



Human Rabies Prevention Program

Introduction

Rabies is probably the oldest-recognized and most-feared disease that affects humans. It is obvious from ancient texts and artwork dating back to the 23rd century BC that humans thousand of years ago clearly recognized the transmission cycle and signs of rabies. The disease is transmitted in the saliva of infected animals, most often introduced into the body by a bite wound. Historically, most human rabies cases occurred as a result of the bite of rabid dogs or wild carnivores. In modern times in developed countries, rabies has been well controlled by mandatory vaccination of pet dogs and cats. Since vaccination of pet animals became routine, human rabies cases have fallen dramatically and are now considered rare in the U. S. Cases of human rabies occurring in the U.S. today involve contact with non-pet reservoir animals, as well as cryptic cases which are presumed to have originated by some form of contact with wild reservoir animals. Clearly, a small but significant risk of contracting rabies persists for individuals who come into contact with reservoir animals.

Oregon State University follows federal guidelines in the conduct of research and other activities which might place personnel in direct contact with animals, animal carcasses, blood, tissues, or body fluids that could potentially contain infectious zoonotic pathogens, including rabies virus. The Centers for Disease Control and Prevention (CDC) has issued specific guidelines for managing possible exposures to rabies, which are incorporated in this document. Due to the severity of rabies when it does occur in humans, it is incumbent upon the university to provide policy support and clear guidance to at-risk personnel on methods to reduce the risk of exposure and disease. This document is intended to establish policy and to provide guidance on exposure avoidance and management to research and clinical students, faculty and staff of Oregon State University.

Background

Rabies is an acute disease that can occur in most mammals. The most common domestic animals associated with rabies transmission are dogs, cats, and ferrets. Less frequently associated domestic animals are cattle, horses, and other livestock. Wild animals frequently associated with rabies transmission are skunks, raccoons, foxes, coyotes, and various species of bats. However, nearly any mammal can be affected. Nocturnal wild animals seen during the day or acting in an unusual manner should be avoided and reported to animal control authorities.

The disease is caused by a negative-strand RNA virus in the *Rhabdoviridae* family, genus *Lyssavirus*. There are seven genetically distinct types of *Lyssavirus* worldwide

(Genotype 1 – Genotype 7). Six of the seven viruses can cause fatal encephalitis disease in humans. However, only rabies virus itself (Genotype 1) is present in North America. It is believed that the current rabies vaccine provides at least some level of protection against other genotypes.

The virus invades the peripheral nervous system and travels via axonal movement from the site of infection to the central nervous system. Once the brain becomes infected, the virus also moves to the salivary glands where it is shed in saliva. Most exposures result from bites or other contact with saliva from rabid animals, and occasionally from exposure to brain or other infectious nervous tissue. Other tissues can also be infectious; several organ transplant recipients have died of rabies. In cases where exposures result in infection, the result is serious, almost universally lethal disease in humans for which preventive and therapeutic interventions are available. The clinical disease can develop weeks, months, or even years after exposure.

In recent years, human rabies in the U. S. has largely been controlled by vaccination of pet animals. Nevertheless, human cases continue to occur in the U. S. at a rate of 1-5 per year. For most of these cases, the infected person is not aware that they have been exposed; most are not associated with bites or known exposures to potentially rabid animals. In such so-called cryptic cases, the virus isolate can be molecularly typed and the species of origin can be determined by comparison of genetic features that correlate with rabies viruses from different species. In the majority of these instances, the causative rabies viruses have turned out to be of bat origin. Thus, direct exposure to bats and activities that place persons in close contact with areas where bats dwell warrant special consideration.

Cryptic cases are particularly troublesome, because the infected person is rarely diagnosed until the terminal stages of the disease, by which time interventions are no longer possible. Additionally, by the time of diagnosis a large number of healthcare workers, family members, and other contact persons have usually been exposed and require postexposure prophylaxis. For example, in each of five fatal human cases that occurred in the U. S. in the year 2000, between 20 and 71 persons with exposure were treated with postexposure prophylaxis.

In addition to cryptic cases, there are other types of non-bite exposures to rabies that can occur. Scratches, abrasions, open wounds, or mucous membranes contaminated with saliva or other potentially infectious material (such as brain tissue) from a rabid animal all give rise to non-bite exposures. Occasionally, non-bite exposures are such that postexposure prophylaxis is given. Inhalation of aerosolized rabies virus is also a potential non-bite route of exposure, but other than laboratory workers, most people are unlikely to encounter an aerosol of rabies virus. A total of four cases of rabies have been known to result from aerosol transmission, although it is likely that at least some of the cryptic cases are also associated with this route of transmission. Two of the four documented aerosol cases were in lab technicians conducting research on rabies, and the others were in individuals who had spent time in caves inhabited with large numbers of bats.

General Precautions to Avoid Rabies Exposures

Once the clinical signs of rabies infection manifest themselves, the disease cannot be cured or treated, and is nearly always fatal. Avoiding exposures is critical and can be done by following these guidelines:

- 1) Consider mammals larger than a rodent or lagomorphs that are not laboratory animals, especially wild animals, as potentially infected with rabies. Exposures can occasionally occur as a result from contact with livestock animals.
- 2) All personnel whose work places them at risk for rabies infection (all personnel working with certain animals as described in this document) should receive pre-exposure vaccination with the human diploid cell vaccine (HDCV).
- 3) Immediately report any bites or scratches from animals to a supervisor or Principal Investigator, the Benton County Health Department, OSU Environmental Health & Safety, and to the Attending Veterinarian so that arrangements can be made for diagnostic evaluation of the suspect animal. Bites or other exposures must be evaluated as soon as possible by a physician to ensure proper postexposure treatment is administered promptly.
- 4) Exercise extreme care in the handling of these animals: dogs, cats (especially feral dogs and cats), skunks, raccoons, foxes, coyotes and bats.
- 5) Wear appropriate protective clothing, gloves, and eye protection when working with any of the above animals.

Key Elements of the Prevention Program

Personal Protective Equipment (PPE)

Exposure to rabies can be minimized by the appropriate and effective use of personal protective equipment (PPE). What constitutes appropriate PPE is determined by the procedure being conducted and the type, duration and extent of exposure, but at a minimum the use of fluid-proof barrier gloves and safety glasses should be used at all times when handling animals that have the potential to be infected. PPE must be supplied by the principal investigator / supervisor.

Training

Training is a key element to any hazardous activity. The ability to avoid exposures and to appropriately respond to exposures when they happen requires that personnel understand the risks and have been trained on effective methods for minimizing those risks. Exposures to rabies can be effectively managed with prompt first aid and medical interventions, but at-risk personnel must know how to respond appropriately and when to seek medical attention. For these reasons, all personnel for whom the plan applies will need rabies awareness training to encompass the guidance in this document.

Medical Care and Monitoring

The exposure control plan is primarily intended to prevent accidental infections, but it also contains specific requirements for pre-exposure vaccination and post-exposure medical care and occupational surveillance where warranted.

The use of preventive strategies will not completely eliminate the possibility of exposure to infectious materials or rabid animals. For certain researchers, clinicians, students, or diagnostic laboratory workers who handle suspect animals, samples, or other potentially infectious materials, the plan requires pre-exposure vaccination; for all workers and students, follow-up and documentation of any possible exposure incident is required. Therapeutic interventions are highly effective if administered appropriately and promptly.

Human Rabies Prevention Program

I. Applicability

This plan applies to all field research, clinical, or teaching activities where there is a likelihood that OSU employees or students could come into contact with rabies through contact with reservoir animals or specimens collected from such animals. The term “reservoir animals” means dogs, cats (especially feral dogs and cats), skunks, raccoons, foxes, coyotes and all types of bats. This plan also applies to research or diagnostic work in which contact is possible with suspected or potentially infected reservoir animal saliva, unfixed neural tissues (e.g., brain), cerebrospinal fluid, or cell culture of rabies virus or related *Lyssaviruses*.

II. Precautions for OSU Personnel

II-1) Precautions for collection, treatment, or other handling of bats and other reservoir animals:

All OSU personnel or students involved in collecting, trapping, providing veterinary care, or other handling of wild or feral reservoir animals shall adhere to the following precautions:

- Bare-handed contact is prohibited when handling reservoir animals and tissue specimens from reservoir animals. Precautions must be taken to avoid direct contact with saliva or cerebrospinal fluid, in particular. Rubber / nitrile / latex / vinyl / PVC gloves shall be used for all animal contact.
- Cut-resistant gloves should be considered – these may be worn under rubber / nitrile / latex / vinyl / PVC gloves to avoid cuts or puncture wounds from bites, claws, or instruments during handling and field work involving reservoir animals.
- Hands must be washed after handling animals and removal of gloves; if hand-washing in the field is not possible, the use of an antimicrobial gel must be substituted.
- Eye protection must be worn when handling animals or specimens collected from animals to prevent splashes of saliva into the eyes.
- If a reservoir animal bites a worker during field work or clinical treatment, that animal must not be released if possible so that it can be observed or tested for signs or pathology associated with rabies. If the animal dies for any reason, the animal or its brain must be submitted as suspect to the Veterinary Diagnostic Laboratory for rabies testing. All animal bites must be reported within one working day to the Benton County Public Health Department, and to the OSU Environmental Health & Safety Office. For more on bite management, see the section on Medical Management.
- If a reservoir animal bites a worker during field work or clinical treatment and subsequently escapes capture, then that animal shall be assumed to be rabid and postexposure procedures will be followed as described in Section V.

- All field personnel must have current Red Cross (or higher) level of certification in First Aid and have available at all times a first aid kit containing tincture of iodine or other effective virucidal antiseptic.

II-2) Precautions for the handling of suspect specimens in animal necropsy suites:

- Where practical, all small animal carcasses should be manipulated in a certified biological safety cabinet (BSC).
- Larger carcasses should be manipulated using equivalent protective measures (e.g. splash protection on eyes, protective solid-front gowns with tight fitting wrists, rubber / latex / vinyl / PVC gloves).
- For procedures involving sawing into the skull / brain of a potentially rabid animal, respiratory protection is recommended. Appropriate respiratory protection would be an N95 respirator.

II-3) Precautions for the handling of animal suspect clinical specimens (including CSF, saliva, and tissues):

The precautions in this section apply to persons who collect, transport, prepare for evaluation, or conduct diagnostic testing on animal specimens.

- Potentially infected animal clinical specimens for diagnostic purposes may be handled in an approved biosafety level 2 (BSL-2) facility using the practices described in the most current version of the CDC/NIH publication “*Biosafety for Microbiological and Biomedical Laboratories.*”
- Collection, sectioning, and preparation of brain or other tissues for testing must be carried out using standard universal precautions. This includes the use of gloves and eye protection for all manipulations of potentially infectious tissues, hand washing upon removal of gloves, and using care to avoid accidental cuts with sharp instruments used for these tasks.
- If tissue or other diagnostic specimens are to be transported, the specimens must be placed in leak-resistant plastic bags within leak-proof secondary containers. The secondary container must have universal biohazard stickers on the outside clearly visible from all angles. Place absorbent material inside the secondary container prior to transport of specimens, and visually inspect specimens when they arrive at the point of destination for leakage during transport before removal, and take appropriate precautions during removal if leakage has occurred. All shipment of specimens by commercial carrier must conform to current U. S. Department of Transportation regulations. Contact EH&S for guidance and assistance with shipping infectious materials.
- The use of disposable instruments for necropsy and tissue preparation is recommended. Re-usable instruments used during necropsy or in the preparation of tissues for diagnostic purposes shall not be handled prior to decontamination with an effective chemical agent. Following chemical decontamination, all instruments must be sterilized by autoclaving after necropsy and tissue preparation tasks before re-use.

- All tissue and carcass wastes must be secured within double plastic bags inside hard-sided, leak-proof secondary containers with tight-fitting lids for containment and transport. Terminal disposal must be by incineration.
- All non-tissue / carcass solid wastes must be collected in autoclavable biohazard bags within hard-sided, leak-proof secondary containers with a lid. Collected wastes must be autoclaved in an autoclave which is validated by spore testing in accordance with Oregon regulations.
- Certified biological safety cabinets (preferably class II) should be used for laboratory manipulations of suspect clinical specimens during testing to the extent possible.

II-4) Precautions for field research or agricultural work in areas where rabid reservoir hosts may be encountered:

The precautions in this section apply to persons conducting work which does not involve contact with reservoir animal hosts, but is being conducted in areas where reservoir hosts may be present.

- All persons to whom this section applies shall receive general rabies hazard awareness training prior to conducting field research or agricultural work.
- All personnel should be trained in first aid and have available a first aid kit.
- If bitten by an animal, follow the procedures in Section V.

III. Training

The responsibility for safety rests with the principal investigator / supervisor. No person shall be required or allowed to perform hazardous tasks without proper training before beginning those tasks. Safety training should be conducted upon initial hiring and annually thereafter, and must be documented.

Employees must be educated about their risk and methods, equipment and practices to control these risks. The topics required to be covered by training include:

- Awareness of the epidemiology, transmission and symptoms of rabies.
- Avoidance of bite exposures.
- Safe work practices and proper use of personal protective equipment.
- Pre-exposure vaccination for certain individuals (see below).
- Emergency and post-exposure management, first aid and medical therapies; occupational health program (if any).

In addition, students or faculty who conduct field work which would place them in contact with reservoir animals must have documented Red Cross training (or higher level) in first aid, and carry a first aid kit / bite kit.

For more information or assistance with training, contact the OSU Environmental Health & Safety, Biosafety Officer.

IV. Pre-Exposure Rabies Vaccination and Serological Testing

IV-1) Pre-Exposure Vaccination

Pre-existing humoral immunity to rabies virus will prevent the development of disease in persons who have been bitten by a rabid animal or otherwise exposed to rabies virus. In addition, as described above, a majority of recent rabies cases in the U.S. are not associated with a recognized bite or other obvious exposure. Pre-exposure vaccination simplifies post-exposure prophylaxis by eliminating the need for rabies immune globulin (RIG) and may provide protection in the event that an exposure is not recognized. For these reasons, persons whose activities carry a risk of exposure to rabies are required to receive pre-exposure vaccination or sign a declination waiver. In addition, OSU personnel who travel on OSU business and are likely to encounter animals in areas of the world where most dogs have not been vaccinated against rabies and where immediate access to appropriate medical care is not readily available are also required to receive pre-exposure vaccination, or sign a declination waiver.

Pre-exposure vaccination against rabies consists of a series of three injections, given on days 0, 7, 21 or 28. Depending on the formulation of the vaccine, it is administered either by the intramuscular (IM) or intradermal (ID) route.

The following persons / activities / occupations are required to receive the rabies vaccine or sign a declination waiver:

- Veterinarians, veterinary technical staff, and veterinary students in the College of Veterinary Medicine who come into contact with reservoir animals (including dogs and cats);
- Workers in the Veterinary Diagnostic Laboratory who may come into contact with diagnostic specimens submitted for rabies evaluation;
- Persons who conduct research requiring them to enter caves;
- Persons who conduct research involving the capture or handling of bats;
- Persons who capture or handle other wild reservoir animals;
- Persons who conduct research on rabies virus;
- Travelers who meet any or all of the following conditions:
 - Those going to countries where rabies is present and who intend to have regular contact with animals (e.g., veterinarians or zoologists);
 - Those going to countries where rabies is endemic and who will be more than 24 hours away from a reliable source of post-exposure vaccine and RIG;
 - Health and laboratory workers who in the course of their travels may come into contact with specimens or patients infected with the virus.

IV-2) Pre-exposure Serologic Testing

In addition to vaccination, for individuals whose activities pose the highest risks of unrecognized exposure, periodic serological testing for adequate antibody titers is also required. Booster vaccine doses should be administered to maintain a serum titer

corresponding to at least the recommendations of the Centers for Disease Control and Prevention. Currently, these recommendations are for a serum titer corresponding to complete neutralization of rabies virus at a 1:5 serum dilution by the rapid fluorescent focus inhibition test (RFFIT). The frequency of required testing varies for these individuals:

Every 2 years Workers who handle specimens from reservoir animals in the
 Veterinary Diagnostic Laboratory
 Persons who enter caves

Every 6 months Persons who conduct research on rabies virus
 Persons who capture or handle bats

Some important notes about pre-exposure vaccination and serologic testing:

- Pre-exposure vaccination does not abrogate the necessity to cleanse and treat bite wounds.
- Persons who are taking chloroquine derivatives as anti-malarial drugs should only receive the IM rabies vaccination, as these drugs suppress the immune response to ID rabies vaccine.

The following table summarizes the requirements for pre-exposure rabies vaccination and serologic testing:

<u>Personnel by Activity</u>	<u>Vaccination</u>	<u>Testing Frequency</u>
Veterinarians, Vet Technical staff, Vet Students	Required	Not required
Vet Diagnostic Lab workers, spelunkers	Required	Every 2 years
Rabies virus researchers; Bat handlers	Required	Every 6 months
Other wildlife researchers; travelers to rabies endemic areas	Required	Not required
All Others	Not required	Not required

V. Medical Management of Rabies Exposures

Successful medical management of rabies exposures depends upon two components, both of which must be administered promptly:

- Thorough cleansing of bite wounds;
- Post-exposure prophylaxis

Students, staff and faculty who conduct field work which would place them in contact with reservoir animals must have documented Red Cross training (or higher level) in first aid, and carry a first aid kit / bite kit. These first aid kits must contain virucidal antiseptic such as providone-iodine.

All exposures or possible exposures to rabies must be evaluated by a qualified medical professional. On or near the OSU main campus, students may go to the Student Health Services during daytime hours; exposed employees (and students after SHS closes) should go to Corvallis Clinic, which is open later. For late night exposures or exposures involving serious injury, all personnel should be transported to the Samaritan Medical Center Emergency Department.

V-1) Bite Wound Treatment

Exposures resulting from animal bites or other parenteral contact should be immediately cleansed with soap and warm water, if available. The wound should initially be encouraged to bleed, taking care not to massage the wound directly, followed by the application of pressure to control bleeding as necessary. Once bleeding has stopped or slowed sufficiently, providone-iodine or other virucidal antiseptic should be used liberally to irrigate the wound area.

Bite victims should be treated promptly by medical professionals. Initial anti-rabies post-exposure prophylaxis needs to be administered within 24 hours of exposure. Under most circumstances, bite wounds are not sutured unless very severe due to the high risk of bacterial infection.

V-2) Post-Exposure Prophylaxis

The type and extent of post-exposure rabies prophylaxis depends upon the pre-exposure status of the exposed individual:

Persons Previously Vaccinated against Rabies:

- One dose of rabies vaccine is administered (IM) on the day of the exposure (day 0), and a second dose is administered on day 3 post-exposure. No rabies immune globulin (RIG) is administered.

Persons Not Previously Vaccinated against Rabies:

- A total of 4 doses of rabies vaccine is administered (IM) on days 0, 3, 7, and 14.
- On day 0 (at the latest day 7 after vaccine dose is administered) a 20 IU/kg body weight dose of rabies immune globulin (RIG) is administered into and around the

wound site.

Deviations and delays in the recommended post-exposure vaccination and RIG schedule should not occur; the regimen described above has been clinically proven to be effective, whereas deviations may not be.

VI. Non-Medical Post-Exposure Procedures

VI-1) Reporting of Exposures

All possible rabies exposures must be reported to the laboratory principle investigator or supervisor, who is responsible for seeing that appropriate documentation and reporting of the incident is completed in a timely manner. Documentation consists of the following:

- An Accident / Illness Report (form SAIF 801) must be filled out and forwarded to OSU Human Resources, promptly after any exposure.
- When an exposure occurs, the principle investigator / supervisor will also contact the Biological Safety Officer, who will complete an incident report. The incident report should contain as much of the following information as possible:
 - a description of the exposed person's duties that relate to the exposure incident,
 - the route of exposure and detailed circumstances of the exposure,
 - the infectious, or potentially infectious material to which the employee was exposed; bite, other saliva contact, infectious tissues, culture fluid, etc.,
 - the disposition of the animal, in cases of animal bite,
 - any recommendations to prevent future exposures.
- Oregon State Law requires that all animal bites be reported to the local health department within one (1) working day after the bite. In Benton County, animal bites need to be reported to the Benton County Health Department. An animal bite reporting form is available on the BCHD, Environmental Health Division web site (see Appendix for link).
- All animal bites that involve animals under the responsibility of the OSU Attending Veterinarian (animals used for research or teaching) need to be reported to the AV.

VI-2) Follow up – Evaluation of Suspect Animals

Where possible, the infectious or potentially infectious material to which the individual has been exposed will be evaluated for the presence of rabies virus. For most rabies exposures, this involves the evaluation of suspect animals involved in a bite exposure. Evaluation is coordinated with the local Public Health Department.

If the animal is not known to be vaccinated, the following apply:

- If the animal is healthy and available for evaluation, quarantine for 10 day observation;

- If the animal is not healthy, dies, or is known or suspected to be rabid, the animal should be euthanized and submitted for testing;
- If the animal is lost to follow-up evaluation, consult with public health officials. Generally, bites from wild carnivores or bats are regarded as rabid unless proven otherwise.

Appendix A: Contact Information for Exposures

Student Health Services

(541) 737-9355

Corvallis Clinic

(541) 758-1150

Good Samaritan Regional Medical Center

Emergency Room: (541) 768-5021

Benton County Health Department

<http://www.co.benton.or.us/health/>

Public Service Building

530 NW 27th St.

Corvallis, OR

Phone: (541) 766-6835

Fax: (541) 766-6142 (*non-confidential business fax*)

Fax: (541) 766-6186 (*confidential, protected health information only*)

Animal Bite Form: http://www.co.benton.or.us/health/environmental_health/bites.php

Environmental Health & Safety

Oak Creek Building

(541) 737-2273

<http://oregonstate.edu/ehs/>

Biological Safety Officer: (541) 737-4557

Matthew.philpott@oregonstate.edu

Appendix B: Vaccination Declination Form

I understand that due to my occupational exposure to reservoir animals or other potentially infectious materials I may be at risk of exposure to rabies. I have been made aware of the risks and given the opportunity to be vaccinated. However, I decline pre-exposure rabies vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring rabies, a fatal disease. If in the future I continue to have occupational exposure to reservoir animals or other potentially infectious materials and I want to be vaccinated with the rabies vaccine, I can receive the vaccination series.

Signed _____ Date _____

Printed Name _____

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The guidance in this document is based on recommendations for control and prevention of human rabies issued by the Centers for Disease Control and Prevention. If current recommendations change in the future, this document shall be modified accordingly to reflect those changes.

This document shall be reviewed for effectiveness after each incident involving a possible exposure, and at other times as deemed appropriate by the Occupational Health Service Committee.