

# Animal Bites and Rabies

## 1. REPORTING AND FOLLOW-UP

### 1.1 Purpose of Reporting and Surveillance

1. To assess the risk of rabies exposure in persons bitten or otherwise exposed to animal saliva, recommend post-exposure rabies prophylaxis (PEP) to those who need it and to provide counseling and reassurance to those who do not.
2. As necessary, to assess risk and arrange for the capture and either confinement (10-day observation) of a live dog cat or ferret, or the laboratory examination of an animal head. This may involve coordination with other agencies, e.g., the Humane Society, county sanitarians, animal control and local law enforcement.

### 1.2 Reporting Requirements

1. Anyone with knowledge of humans being bitten by potentially rabid animals (e.g., physicians, veterinarians, animal control personnel, law enforcement officials or animal owners) is required to report such incidents to the Local Health Department (LHD) within one working day.
2. Any confirmed case of rabies in animals and any suspected or confirmed case of human rabies must be reported immediately (day or night) to the LHD, or, if LHD staff cannot be contacted, to the Oregon Health Authority (OHA).

### 1.3 Local Health Department Reporting and Follow-Up Responsibilities

1. Whenever possible, animal bites should be investigated on the day they were reported.
2. Animal bite case reports information should be entered electronically through “Orpheus” to the OHA Communicable Disease (CD) Section. Suspicions about human rabies cases should be phoned in immediately to 971-673-1111.
3. Decisions about the disposition of animals that have bitten humans are the responsibility of the local health officer. CD Section epidemiologists are always available to consult on bite situations and may make executive decisions under unusual circumstances or when local personnel are unavailable.
4. The Oregon State Public Health Lab (OSPHL) must be notified by phone or email in advance of all animal heads being sent in for rabies testing by calling 503-693-4100.
5. County or LHD personnel are responsible for the supervision of confined animals.
6. Any case of human rabies will be investigated by the local health department in cooperation with OHA epidemiologists or Oregon Department of Fish and Wildlife.

## 2. RABIES AND ITS EPIDEMIOLOGY

### 2.1 Etiologic Agent

The rabies virus is a member of the Rhabdovirus family.

### 2.2 Description of Illness

Rabid animals can show a range of symptoms, often described as either “dumb” or “furious” rabies and they may progress from one state to the other. Dumb rabies is characterized by reclusive behavior, drooling, anorexia, a startle response to sudden noise or light exposure and irritation around the site of the bite, resulting in frequent licking and biting of the area. Furious rabies is marked by excitation and marked aggressiveness, notably biting of objects, animals, humans, or even self. Salivation is profuse and there is usually a change in voice. Central nervous system (CNS) signs of rabies may include an ascending paralysis, incoordination, convulsions and blindness. Wildlife often seems to lose their fear of people and nocturnal and crepuscular creatures may be out during daylight hours. Infected bats may act strangely (e.g. crawling around, hissing, etc.).

It is important to remember that these signs and behaviors are not pathognomonic for rabies. Behavioral changes and clinical signs caused by a variety of infectious and non-infectious processes (e.g., pesticide

## Animal Bites and Rabies

exposure, heavy metal poisoning, trauma) can mimic those associated with rabies. Human rabies is not unlike rabies in other mammals. Prodromal symptoms include paresthesias, notably at or near the site of the original wound, irritability, and other disquieting neurological, behavioral, and mood changes. Rabies is virtually always fatal.

### 2.3 Reservoirs

Almost all terrestrial mammals can be infected in theory, but in practice only one or two species tend to be significant reservoirs in endemic areas. In Oregon, Washington, and Idaho, bats are the only reservoir species, and other animals — notably bat predators such as foxes or cats — are only rarely infected as “spillover” from rabid bat populations. In other parts of the U.S., skunks, raccoons and foxes are important reservoirs in addition to bats. In some parts of the world, dogs and other carnivores may be important reservoirs.

### 2.4 Modes of Transmission

Rabies is spread by the inoculation of virus-containing saliva into broken tissue or onto mucous membranes almost exclusively via animal bite. Person-to-person transmission of rabies has never been confirmed (except via corneal and organ transplants). Twenty-three cases of human rabies were acquired in the U.S. between 2000 and 2010. (The use of standard precautions for all patients should all but eliminate the need for PEP among hospital staff.)

### 2.5 Incubation Period

The incubation period is typically two to eight weeks, but highly variable. Reports as short as 5 days and >1 year have been reported for non-human animals, and an incubation period of 7 years was inferred for one human. This variation may depend on the species exposed, the size of viral inoculum, and other factors. The proximity of the bite to the brain may also be a factor; virus inoculated into the head has a relatively short distance to travel, thus face bites are particularly urgent.

The incubation period is not to be confused with the period of communicability.

### 2.6 Period of Communicability

Infected animals can transmit rabies only after the infection has spread to the salivary glands, which typically occurs close to or after the time that CNS signs develop. In fact, many animals will die of rabies *before* they begin to shed virus. Laboratory studies have established that, in dogs, shedding begins *at most* 3 days before signs occur—in cats, it is 1 day before. Shedding may persist until the animal dies, which is typically a few days. Little or nothing is known about the shedding period in other species. The rationale for a 10-day confinement period for dogs, cats and ferrets rests on this observed [maximal] interval between viral shedding and onset — padded by a healthy margin of safety—and has nothing to do with incubation period *per se*.

### 2.7 Treatment

Treatment for rabies is essentially palliative. Once symptoms attributable to infection occur (in both humans and other animals), the chance of survival is virtually nil.

## 3. ASSESSING THE NEED FOR PROPHYLAXIS AND FOLLOW-UP

With respect to rabies concern, animal bites can be classified into three categories: high risk, low risk, and “no” risk. The boundaries between these categories can be difficult to spell out exact definitions that cover all scenarios. Risk assessment hinges on the answers to two questions:

1. Was there a significant exposure to animal saliva?
2. Is there a significant risk that the animal in question was shedding rabies virus in saliva at the time of the bite/exposure?

### 3.1 Was there a Human Exposure?

Rabies virus does not penetrate intact skin or clothing. Thus, unless there is a history of a bite that broke the skin, or saliva contact with broken skin or mucous membranes (including the eyes), there was no exposure. Those who merely pet a dog or pick up a bat later found to be rabid, for example, have not had a significant exposure. If there was no exposure, then there is no risk.

### 3.2 Is there a Significant Risk the Animal was Rabid and Secreting Virus?

This question can be answered by a combination of knowledge about the natural history of rabies in Oregon, the circumstances of the exposure, knowledge and observation of the offending animal (if possible) and, sometimes, laboratory testing. A healthy dose of common sense is helpful, too. If there is no significant risk that the animal in question was secreting rabies virus, then it is a no risk exposure.

*Because of the prevalences of rabies in bats, all bat bites are considered high risk, regardless of circumstances.*

#### 1. Natural History

As noted above, only bats or animals that might have been exposed to infected bats are potential sources of transmission in Oregon (if there is no evidence that a biting animal has recently come from out-of-state). Bats are less active in Oregon during cold weather, so there is relatively little risk of animals being bitten by bats between the months of November and April. By the same token, indoor pets cannot be exposed unless a bat flies into the house, bites them, and escapes unnoticed, which is not a very plausible situation.

While almost all mammals can be experimentally infected with the rabies virus, in real life many species are essentially rabies-free, due to both behavioral and dietary characteristics as well as innate resistance to the virus. Lagomorphs (e.g., rabbits, hares), small rodents (e.g., mice, rats, squirrels, gerbils, hamsters) and cervids (e.g., deer, elk) all fall into this category. Absent extraordinary circumstances (for genuinely “unprovoked” bites, see next section), bites by these animals do not merit follow-up for rabies.

#### 2. Circumstances of the Bite

Talk to the person bitten and other witnesses to get a first-hand account of what was happening when the bite occurred. Differentiate “unprovoked” and “provoked” bites. A bite is considered unprovoked when an animal crosses neutral space and attacks “for no reason.” Such incidents are rare.

Almost all bites are provoked, meaning that — in context — the bite was normal under the given circumstances. Typical provoked bite situations include:

- persons bitten by unfamiliar or non-domesticated animals they were interacting with (e.g., petting a stray cat, feeding squirrels, breaking up a fight between animals, cornering a raccoon on the porch, etc.);
- persons bitten by injured animals (e.g., dogs hit by cars);
- persons bitten by dogs protecting “their space” (e.g., a front yard, their food).

Bites to the head or neck increase the urgency of the situation, as they decrease the time when prophylaxis is likely to be effective.

#### 3. Knowledge of the Offending Animal

Bites by animals with a history of menacing or biting behavior are less likely to reflect changes in behavior that might be attributable to rabies.

Although vaccine failure is possible, dogs, cats, and ferrets with a documentable history of up-to-date rabies vaccinations are unlikely to be rabid. Vaccines given to other species, including hybrids such as wolf-dog crosses, are of unknown efficacy and should be disregarded as mitigating factors. They have no legal standing in Oregon.

#### 4. Laboratory Testing

Animals can only be tested for rabies by euthanizing them, decapitating them, and assaying brain tissue for the presence of virus. Testing is available only at the OSPHL or the Oregon State University Veterinary Diagnostics Laboratory (OSUVDL) (see §4 below).

Antemortem testing for humans is available at the Centers for Disease Control and Prevention with consultation with an epidemiologist at OHA. Required specimens will include serum, cerebrospinal fluid, saliva, and a skin biopsy from the nape of the neck that contains one or more hair follicles. Contact the OHA on-call epidemiologist for instructions on collection, handling and shipping of human specimens.

### 3.3 Making a Decision

CD Section epidemiologists are always available for consultation. LHD personnel are strongly encouraged to consult about all high risk bites. Bat bites are always high risk and should always be investigated as a potential rabies exposure.

### 4. CONFINEMENT AND HEAD TESTING

#### 4.1 Confinement

To avoid needless euthanasia of pets, and to minimize the considerable expense of animal testing, confinement and observation is the preferred follow-up for dogs and cats that have bitten people. Such animals should never be killed if they can be held under observation. Without the approval of local health officials, veterinarians and others are prohibited from killing possibly rabid animals that have bitten someone (see OAR 333-019- 0024 and 0027).

If a dog, cat or ferret appears healthy and is eating and drinking normally 10 days after a bite occurred, there is no chance that rabies transmission occurred. Should an animal that has been confined following a bite develop any signs of neurological/CNS disease, however, it should be killed immediately and the head submitted for testing. Such symptoms include: hind leg paralysis, aimless movement, seizures, unusual voice sounds, blindness, inability to swallow and persistent dilation of pupils. The mechanics of confinement are left to the discretion of the LHD. Confinement may be at a county animal pound or a local humane society. At the discretion of the LHD, responsible owners may be allowed to confine low-risk dogs or cats on their own premises.

#### 4.2 Head Testing

The OSPHL must be notified in advance of all heads being submitted for testing at 503-693-4100. Advise them of the mode of transportation and expected time of arrival for all specimens. If it is outside of regular business hours, contact the on-call epidemiologist at 971-673-1111.

Oregon State University is also available to test animals for rabies for a fee. Please contact them at (541-737-3261) for prices and shipment information.

##### 1. Lab Schedule

*High Risk.* Express tests for high risk situations are run as needed, with results available within 36 hours. Express testing can be expensive (air freight charges, etc.), so be sure you are dealing with a high-risk situation and not just a hysterical citizen. Contact the OSPHL (or, if unavailable, the on-call epidemiologist) immediately to coordinate arrangements for express testing.

The main point of express testing is to save the patient some or all of the cost of unnecessary PEP. Coordinating the transportation of heads to the lab is often the most important step in assuring a satisfactory and timely result. Transportation alternatives include air freight, drive-in to the lab (by the person bitten, the animal owner, or a county employee, for example), bus service, or same- or next-day courier service (FedEx, Express Mail, etc.). Your local hospital or medical lab is another potential source of information about emergency specimen transportation options. Health departments that are outside the Portland area should investigate these alternatives before the need arises. Collect the relevant information (route schedules, fees, payment options, phone numbers, etc.) and keep it current and available to the appropriate personnel.

*Low Risk.* Heads from low risk situations are batched twice a week (currently on Mondays and Wednesdays; earlier if there is a Thursday or Friday holiday). Specimens for the batch run should arrive at the lab by noon on Wednesday — or later by special arrangement.

*No risk.* “No risk” heads are not run at the OSPHL.

##### 2. Specimen Handling and Shipping

Animals should be killed by lethal injection, gas or other means that do not damage the brain and that do not place people at risk of further exposure. Heads received in poor condition (e.g., riddled with bullet holes, frozen, or decomposed) often cannot be satisfactorily tested. Send animal heads only with the exception of bats (whole bats are acceptable). Caution should be exercised when decapitating animals; the working assumption should be that the animal is rabid. Wear heavy gloves and use goggles or a face shield to avoid splashing brain/CNS tissue into the eyes or mouth.

Pack the head in a leak-proof container and seal it with tape. If plastic bags are used, use at least two and make sure they are sealed. The sealed head should go into another leak-proof container with enough cold packs to maintain refrigerator temperatures until the specimen reaches the lab. DO NOT freeze heads. Dry ice is not recommended, as it may freeze the head. Label the outside of the container with “REFRIGERATED SPECIMEN” and include the lab’s phone number (503-693-4100) and a notation to “CALL ON ARRIVAL.”

## Animal Bites and Rabies

Containers must be shipped prepaid, and addressed to:

Oregon State Public Health Laboratory  
3150 229th Ave., Ste. 100  
Hillsboro, OR 97124

Oregon State University  
Veterinary Diagnostic Laboratory  
30th & Washington Way  
Magruder Hall, Room 134  
PO Box 429  
Corvallis, OR 97339

### 3. Reporting of Results

The OSPHL will notify the LHD of all test results. Positive tests will also be reported to the OHA CD Section. It is the responsibility of the LHD to communicate results to the person bitten and other interested parties (i.e. doctors, veterinarians, etc.). For high risk situations, make sure you know how to contact these persons promptly.

#### 4.3 Veterinary Diagnostics Laboratory (VDL)

For a fee, the Oregon State University Veterinary Diagnosis Laboratory (OSUVDL) in Corvallis will test animal heads for rabies. This alternative can be suggested to persons who are not satisfied with the determination that theirs is a “no risk” situation. Generally speaking, OSUVDL will not test animals that have bitten people without the prior approval of OHA CD epidemiologists, but this approval is readily obtained for no risk situations. OSUVDL will also test wild animals in which an alternative diagnosis may be requested or needed by other agencies.

Specimen preparation and shipping is best left to interested parties and/or their veterinarians. Requirements are similar to those outlined above for the OSPHL. Questions should be referred to the OSUVDL at 541-737-3261.

## 5. PROPHYLAXIS

### 5.1 Wound Treatment

All bite wounds should be thoroughly and immediately washed with soap, water and copious flushing. Betadine® or similar disinfectants can be applied. If possible, the wound should be left open to heal. Animal bite wounds often become infected (especially cat bites) and may require antibiotic therapy. Check tetanus immunization status, and provide a booster to persons who are out of date. Patients should be encouraged to seek medical attention promptly if signs of wound infection occur.

### 5.2 Post-Exposure Rabies Prophylaxis (PERP)

LHD and OHA staff can only make recommendations to patients and physicians about the advisability of PEP. Rabies immune globulin (RIG) and rabies vaccine are freely available by prescription, and physicians are free to take or leave our advice.

For many people, the prospect of PEP conjures up images of dozens of painful injections given with giant needles, often in the “stomach.” Understandably, these myths may contribute to the natural anxiety felt by many people after animal bites, and should be quickly debunked. Modern PEP is a simple, extremely effective and relatively painless procedure.

PEP can be given by anyone capable of giving IM injections; there is no good reason for patients being dispatched to distant emergency rooms. Therapy consists of passive immunization with rabies immune globulin (RIG, Imogam®; 20 IU/kg), given as soon as possible after exposure, combined with active immunization with Imovax Rabies by Sanofi Pasteur, a human diploid cell vaccine (HDCV) or RabAvert by Novartis, a purified chick embryo cell vaccine (PCECV) administered in 1-ml doses on four days (days 0, 3, 7, 14).

These biologics are stocked at some LHDs, hospital pharmacies and several emergency rooms in Oregon; they can be ordered for next-day delivery at most locations. As many as 50% of vaccines may experience

## Animal Bites and Rabies

local reactions including pain, erythema, and swelling or itching at the injection site, and/or systemic reactions such as headache, nausea, abdominal pain, myalgias, and dizziness

PEP should not be interrupted or discontinued because of side effects except in the case of anaphylactic reaction. Pregnancy is not a contraindication.

### 5.3 Pre-Exposure (Human)

Persons who live in an area with a high rate of terrestrial rabies and are at risk of being bitten or exposed to infected tissues (e.g., veterinarians, wildlife workers, laboratory personnel, animal control officers) may benefit from pre-exposure rabies prophylaxis. The regimen consists of three doses of HDCV or PCECV (IM) on days 0, 7, and 28. Should immunized persons subsequently be bitten by a possibly rabid animal, they will need only two 1-ml boosters of HDCV, three days apart.

### 5.4 Rabies Vaccine for Animals

There are formulations of rabies vaccine licensed for cats, dogs, ferrets, horses, cows and sheep. Oregon laws require that dogs be vaccinated for rabies by the time they reach 6 months of age. (This vaccination is required for licensure in all Oregon counties.) Dogs that are immunized at <1 year of age must be revaccinated within the following year, and every 3 years thereafter. Cat vaccination in Oregon is required by individual counties. Please check with your local county animal services for the most update information. It is highly recommended to vaccinate cats against rabies because cats are bat predators. The schedule for cats is the same as for dogs. Only a 1-year vaccine is approved for ferrets.

## 6. FOLLOW-UP TO ANIMAL RABIES CASES; BAT-PROOFING

### 6.1 Public Education and Awareness

Publicity surrounding the identification of a rabid animal often provides an opportunity to educate citizens about the importance of ongoing animal control measures, including the following recommendations.

1. Avoid physical contact with healthy, sick, alive or dead bats.
2. Do not hand feed or otherwise handle stray animals and wildlife.
3. Report all animal bites promptly to the local health department.
4. Every effort should be made to capture stray or wild animals that have bitten people, if it can be done safely, in order that they can be tested for rabies if indicated.
5. Vaccinate all dogs and cats, in order to create an immune barrier between these frequently handled animals and wildlife.
6. Control populations of stray or unwanted animals.

### 6.2 Animals Exposed to Known or Suspected Rabid Animals

1. If an unimmunized dog, cat or ferret has known contact with a rabid animal, the bitten animal should be humanely euthanized. If the owner will not permit this, the animal must undergo a supervised quarantine for 6 months, with the vaccine administered either as soon a quarantine starts or 1 month prior to release.
2. A dog, cat or ferret with a current rabies vaccination that has had a known contact with a rabid animal should be revaccinated and confined at home for 45 days (indoors, in a fenced yard, or on a leash at all times).
3. See the American Veterinary Medical Association's Compendium of Animal Rabies Prevention and Control by the National Association of State Public Health Veterinarians (NASPHV) web site at: <http://www.nasphv.org/documentsCompendia.html> for information on animal confinement and other recommendations.

Oregon OARS 333-019-0027 was amended to bring Oregon rules in line with the National Association of Public Health Veterinarians and CDC guidelines (contained in the Compendium).

### 6.3 Bat Control

1. Houses and out buildings can be bat-proofed by covering large openings with screen wire and caulking or closing holes to less than 1 cm (3/8 in.) in diameter. Doors and windows should be screened. Fireplace dampers should be closed during warm months.

## Animal Bites and Rabies

2. For those interested in encouraging bat colonies, bat boxes are easily constructed (plans are available from various sources). They should be located away from human habitations.
3. With care, bats can be removed safely from a dwelling. Wait for the bat to settle on a reasonably flat surface, and trap it under a wide-mouthed jar or can. Use a piece of cardboard as a temporary cover. When the bat settles to the bottom of the jar, slide the cardboard off and immediately put the jar lid in place. Turn the bat loose in another location or, if sick or injured, humane euthanasia should be used; gas anesthesia, 4% CO<sub>2</sub>, or CO<sub>2</sub>. Please note that putting the jar or can in the freezer is not considered to be humane euthanasia.

### 7. MANAGING SPECIAL SITUATIONS

#### 7.1 Curious Animal Behavior

Rabies is only one of many conditions that can affect animal behavior. Trauma, pesticide and other poisons and infectious diseases can all trigger rabies-like signs. Unless humans are bitten by these animals, there should be no public health concern about rabies.

Canine distemper, for example, often affects Oregon raccoons, causing muscle twitching, convulsions with salivation and chewing movements, and ascending paralysis with ataxia. Foxes, coyotes, mink and skunks are also susceptible to canine distemper, but outbreaks in these species have not been reported in Oregon. Infected animals may come out during the day and may approach humans or domestic pets without fear. (A definitive diagnosis of distemper can be made, and public fears allayed, by sending fresh raccoon carcasses to the OSUVDL at 541-737-3261 for necropsy and histopathology studies. Call to find out the cost per animal.)

#### 7.2 Wildlife Die-offs

Local Health Departments are often called because of a real or perceived animal die-off. These seldom have public health significance, and are best handled by contacting the nearest area office of the Department of Fish and Wildlife. Their staff is well versed on the ecology of the area and trained in these investigations.

#### 7.3 Suspected Human Rabies

Contact the OHA CD Section immediately at 971-673-1111.

Antemortem confirmation of human rabies is often not possible. Nuchal skin biopsies, corneal impression smears, neutralizing antibody titers and other tests on human material must be performed at the CDC by arrangement through OSPHL. Postmortem testing is the same as for other animals.

### UPDATE LOG

July 2014: Updated human vaccine information section 5.2 and 5.3 and revised the website for the compendium for animal rabies 2011. (DeBess)

March 2011: Clarified language (overall). Updated ACIP recommendation on the number of rabies vaccines required for post exposure prophylaxis and updated time of vaccination when animals are quarantined for 6 months (animal to animal rabies exposure). (DeBess)