Human Rabies Prevention Program

Introduction

Transmission of rabies virus occurs when saliva or neural tissue from an infected mammal is introduced into a person or another animal through, for example, a bite or contact with mucous membranes. Worldwide, approximately 59,000 human rabies deaths occur each year. The canine rabies virus variant (CRVV) is the most common source of human rabies infections, accounting for approximately 98% of cases, including some cases among U.S. travelers. In the United States, CRVV has been eliminated, but wildlife rabies remains endemic, accounting for approximately 5,000 reported rabid animals each year. Specific wildlife rabies virus variants (RVVs) associated with mesocarnivores (small to midsized animals whose diet includes 50%–70% meat) are endemic in distinct geographically confined locations in 42 U.S. states and Puerto Rico. In contrast, bat RVVs are widely distributed throughout the United States, with only Hawaii being rabies-free. During January 2000–December 2020, 52 cases of human rabies were diagnosed in the United States, 38 of which were indigenously acquired (i.e., from rabies exposures that occurred in the United States); none were in persons who had previously received PrEP (MMWR, 2023).

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

Human rabies is an acute, progressive encephalomyelitis that is nearly always fatal once symptoms begin. Several measures have been implemented to prevent human rabies in the United States, including vaccination of targeted domesticated and wild animals, avoidance of behaviors that might precipitate an exposure (e.g., provoking high-risk animals), awareness of the types of animal contact that require postexposure prophylaxis (PEP), and use of proper personal protective equipment when handling animals or laboratory specimens. PEP is widely available in the United States and highly effective if administered after an exposure occurs.

A small subset of persons has a higher level of risk for being exposed to rabies virus than does the general U.S. population; these persons are recommended to receive preexposure prophylaxis (PrEP), a series of human rabies vaccine doses administered before an exposure occurs, in addition to PEP after an exposure. PrEP does not eliminate the need for PEP; however, it does simplify the rabies PEP schedule (i.e., eliminates the need for rabies immunoglobulin and decreases the number of vaccine doses required for PEP). As rabies epidemiology has evolved and vaccine safety and efficacy have improved, Advisory Committee on Immunization Practices (ACIP) recommendations to prevent human rabies have changed (MMWR, 2022).

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 of 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.

3) Immediately report any bites or scratches from animals to a supervisor or Principal Investigator, the Benton County Health Department, OSU Environmental Health & Safety 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 accompany 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 and 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 Oregon Veterinary Diagnostic Laboratory for rabies testing. All animal bites must be reported within one working day to the Benton County Health Department (or other county health department, if the bite occurs elsewhere in Oregon). For more on bite management, see the section on Medical Management. All bites and other injuries must also be reported on the HR Advocate system.
- 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 post-exposure 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 domestic 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.

During 2019-2021, the Advisory Committee on Immunization Practices updated the rabies PrEP recommendations to replace the three-dose schedule. Pre-exposure vaccination against rabies consists of a series of two intramuscular injections, given on days 0 and 7. Intradermal vaccine is no longer recommended in the latest guidelines.

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

- Veterinarians, veterinary technicians, veterinary assistants, animal attendants, and veterinary medical students in the Carlson College of Veterinary Medicine who come into contact with reservoir animals (including dogs and cats);
- Workers in the Oregon Veterinary Diagnostic Laboratory who may come into contact with diagnostic specimens submitted for rabies evaluation;
- Persons who conduct research requiring them to enter and spend time in caves or other areas where bats congregate;
- 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 HRIG;
    - 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 minimum serum titer of >0.5 IU/mL. The frequency of required testing varies for these individuals:

Every 6 months: Persons working with live rabies virus in research, or vaccine production or performing testing for rabies in diagnostic laboratories. (OVDL staff who test tissue for rabies virus)

One time titer at 1-3 years:

After 2 dose primary series: Persons who interact with animals that could be rabid, including but not limited to: (1) Veterinarians, technicians, animal control officers and students in these fields. (2) Persons who handle reservoir species (wildlife biologists, rehabilitators and trappers)
(3) Spelunkers and (4) Travelers who may come into contact with animals and are in a location where adequate health care for rabies exposure including Rabies Immune Globulin and vaccine are not readily available (many developing countries – esp rural areas)

Every 2 years: Persons who (1) handle bats (2) have contact with bats (3) enter high density bat environments or (4) perform animal necropsies (e.g. biologists who enter bat roosts or collect suspected rabies samples, workers who handle specimens from reservoir animals in the Veterinary Diagnostic Laboratory)

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

- Pre-exposure vaccination does not abrogate the necessity to cleanse and treat bite wounds.
- Pre-exposure prophylaxis does not eliminate the need for additional rabies vaccine injections immediately following a known exposure; it only simplifies the post exposure injection protocol.
- Persons who are taking chloroquine or related drugs should stop these drugs when rabies vaccine is being administered. If stopping these drugs is not possible then checking an antibody titer to ensure a response is at least 0.5 IU/mL no sooner than one week and preferably at 2-4 weeks after vaccine series is advised.

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

Personnel by Activity	**Vaccination**	**Testing Frequency**
Veterinarians, CCVM technical staff, CCVM medical students, spelunkers	Required	one time at 1-3 years
Bat handlers or persons entering bat environments, some OVDL workers	Required	Every 2 years
Rabies virus researchers; OVDL workers who test tissue for rabies	Required	Every 6 months
Immunocompromised OVDL workers, spelunkers, rabies virus researchers; bat handlers	Required	4 weeks after initial series and after any boosters. Routine testing per activity and risk
Other wildlife researchers; travelers to rabies endemic areas	Required	one time at 1-3 years
No direct exposure to: rabies virus, reservoir animals, bats, caves, other bat environments, potentially infected tissues or travel to rabies endemic areas	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 povidone-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 or an urgent care center. Exposed persons may go to a personal physician only if they can be seen the same day. 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

Regardless of the risk for rabies, bite wounds can cause serious injury, such as nerve or tendon laceration and infection. For many types of bite wounds, PEP should begin with immediate thorough cleansing of all wounds with soup and water a with water or a dilute water povidone-iodine solution has been shown to markedly decrease the risk of bacterial infection. Wound cleansing is especially important in rabies prevention since, in animal studies, thorough wound cleansing alone without other medical treatments (e.g., PEP) has been shown to markedly reduce the likelihood of rabies (CDC, 2024).

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:

<u>Persons Previously Vaccinated against Rabies:</u>

- 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.

<u>Persons Not Previously Vaccinated against Rabies:</u>

- 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 principal 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:

- The supervisor must complete the HR Advocate Public Incident form online at https://risk.oregonstate.edu/workerscomp/forms.When medical attention has been sought, the employee and supervisor should promptly complete the SAIF 801 form (Report of Job Injury or Illness) after any exposure.
- Return the completed forms to the Office of Insurance and Risk Management Services.
- When an exposure occurs, the principal investigator / supervisor will also contact the Biological Safety Officer (biosafety@oregonstate.edu), 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, including any personal protective equipment worn or tools being used;
    - 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;
    - 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 Attending Veterinarian.

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 county health department and/or the Oregon Veterinary Diagnostic Laboratory.

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.

References

Rao AK, Briggs D, Moore SM, et al. Use of modified preexposure prophylaxis vaccination schedule to prevent human rabies: Recommendations of the Advisory Committee on Immunization Practices – United States, 2022. MMWR Morbidity and Mortality Weekly Rep 2022;71:619-627. Retrieved from: https://www.cdc.gov/mmwr/volumes/71/wr/mm7118a2.htm?s_cid=mm7118a2_w.

CDC Rabies post-exposure prophylaxis, May 15, 2024. Retrieved from https://www.cdc.gov/rabies/hcp/prevention-recommendations/post-exposure-prophylaxis.html#:~:text=Regardless%20of%20the%20risk%20for,the%20risk%20of%20bacterial%20infection.

Appendix A: Contact Information for Exposures

OSU Health Center
(541) 737-7566

Corvallis Clinic
(541) 758-1150

Good Samaritan Regional Medical Center
Emergency Room: (541) 768-5021

Benton County Health Department
https://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 Bites: https://health.bentoncountyor.gov/animal-bites/

Environmental Health & Safety
Oak Creek Building
(541) 737-2273
https://ehs.oregonstate.edu/

OSU Biological Safety Officer:
Debra De Loach, PhD, CPBCA
(541) 737-7080
debra.deloach@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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Revised, October 2014
Revised, December 2014
Revised, April 2024
Approved by Occupational Health Advisory Committee, May 2024

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 Advisory Committee.