

## OREGON PUBLIC HEALTH DIVISION • DEPARTMENT OF HUMAN SERVICES

### PREVENTION OF RABIES: FIVE VIGNETTES

*An allusion to “canine madness” in Homer’s The Iliad has persuaded many medical historians that rabies may have been known to the Mediterranean world as early as the 10th century BC. Homer likens Hector to a “raging dog.” He writes that Sirius, the dog star of Orion, “exerts a malignant influence upon the health of mankind.”<sup>1</sup>*

Rabies virus is shed in the saliva of infected mammals and transmitted via bite. Following a bite, the virus finds its way into the victim’s nerve cells and travels to the brain. The early symptoms of rabies are non-specific: fever, headache and general weakness or discomfort. As the disease progresses, more specific symptoms appear, including insomnia, anxiety, confusion, partial paralysis, excitation, hallucinations, agitation, hypersalivation, difficulty swallowing and hydrophobia (fear of water due to difficulty in swallowing and painful spasms). Death usually occurs within days of the onset of these symptoms.

One hundred years ago, human rabies in the United States typically resulted from dog bites, which remain a common means of rabies acquisition in developing countries. Thanks to canine rabies vaccination programs and license-related requirements, no rabies is known to have been caused by a dog bite in the U.S. since the late 1950s. Human deaths in the U.S. attributed to rabies have declined from >100/year to ~2/year, and most cases in recent decades resulted from bat bites. Because any mammal can potentially acquire and transmit rabies, whether rabies prophylaxis is needed following a given animal bite is perhaps the most common question posed to public health officials. Following is a brief summary of rabies in Oregon, recommendations for prophylaxis and five vignettes to illustrate the decision-making process when a possible exposure to rabies occurs in our State.

#### RECENT ANIMAL RABIES

In late 2009, an astute veterinarian in Southern Oregon examined a non-healing abscess on the face of a goat in a milking herd. The goat was treated with antibiotics

and the wound debrided. A week later the wound was partially healed, but the goat had weakness and other neurologic deficits in the hind legs. Over the next two days the poor goat lost the ability to move and drooled continuously. The goat was euthanized, and its head was sent to the Veterinary Diagnostic Laboratory at Oregon State University for rabies testing, which is done by direct fluorescent antibody (DFA) staining of the brain stem and cerebellum from necropsy specimens. Result: positive. The herd was quarantined for 6 months. No further cases in the goat herd were identified.

With the assistance of the Oregon Department of Fish and Wildlife, enhanced rabies surveillance was instituted during the first 5 months of 2010 in Josephine and Jackson counties. Of 10 bats tested, two were positive, and three of seven foxes tested were positive. In addition, three raccoons, three skunks and three more goats were tested and proved free of rabies.\*

All of the positive animals were infected with bat-variant rabies virus. Bats are the only reservoir for rabies in Oregon. Foxes do not often bite humans, but when they do, be very concerned: they can acquire rabies from bats, and 19 (26%) of 72 foxes tested in Oregon between 2000–2009 proved to be rabid.

#### RABIES POST-EXPOSURE PROPHYLAXIS (RPEP)

Elimination of virus at the site of the bite by chemical or physical means goes a long way toward preventing rabies. After an animal bite, immediate, vigorous washing and flushing with soap and water, detergent, or even water alone are imperative. This procedure is recommended for all bite wounds, including those unrelated to possible exposure to rabies. After washing, apply ethanol, tincture or aqueous solution of iodine or povidone iodine. Administer tetanus prophylaxis if indicated.<sup>2</sup>

In previously unvaccinated patients, human rabies immune globulin (HRIG) should be administered to provide

\* Not that it did them any good.

Figure 1. Rabid bats identified in Oregon, by year

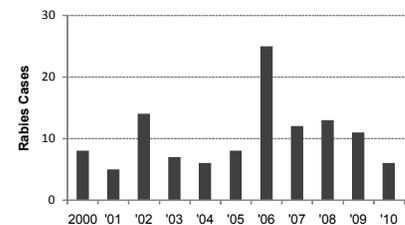
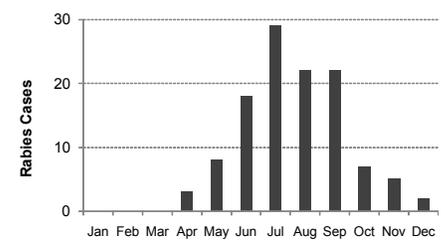


Figure 2. Rabid bats identified in Oregon, by month, 2000–2010



immediate protection through rabies-virus-neutralizing antibodies, covering the patient until he can respond to the vaccine by actively producing antibodies — which takes about two weeks. The recommended dose of HRIG is 20 IU/kg (0.133 mL/kg) body weight. Infiltrate as much of this HRIG as you can into and around the wound. Administer the balance of the dose into the deltoid or quadriceps muscle. In addition, as soon as possible after exposure (i.e., on “day 0”), begin the four-dose, intradeltoid series of human diploid cell vaccine (HDCV; Imovax®) or purified chick embryo cell vaccine (PCECV; RabAvert®); the vaccine must also be given on days 3, 7 and 14 after the first vaccination.<sup>3</sup>

Vaccine preparations for intradermal administration are no longer available in the U.S. Because rabies is almost invariably fatal once contracted, there are no contraindications to RPEP for exposed persons. However, prophylaxis should not be undertaken lightly, as the biologics are expensive and necessitate at least four visits to a healthcare provider. According to a study in southern California, between 1998–2002, the average total cost of a suspected human rabies exposure was \$3,688, of which direct medical costs amounted to \$2,564, and indirect cost (lost wages, transportation, etc. — not reimbursable to the patient) came to \$1,124.<sup>4</sup>



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### SO WHAT'S AN "EXPOSURE"?

*Vignette 1: The "Gift": A cat brings "a gift" of a young bat to its owner. Using gloves, the cat owner's 20-year-old son carefully picks up the bat, throws it in the trash, and the garbage is picked up. The cat has not been vaccinated for rabies.*

This is a common situation, as cats not uncommonly come into contact with bats and are thereby potentially exposed to rabies. According to Oregon's Administrative Rules (OAR-333-019), the cat should be vaccinated for rabies immediately and quarantined (not allowed outside the home) for six months. If the owner is unable to quarantine the cat, the other option is to euthanize it.<sup>5</sup> There was no human exposure — because there was no bite. Had the cat been vaccinated for rabies, it could have been re-vaccinated immediately and then quarantined for just 45 days.<sup>4</sup>

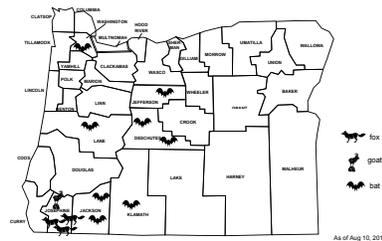
*Vignette 2: "Neighborly love": A woman is bitten by a neighbor's dog and goes to the emergency department. Concerned about rabies, the ED doc contacts the local health department and animal services.*

In this scenario, the dog, regardless of rabies vaccination status, should be quarantined for 10 days by the local animal services organization. (The same would apply if the biting pet were a cat or a ferret.) RPEP should not be started unless the pet dies during quarantine — in which case the animal should be tested for rabies.

*Vignette 3: "Woof, wolf.": A wolf-dog hybrid attacks a child in rural Oregon. The owner has vaccinated this animal within the last year. Can the animal be quarantined for 10 days?*

Wolves and wolf-dog hybrids are not considered dogs. Because the efficacy of rabies vaccine has not been studied in wolf-dog hybrids (part dog, part wild animal), the animal's vaccination against rabies cannot be relied upon. Moreover, the relationship of

Figure 3. Rabies positive animals, Oregon, 2010.



clinical symptoms to the presence of rabies virus in saliva has not been defined in these animals, so that the appropriate period of quarantine is not known. Therefore, the wolf-dog hybrid should be euthanized and tested for rabies.<sup>5</sup>

*Vignette 4: "A Dinner Guest": You have been feeding a baby raccoon for the last few months and have been able to some degree to "domesticate" it. He comes to your back door and begs for food; you find him cute and give in, offering him some dog food. Your dog is weary of this situation and feels slighted! On a beautiful summer eve, your back door is open, and the raccoon comes by for a light supper. Your dog challenges the raccoon, and the animals get into a fight. You try to separate the feuding parties, and in the process you are bitten but don't know exactly by which. Your dog is badly injured and so are you.*

Another common scenario for our on-call epidemiologists. Although raccoon rabies has been epizootic on the Atlantic Coast, many raccoons in Oregon are tested for rabies every year, and none have been found to carry rabies; we simply do not have these strains of virus. In this scenario, post-exposure prophylaxis should not be started. Clean the wound and administer tetanus vaccine according to guidelines. Your suffering dog

should be treated by a veterinarian. No quarantine is needed.<sup>5</sup>

*Vignette 5: "Starry, starry night": A couple goes away for a romantic dinner at a beautiful hotel in the Columbia Gorge. They wine and dine and enjoy the lovely fall evening. The windows are open; the sky is full of beautiful bright stars. The next morning the woman wakes up and feels some numbness on her lower lip. To her horror, she finds a small brown bat biting her lower lip. She screams and the bat flies away. Her husband was not exposed.*

In this case, RPEP is indicated: consistently over the past few decades, about 10% of the bats tested in Oregon have been positive for rabies. Immediately clean the site vigorously, infiltrate HRIG at the site of the bite, if possible, and give the first dose of rabies vaccine. Schedule follow-up rabies vaccinations at day 3, 7, and 14.<sup>2</sup>

### FOR MORE INFORMATION

- Visit our rabies web site at [www.oregon.gov/DHS/ph/acd/diseases/rabies/rabies.shtml](http://www.oregon.gov/DHS/ph/acd/diseases/rabies/rabies.shtml). Check out the Compendium of Animal Rabies Prevention and Control at [www.naspho.org/Documents/RabiesCompendium.pdf](http://www.naspho.org/Documents/RabiesCompendium.pdf).

### REFERENCES

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4. Shwiff SA, Sterner RT, Jay MT, et al. Direct and indirect costs of rabies exposure: a retrospective study in southern California (1998–2002). J Wildl Dis 2007;43:251–7.
5. Oregon Administrative Rules regarding rabies; available at [http://arcweb.sos.state.or.us/rules/OARs\\_300/OAR\\_333/333\\_019.html](http://arcweb.sos.state.or.us/rules/OARs_300/OAR_333/333_019.html).