxis is rarely required, and testing of the animal for rabies is rarely recommended. These animals are so small that if a rabid animal (raccoon, skunk, fox, etc.) were to attack, the animal would likely die before having a chance to develop rabies. Only when such animals attack in an unprovoked manner

should there be suspicion of rabies. Small animals, such as squirrels and chipmunks that bite humans who are feeding them, are acting normally. Such bites are considered provoked, and people should be taught not to hand feed wild animals. Squirrels are unlikely to present with rabies, and their bites almost never require prophylaxis. The only exception to this list is the woodchuck, also called a groundhog, which is considered at higher risk for carrying rabies (see High Risk Wild Animals).

Other larger aquatic mammals, such as beavers, muskrats, and otters, are considered to present an intermediate risk for rabies because they may be large enough to fight off or effectively escape the attack of a rabid animal and survive to develop rabies themselves. Beavers have occasionally been reported to be rabid in the United States and 3 out of 8 otters tested in Massachusetts were rabid.

### **Rodents and other small mammals caged outdoors**

Outdoor cages housing rodents and lagomorphs may allow exposure to rabid animals, but offer enough protection so that these smaller animals survive the exposure. There have been rabies cases reported in animals caged outdoors in this manner. If a small animal that is caged outdoors exposes a human and is not available for testing, post-exposure prophylaxis should be considered.

### **Rodents and other small mammals caged indoors**

Healthy caged rodents and lagomorphs such as hamsters, gerbils, rats, mice and rabbits which have been caged **exclusively** indoors for the past six months or more, and which have not been exposed to any potentially rabid animals for the past six months, pose a negligible risk of being rabid.

## **3. Behavior of Animals with Rabies**

**The behavior of an animal is NOT a reliable indicator of whether or not the human exposed is at risk.**

Animals with rabies can appear aggressive (“furious rabies”) or normal or meek (“dumb rabies”). Common signs of rabies include neurologic signs, such as paralysis and ataxia (uncoordinated movement), and hypersalivation. Rabid animals often behave strangely after the virus attacks their brains. Rabid animals may attack people or other animals for no reason. Wild animals may lose their fear of people and seem to be unnaturally friendly. Not all rabid animals act in these ways, however, so all wild and stray animals should be kept at a distance - especially bats, skunks, foxes, and raccoons.

## **4. Post-Exposure Treatment**

After reviewing the circumstances surrounding the exposure, the local health officer can provide advice about the need for administration of rabies immune globulin (RIG) and rabies vaccine. The correct rabies post-exposure schedule will depend on whether or not the individual has ever received rabies pre-exposure prophylaxis (see Attachment 3). Two rabies vaccines are available currently in the United States: human diploid cell vaccine (HDCV) and purified chick embryo cell (PCEC) vaccine. They are safe, effective, and require a series of five injections, if not previously immunized, administered in the arm in adults and, when indicated, in the thigh in younger children. Specific immune globulin available in the United States is human rabies immune globulin (HRIG). It also is safe and effective, and should be given with the first dose of the rabies vaccine to previously unimmunized individuals.

Those people who have received pre-exposure prophylaxis (a series of 3 injections of vaccine without HRIG) or who have previously received post-exposure prophylaxis due to a rabies exposure, are considered to be previously immunized against rabies. After a new exposure, those previously immunized individuals require 2 injections of vaccine without HRIG.

**MDPH Division of Epidemiology and Immunization is available 24 hours a day, seven days a week, to provide guidance: 617-983-6800**

All advice should be discussed with an appropriate health care provider. The final decision as to whether or not to administer PEP to an individual is a medical one and can only be made by a licensed physician. This decision should be made by the patient and their physician after a careful review of all the variables surrounding the exposure.

Hospital pharmacies and urgent care centers often stock HRIG and HDCV. We urge you to check with the facilities serving your area regarding the local availability of these agents. HRIG and HDCV can be obtained by contacting Sanofi-Pasteur (1-800-VACCINE). PCEC can be obtained by contacting Novartis (1-800-244-7668). HRIG can be obtained by contacting Talecris, Customer Service (1-800-243-4153).

#### **D. Laboratory Testing of Animals**

After a significant human exposure has occurred, the local health department should assist the local animal control official, physician and town residents to facilitate animal testing. The MDPH State Laboratory Institute will perform rabies tests on wild or domestic animals that have exposed humans or domestic animals. For information on submission of such specimens, please refer to Chapter 3 (Domestic Animal Issues), Chapter 4 (Wild Animal Issues), and Attachment 9 (Guidelines for Submission of Specimens for Rabies Testing).

#### **E. Promoting Pre-Exposure Prophylaxis**

Local health departments should ensure that all animal control officials, veterinarians and other high-risk personnel in their community are aware that it is recommended that they receive pre-exposure prophylaxis. The ACIP recommendations should be consulted for **pre-exposure prophylaxis** by risk category/occupation, and the local epidemiology of rabies should be considered. Veterinary, animal and wildlife workers in Massachusetts are classified in the "frequent" risk category.

**ADDITIONAL INFORMATION ABOUT PRE- AND POST-EXPOSURE PROPHYLAXIS CAN BE FOUND IN THE MOST RECENT EDITION OF THE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES (ACIP) STATEMENT ON RABIES PREVENTION. [NOTE: AS OF THIS WRITING, THE MOST CURRENT VERSION IS FROM 1999. AN UPDATED VERSION IS SCHEDULED TO BE PUBLISHED IN MARCH, 2007.]**