



## Report Immediately

# Rabies

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## Disease Plan

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Last updated: December 31, 2019, by Dallin Peterson

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

## ✓ CRITICAL CLINICIAN INFORMATION

<b>Clinical Evidence</b>
<p>Signs/Symptoms</p> <ul style="list-style-type: none"><li>• Animals<ul style="list-style-type: none"><li>○ Aggressive behavior</li><li>○ Excessively salivate</li><li>○ Paralysis</li><li>○ Difficulty swallowing</li></ul></li><li>• Humans<ul style="list-style-type: none"><li>○ Progressive neurologic signs</li><li>○ Hydrophobia</li><li>○ Difficulty swallowing</li><li>○ Paresis</li></ul></li></ul>
<p>Period of Communicability</p> <ul style="list-style-type: none"><li>• Animals<ul style="list-style-type: none"><li>○ Dogs, cats, and ferrets: 3-7 days before onset of clinical signs and shed virus throughout illness</li><li>○ Other wild animals: Not determined for all wild animals but skunks can shed virus up to 18 days before death.</li></ul></li><li>• Humans<ul style="list-style-type: none"><li>○ The period in which a patient is considered infectious begins up to 10 days before symptom onset and lasts until death.</li></ul></li></ul>
<p>Incubation Period</p> <ul style="list-style-type: none"><li>• Animals<ul style="list-style-type: none"><li>○ On average, 1-3 months</li></ul></li><li>• Humans<ul style="list-style-type: none"><li>○ On average 3-8 weeks, but can be as shorter due to the site of exposure and viral strain</li></ul></li></ul>
<p>Mode of Transmission</p> <ul style="list-style-type: none"><li>• Transmitted through the bite or scratch of an infected rabid animal</li></ul>
<b>Laboratory Testing</b>
<p>Type of Lab Test and Specimen Collection Criteria</p> <ul style="list-style-type: none"><li>• Animals<ul style="list-style-type: none"><li>○ Direct fluorescent antibody testing at the Utah Public Health Lab</li><li>○ Specimen collection and packaging instructions can be found here: (<a href="http://health.utah.gov/epi/diseases/rabies/UDOH_Rabies_Specimen_Guidance_2019.pdf">http://health.utah.gov/epi/diseases/rabies/UDOH_Rabies_Specimen_Guidance_2019.pdf</a>)</li></ul></li><li>• Humans<ul style="list-style-type: none"><li>○ Consult your local health department or the Utah Department of Health for postmortem human testing</li></ul></li></ul>
<b>Treatment Recommendations</b>
<p>Type of Treatment</p> <ul style="list-style-type: none"><li>• There is no treatment for human or animal rabies infection.</li></ul>
<p>Prevention</p> <ul style="list-style-type: none"><li>• Animals<ul style="list-style-type: none"><li>○ The best prevention for dogs, cats, ferrets is to keep them up to date for all rabies vaccinations.</li></ul></li></ul>

- Humans
  - Leave wildlife alone.
  - Persons who work with rabies in laboratory settings, animal control or wildlife officers should consider rabies pre-exposure vaccinations.
  - The best prevention for a human who might have been exposed to a rabid animal is to obtain rabies post-exposure prophylaxis.

**Contact Management**

Isolation of Case

- Standard fluid precautions should be followed; person-to-person transmission of rabies has not been documented.

Quarantine of Contacts

- Animal rabies
  - Healthy dog, cat or ferret that bites a human: 10-day quarantine
  - Vaccinated dog, cat or ferret exposed to wild animal: 45-day quarantine and given a rabies booster
  - Unvaccinated dog or cat exposed to wild animal: 4-month strict quarantine or euthanasia
  - Unvaccinated ferret exposed to wild animal: 6-month strict quarantine

**Infection Control Procedures**

Prevention

- Standard fluid precautions should be followed; person to person transmission of rabies has not been documented

## ✓ WHY IS RABIES IMPORTANT TO PUBLIC HEALTH?

Rabies is a preventable viral disease of mammals most often transmitted through the bite of a rabid animal. Rabies is considered virtually 100% fatal. Engaging public health is crucial when coordinating a response to a potential exposure to ensure life-saving treatment is provided.

## ✓ DISEASE AND EPIDEMIOLOGY

### Clinical Description

#### Animal Rabies

Rabies is primarily a disease of the central nervous system. Animals with rabies can appear aggressive (“furious rabies”) or normal or meek (“dumb rabies”). Animals with furious rabies often exhibit aggressive or unusually excited behavior; they may excessively salivate and may attack other animals or humans. Dumb rabies may be more difficult to detect; animals may seem tame, wounded, or dazed. The behavior of an animal, however, is not a reliable indicator of whether or not it has rabies.

#### Human Rabies

Human rabies presents as a rapidly progressing illness, with a duration of 2–21 days. A prodromal phase, lasting about 2–10 days, is characterized by pain and numbness/tingling at the site of the bite (present in 50–80% of cases) and by nonspecific complaints such as fatigue, headache, and fever. Behavioral changes may also be apparent, including apprehension, anxiety, agitation, irritability, insomnia, and depression.

The prodromal phase is followed by the neurologic phase, during which the following can occur: disorientation and hallucinations, paralysis, episodes of terror and excitement, hydrophobia (fear of swallowing liquids), hyperventilation, hypersalivation, and seizures. These symptoms are invariably followed by coma and death. Once symptoms begin, drugs or treatments typically do not improve the patient’s condition.

### Causative Agent

The rabies virus is a rhabdovirus of the genus *Lyssavirus*. All members of the genus are antigenically related, but use of nucleotide sequencing and monoclonal antibodies can show differences according to animal species or geographic location.

### Differential Diagnosis

The differential diagnosis for rabies includes: delirium tremens, reaction to illicit drugs, strychnine poisoning, acute psychosis, tetanus, bacterial meningitis, cerebral abscess, viral encephalitis, cerebral malaria, post-rabies vaccine encephalitis, and snake bite.

## Laboratory Identification

### Animal Testing

The Utah Public Health Laboratory (UPHL) performs rabies testing on animal specimens. Local health departments (LHDs), animal control officers and the public must make arrangements for testing and transport of specimens to the UPHL. Animal control officers and veterinarians should be familiar with the proper way to euthanize, preserve, and ship animal specimens to the laboratory. Except for whole bats and other very small animals, only heads will be accepted.

Further guidance can be found here:

[http://health.utah.gov/epi/diseases/rabies/UDOH\\_Rabies\\_Specimen\\_Guidance\\_2019.pdf](http://health.utah.gov/epi/diseases/rabies/UDOH_Rabies_Specimen_Guidance_2019.pdf)

### Human Testing

Human rabies testing requires consultation between LHDs, Utah Department of Health (UDOH) and Centers for Disease Control and Prevention (CDC). All clinical samples from suspect cases of human rabies should be sent to the UPHL for forwarding to the CDC for testing. Contact the UDOH Epidemiology or UPHL Virology Section for specific instructions regarding types of specimens to submit and proper methods for submission.

## Prevention and Post-Exposure Prophylaxis (PEP)

### Animal

Regularly vaccinating animals is the best way to prevent rabies. If animals are current on vaccines and are exposed to rabid animals, they may only require booster vaccinations.

Depending on vaccine status of the animal exposed to a rabid animal, quarantine may be put into place. Quarantine periods (rarely exceed four months) exist for domestic animals exposed to a rabid or potentially rabid animal. (See Isolation and Quarantine Requirement Section)

For additional information, please see the National Association of State Public Health Veterinarians Inc. (NASPHV) Compendium of Animal Rabies Prevention and Control 2016.

<http://www.nasphv.org/Documents/NASPHVRabiesCompendium.pdf>

### Human

Specific immunological protection in humans is provided by administration of human rabies immune globulin (HRIG) at the site of a bite as soon as possible after exposure to neutralize the virus, then giving vaccine at a different site to elicit active immunity. As much of the HRIG should be infiltrated into and around the bite wound as possible, and the rest, if any, should be given intramuscularly (IM). HRIG can be given up to 8 days after vaccine (8 days based on first vaccine given on day 0). HRIG potency and dose information can be found at

[https://www.cdc.gov/rabies/medical\\_care/index.html](https://www.cdc.gov/rabies/medical_care/index.html) and

<https://www.cdc.gov/rabies/resources/availability.html>.

Vaccine should be given as soon as possible after exposure and once initiated; the last dose should be given within 14 days. Vaccine should be given IM on days 0, 3, 7, and 14. Once

symptoms develop, rabies is typically fatal. Therefore, treatment needs to be initiated as soon as possible following exposure. If person is immunosuppressed, recommendation is five doses of vaccine on days 0, 3, 7, 14, and 21.

## **Case Fatality**

Rabies is nearly always fatal in humans. There have been a few documented cases that have survived rabies without prior post-exposure prophylaxis (PEP) using a complex treatment protocol, but this treatment regimen is rarely successful.

## **Mortuary/Autopsy Requirements**

Cremation is recommended for patients who have died from rabies. If cremation is not desired, the body should be permanently sealed in a closed casket without embalming. If the body must be prepared for public viewing, it should be embalmed using formalin with a concentration  $\geq 2\%$ , which has been shown to inactivate other enveloped RNA viruses. Although there is no evidence for aerosolization of rabies virus during routine embalming procedures, manipulation of the body and methods that use embalming fluids under pressure could potentially release infectious materials, particularly if organs and other tissues were removed during autopsy. The embalmer should use an N95 respirator, face shield, and puncture-resistant gloves in addition to standard infection control measures. Before dressing, the body should be disinfected with a 10% solution of sodium hypochlorite or equivalent disinfectant. Family members of rabies patients should avoid contact with the deceased body.

## **Reservoir**

Although all species of mammals are susceptible to rabies virus infection, only a few species are important for maintaining the disease in nature. In the U.S., raccoons, skunks, foxes, and coyotes are the major reservoirs in ground animals, and bats are the major non-ground animal reservoir. The most prevalent strain in Utah is the bat strain. In developing countries, dogs are the principal problem. Any rabies strain can be passed to other animals and humans through exposure to infectious saliva.

Small rodents (e.g., squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, and mice) and lagomorphs (rabbits and hares) have not been known to transmit rabies to humans and are almost never found to be infected with rabies. Rodents and lagomorphs that are caged outdoors are sometimes exceptions because the cages may allow exposure to rabid animals, but provide enough protection for the caged animal to survive and later develop rabies.

## **Transmission**

Transmission of rabies virus usually begins when infected saliva of a host is passed to an uninfected animal. The most common mode of rabies virus transmission is through a bite and exposure to virus-containing saliva from an infected host. Though rare, transmission has been documented via other routes, such as contamination of mucous membranes (e.g., eyes, nose, mouth), aerosol transmission, and corneal and organ transplantations.

## **Susceptibility**

All mammals are considered susceptible to rabies.

## **Incubation Period**

### **Animal Rabies**

Depending on a number of factors, including the animal species, the virus strain, and the anatomical site of exposure, the incubation period may vary from a few days to several years, but is typically 1–3 months. Some animals, such as dogs and cats, have been studied extensively, and the incubation period for these animals rarely exceeds four months.

### **Human Rabies**

The incubation period for human rabies is usually 3–8 weeks, but can be as short as nine days (although 9-day incubation periods have not been documented in the U.S. with native strains), or as long as seven years. Less than 1% of human cases have an incubation period longer than six months. The incubation period is typically related to the site of exposure; for example, the incubation period is usually shorter if the virus is inoculated closer to the central nervous system (brain) or in an area that is more highly innervated (such as the hand). The incubation period also depends on the severity of exposure (a larger dose of virus results in a shorter incubation period), the age of the exposed person (younger age generally results in a shorter incubation period), and the strain of the virus.

## **Period of Communicability**

### **Animal Rabies**

Animals are not infectious until virus appears in their saliva, generally toward the end of the incubation period. Dogs, cats, and ferrets may shed virus for about 3–7 days before the onset of clinical signs and may continue shedding throughout the course of their illness. The shedding/communicability period for most wild animals has not been determined, although skunks may shed virus for up to 18 days before death. Carcasses of animals with rabies may contain infectious virus, depending on temperature and environmental conditions. Rabies virus may persist in a frozen carcass for many weeks. Drying and sunlight rapidly deactivate rabies virus. Dried saliva or a dried animal carcass would not contain live rabies virus.

### **Human Rabies**

Rabies virus in humans may be transmissible beginning up to ten days before symptom onset and will remain infectious until death. Saliva is considered potentially infectious, as are other bodily tissues and fluids. It should be noted, however, that with the exception of corneal and solid organ transplants from infected persons, there have been no documented cases of person-to-person transmission of rabies.

## Epidemiology

### Animal

Animal rabies exists in most parts of the world. In the U.S., Hawaii is the only state that has never reported an indigenously-acquired rabies case in humans or animals. Wild animals accounted for 92% of reported cases of rabies in 2016. Raccoons continued to be the most frequently reported rabid wildlife species (32% of all animal cases during 2012), followed by bats (27%), skunks (25%), foxes (6%), and other wild animals (2%). Reported cases increased among all wild animals during 2012. The remaining 8% were domestic animals. Most of the continental U.S. has endemic rabies in terrestrial mammals; bat rabies is endemic in Alaska, as well as throughout the continental U.S. Utah averages 12-15 positive rabid bats per year. In 2006, Utah had its first non-bat mammal since 1995, a fox. In 2014, a spotted skunk tested positive. Both the fox and skunk were infected with bat strains. Dogs are a primary reservoir for human rabies in Mexico and much of Central and South America, Asia, and Africa. In the U.S., children are exposed to rabid and potentially rabid animals more often than adults.

### Human

In the U.S. over the past century, the number of human deaths attributed to rabies has declined from 100 or more each year to an average of 1–2 each year. The decline is due to pet vaccination and animal control programs, begun in the 1940s, that have essentially eliminated the domestic dog as a reservoir of rabies, and to the development of effective human rabies vaccine and immune globulin. Since 1995, 46 human rabies deaths in the U.S. have been reported to the CDC, with 35 of those associated with bat variants. Eleven of these deaths are believed to have been caused by contact with rabid animals (mostly dogs) outside the U.S. In 2004, a case of rabies in an organ donor and four cases of rabies in organ recipients were identified. Worldwide, an estimated 55,000–65,000 human rabies deaths occur each year. The vast majority of these deaths occur in developing countries. In Utah, the last human rabies case was identified in 2018.

## ✓ PUBLIC HEALTH CONTROL MEASURES

### Public Health Responsibility

*Note: Due to the rarity and potential severity of human rabies, a confirmed human rabies diagnosis will be made with extensive involvement from the UDOH and the CDC.*

- Immediately notify the UDOH Bureau of Epidemiology to report any suspect or confirmed case(s) of human rabies. If after-hours, this may be done by calling 1-888-EPI-UTAH (374-8824).
- Assist UDOH with obtaining clinical specimens needed for laboratory confirmation, if necessary.
- Identify potentially exposed persons.
  - Institute isolation and quarantine requirements as they apply to a particular case.

- Provide education and guidance as requested from the public and/or providers. Educational components are listed below. For further questions, guidance can be provided by UDOH and/or CDC.

## **Prevention**

Prevention of human rabies relies upon controlling rabies in the animal population. Therefore, animal quarantine regulations and animal vaccination regulations must be enforced.

### **Personal Preventive Measures/Education**

Provide the public with the following guidance to help prevent rabies and/or potential exposures:

- Vaccinate pets; cat, dog, and ferret vaccinations are required by law. Although not required by law, livestock vaccinations are encouraged.
- Do not feed or handle wild or stray animals. Avoid sick animals or animals that are acting strangely.
- Do not touch or handle dead animals.
- If there are questions regarding capture of an animal or handling of a carcass, contact the local animal control officer.
- Cover your garbage cans and keep pet food indoors so wild animals are not attracted to it.
- Do not keep wild animals as pets. This is illegal as well as dangerous.
- Never handle bats. A bat bite or scratch may be so small that it goes unnoticed. Persons who awaken to find a bat in their room and others who are unable to provide clear details of whether an exposure occurred, such as young children or people with disabilities, who are found alone with a bat in a room, may require PEP. Consult with public health and/or a health care provider for recommendations.

When a person calls about a secondhand or indirect exposure (usually contact with a pet that was previously bitten by a wild or potentially rabid animal), make sure that the person does not touch the pet's bite wound. Suggest gloves, soap, and water to clean the wound to avoid human exposure to the attacking animal's saliva.

## **Chemoprophylaxis**

### **Post-exposure prophylaxis (PEP)**

Specific immunological protection in humans is provided by administration of human rabies immune globulin (HRIG) at the site of the bite as soon as possible after exposure to neutralize the virus, then giving vaccine at a different site to elicit active immunity. As much of the HRIG should be infiltrated into and around the bite wound as possible, and the rest, if any, should be given IM. HRIG can be given up to 8 days after vaccine (8 days based on first vaccine given on day 0). Vaccine should be given as soon as possible after exposure and once it is initiated, the last dose should be given within 28 days. Vaccine should be given IM on days 0, 3, 7, and 14. If person is immunosuppressed, recommendation is 5 doses of vaccine on days 0, 3, 7, 14, and 21.

## Vaccine (human)

Two types of rabies vaccines are available for use in the U.S. They include human diploid cell vaccine (HDCV, Imovax® Rabies, sanofi Pasteur), and purified chick embryo cell vaccine (PCECV, RabAvert®, Novartis Vaccines and Diagnostics). Ideally, an immunization series should be initiated and completed with one vaccine product. No clinical studies have been conducted that document a change in efficacy or the frequency of adverse reactions when the series is completed with a second vaccine product. Pre- or post-exposure prophylaxis should not be withheld or delayed due to unavailability of the same vaccine product, if a second vaccine product is available.

Pre-exposure vaccination should be offered to persons in high-risk groups, such as veterinarians, animal handlers, and certain laboratory workers. Pre-exposure vaccination also should be considered for other persons whose activities bring them into frequent contact with rabies virus or potentially rabid bats, raccoons, skunks, cats, dogs, or other species at risk for having rabies. In addition, international travelers might be candidates for pre-exposure vaccination if they are likely to come in contact with animals in areas where dog rabies is enzootic, and immediate access to appropriate medical care, including biologics, might be limited.

Pre-exposure prophylaxis is administered for several reasons. First, while pre-exposure vaccination does not eliminate the need for additional therapy after a rabies exposure, it simplifies therapy by eliminating the need for HRIG and decreasing the number of doses of vaccine needed -- a point of particular importance for persons at high risk for being exposed to rabies in areas where immunizing products might not be available, or where they might be at high risk for adverse reactions. Second, pre-exposure prophylaxis might protect persons whose post-exposure therapy is delayed. Finally, it might provide protection to persons at risk for unapparent exposures to rabies.

Pre-exposure prophylaxis should be given in three 1.0-mL injections of HDCV, or PCECV and should be administered IM in the deltoid region -- one injection per day on days 0, 7, and 21 or 28.

### Post-exposure prophylaxis and pre-exposure prophylaxis guide

Vaccination Status	Intervention	Regimen
Not previously vaccinated	Wound cleansing	All PEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a viricidal agent (e.g., povidine-iodine solution) should be used to irrigate the wounds.
	Human rabies immunoglobulin (HRIG)	Administer 20 IU/kg body weight. If anatomically feasible, as much of the dose as possible should be infiltrated around and into the wound(s), and any remaining volume should be administered intramuscular (IM) at a different site than the vaccine administration.
	Vaccine	Human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (PCECV) 1.0 mL, IM (deltoid area), 1 each on days 0, 3, 7, and 14.

<b>Previously vaccinated</b>	Wound cleansing	All PEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent (e.g., povidine-iodine solution) should be used to irrigate the wounds.
	HRIG	HRIG should not be administered
	Vaccine	HDCV or PCECV 1.0 mL, IM (deltoid area), 1 each on days 0 and 3.
<b>Pre-exposure prophylaxis</b>	Vaccine	HDCV or PCECV 1.0 ML, IM (deltoid area), 1 each on days 0, 7, and 21 or 28.

## **Isolation and Quarantine Requirements**

### **Isolation**

#### **Human**

Typically, persons with human rabies require hospitalization for severe illness. Always follow Standard body fluid precautions. As stated previously, person-to-person transmission of rabies has not been documented but may be possible.

#### **Animal**

Isolation may range from 10 days to four months depending on the vaccination status of the animal (see quarantine requirements).

### **Hospital**

Standard body substance precautions (gloves, gown, mask).

### **Quarantine**

#### **Animal**

Quarantines may range from 10 days to six months, depending on the vaccination status of the animal (see below). Euthanasia may sometimes be recommended.

#### **Dogs, Cats, and Ferrets**

Rabies virus may be excreted in the saliva of infected dogs, cats, and ferrets during illness and/or for only a few days prior to illness or death. A healthy dog, cat, or ferret that bites a person should be confined and observed daily for 10 days; administration of rabies vaccine to the animal is not recommended during the observation period to avoid confusing signs of rabies with possible side effects of vaccine administration. Such animals should be evaluated by a veterinarian at the first sign of illness during confinement.

Animals with up-to-date vaccinations that are exposed to a confirmed rabid animal should be given a booster and observed for 45 days. Any unvaccinated animal that is exposed to a confirmed rabid animal should be in strict quarantine, or euthanized. Dogs and cats must be placed in strict quarantine for four months and six months for ferrets. Any illness in the animal should be reported immediately to the local health department. If signs suggestive of rabies develop, the animal should be euthanized, and the head shipped for testing. Any stray or

unwanted dog, cat, or ferret that bites a person may be euthanized immediately and the head submitted for rabies examination.

For more detailed information on isolation and quarantine, please see the NASPHV Compendium of Animal Rabies Prevention and Control, 2016.

**Other Biting Animals**

Other biting animals which might have exposed a person to rabies should be reported immediately to the local health department. Management of animals other than dogs, cats, and ferrets depends on the species, the circumstances of the bite, epidemiology of rabies in the area, biting animal’s history, current health status, and potential for exposure to rabies. Prior vaccination of these animals may not preclude the necessity for euthanasia and testing.

✓ **CASE INVESTIGATION**

**Reporting**

- Report all suspect and confirmed cases of rabies.
- Animal bites are not reportable to the UDOH. However, an epidemiologist is available 24/7 (1-888-EPI-UTAH) for consultation on animal bite management regarding potential rabies exposures.

**Table of criteria to determine whether a case of animal rabies should be reported to public health authorities**

Criterion	Case Definition
	Confirmed
<b>Laboratory Findings</b>	
A positive direct fluorescent antibody test performed ideally on central nervous system tissue	S
Isolation of rabies virus (in cell culture or in a laboratory animal)	S
A reverse transcriptase PCR product from appropriate brain tissue confirmed as rabies by sequencing	C

Notes:

S = this criterion alone is sufficient to report a case.

C = this finding corroborates (e.g., supports) the diagnosis of, or is associated with rabies, but is not included in the case definition. Findings should be reported and notifiable.

**Table of criteria to determine whether a suspect case of human rabies should be reported to public health authorities**

Criterion	Rabies	
<b>Clinical Evidence</b>		
Encephalitis	O	O
Myelitis	O	O
Dysphagia	O	O

Hydrophobia		O	O
Anxiety		O	O
Agitation		O	O
Paresthesias or pain at the wound site		O	O
Ascending flaccid paralysis		O	O
Healthcare record contains a diagnosis of rabies	S		
Death certificate list rabies as a cause of death or a significant contributing condition	S		
<b>Laboratory Evidence</b>			
Detection of Lyssavirus antigens in a clinical specimen (preferably the brain or the nerves surrounding hair follicles in the nape of the neck) by direct fluorescent antibody test		O	
Isolation (in cell culture or in a laboratory animal) of a Lyssavirus from saliva or central nervous system tissue		O	
Identification of Lyssavirus specific antibody (e.g., by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the CSF		O	
Identification of Lyssavirus specific antibody (e.g., by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the serum of an unvaccinated person			N
Detection of Lyssavirus RNA (using reverse transcriptase–polymerase chain reaction [RT-PCR]) in saliva, CSF, or tissue		O	

S = this criterion alone is Sufficient to classify a case.

O = At least one of these “O” (Optional) criteria in each category (e.g., clinical evidence and laboratory evidence) in the same column—is required to classify a case.

N = This criterion in conjunction with all other “N” and any “O” criteria in the same column is required to classify a case.

## Case Definition

### Rabies (2011)

#### Clinical Description

Rabies is an acute encephalomyelitis that almost always progresses to coma or death within 10 days after the first symptom.

#### Laboratory Criteria for Diagnosis

##### Animal

- Positive direct fluorescent antibody test (preferably performed on central nervous system tissue)
- Isolation of rabies virus (in cell culture or in a laboratory animal)

**Human**

- Detection of Lyssavirus antigens in a clinical specimen (preferably the brain or the nerves surrounding hair follicles in the nape of the neck) by direct fluorescent antibody test, or
- Isolation (in cell culture or in a laboratory animal) of a Lyssavirus from saliva or central nervous system tissue, or
- Identification of Lyssavirus specific antibody (e.g., by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the CSF, or
- Identification of Lyssavirus specific antibody (e.g., by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the serum of an unvaccinated person, or
- Detection of Lyssavirus viral RNA (using reverse transcriptase-polymerase chain reaction [RT-PCR]) in saliva, CSF, or tissue.

**Comment:** Laboratory confirmation by all of the above methods is strongly recommended.

**Case Classification**

**Animal**

*Confirmed:* a case that is laboratory confirmed.

**Human**

*Confirmed:* a clinically compatible case that is laboratory confirmed by testing at a state or federal public health laboratory.

**Classification Table for a case of animal rabies**

Criterion	Confirmed
<b>Laboratory Findings</b>	
A positive direct fluorescent antibody test performed ideally on central nervous system tissue	S
Isolation of rabies virus (in cell culture or in a laboratory animal)	S

Notes:

S = This criterion alone is sufficient to report a case.

**Classification Table for a case of human rabies**

Criterion	Confirmed
<b>Clinical Evidence</b>	
Encephalitis	O
Myelitis	O
Dysphagia	O
Hydrophobia	O
Anxiety	O
Agitation	O
Paresthesias or pain at the wound site	O

Ascending flaccid paralysis	○
Healthcare record contains a diagnosis of rabies	○
Death certificate list rabies as a cause of death or a significant contributing condition	○
<b>Laboratory Evidence</b>	
Detection of Lyssavirus antigens in a clinical specimen (preferably the brain or the nerves surrounding hair follicles in the nape of the neck) by direct fluorescent antibody test	○
Isolation (in cell culture or in a laboratory animal) of a Lyssavirus from saliva or central nervous system tissue	○
Identification of Lyssavirus specific antibody (e.g., by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the CSF	○
Identification of Lyssavirus specific antibody (e.g., by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the serum of an unvaccinated person	○
Detection of Lyssavirus RNA (using reverse transcriptase–polymerase chain reaction [RT-PCR]) in saliva, CSF, or tissue	○

### Case Investigation Process

- UPHL will notify UDOH immediately of all positive results.
  - If human rabies is suspected, contact UDOH for specimen collection and coordination between UDOH and UPHL for shipment to CDC.
  - Only positive animals are necessary in EpiTrax.
- UDOH will notify LHD.
- Identify victim; note date, time, and location of incident.
- Ascertain immunization status of person and/or animal.
- Note the location of the wound.
- Reinforce proper wound care. If feasible to recommend, ask person to wash with soap and water for 10 minutes.
- LHD will contact Animal Control, bite victim, etc. to determine if anyone is in need of PEP.
  - If there is a need for PEP, LHD may call UDOH to assist in coordinating with hospital.

*The UPHL is the only facility in Utah that tests for rabies. Human rabies tests are only performed by the CDC.*

Please refer to following chart for post-exposure prophylaxis guidelines:

## GUIDE TO RABIES POST-EXPOSURE EVALUATION AND MANAGEMENT

Animal Type	Evaluation and Disposition of Animal	Post-exposure Prophylaxis (PEP) Recommendation
Dogs, cats, ferrets, cattle, horses and sheep	Healthy and available for 10-day observation, <b>quarantine</b> regardless of vaccination status <sup>1</sup>	Should not begin PEP unless animal develops rabies
	Rabid	Immediate PEP
	Suspected Rabid Available for testing	Await testing results; begin PEP immediately if the animal is positive for rabies.
	Unavailable for testing	Immediate PEP
Skunks, raccoons, bats, <sup>2</sup> foxes, and most other carnivores, including dog/wolf hybrids <sup>3</sup> ; woodchucks and livestock for which there is NO USDA-approved rabies vaccine	Unknown (escaped)	Immediate PEP
	Regard as rabid until animal proven negative by laboratory tests. <sup>4</sup> (Animal available for testing.)	Await testing results; begin PEP immediately if the animal is positive for rabies.
Rodents (except woodchucks), and lagomorphs (rabbits and hares) and other small mammals except bats	Animal unavailable for testing	Immediate PEP
	Consider individually <sup>5</sup>	Bites of squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice, other small rodents, rabbits, and hares almost never require PEP. However, testing and/or PEP is indicated in some circumstances.

### Footnotes

1. If a dog, cat, ferret, cattle, horse or sheep being held for the 10-day quarantine develops signs of rabies or signs of any illness, the animal should be euthanized or quarantined and tested immediately. If the results are positive, the exposed person should begin PEP immediately.
2. It may be difficult to recognize that an exposure to a bat has occurred since the size of bites or scratches by bats may be very small. Therefore, bat bites may go unnoticed or be mistaken for an insect bite or sting. Post-exposure treatment should be given in any situation where a bat is physically present and a bite, or any other exposure/contact, cannot be ruled out. When children are involved, and/or there are no witnesses to rule out a potential exposure, this is particularly important.
3. Dog/wolf hybrids, regardless of vaccination history, should be considered as wild, unvaccinated animals.
4. The animal should be humanely killed and tested as soon as possible. Holding for observation is not recommended. Do not give post-exposure prophylaxis if immunofluorescence test results of the animal are negative.
5. Rodents (except woodchucks), lagomorphs (rabbits, hare), and other small mammals except bats:
  - o Small mammals caged outdoors: Outdoor cages may allow exposure to rabid animals, and several rabies cases have been reported from animals caged in this manner. If the animal is not available for testing, post-exposure prophylaxis is recommended.
  - o Small mammals caged indoors: Healthy hamsters, gerbils, rats, mice, and rabbits, etc., which have been caged exclusively indoors for the past 6 months and which have no history of receiving a modified live rabies vaccine, pose no risk. Treatment would not be recommended for the exposed person.
  - o Wild rodents, lagomorphs and other small mammals except bats: These animals are unlikely to have rabies. Each exposure needs to be evaluated as outlined below.
    - Provoked bite: If the bite was provoked (such as through feeding, petting, or playing with the animal) and the animal appeared healthy, it is unlikely that the

animal was rabid at the time of the bite and most experts would not recommend post-exposure prophylaxis.

- Unprovoked bite or unhealthy animal: If the bite was unprovoked or the animal appeared unhealthy, it should be submitted to the Utah Public Health Laboratory for testing. If the animal is unavailable for testing, PEP should be considered.

**NOTE:** Birds, reptiles, amphibians, and fish do not get rabies. (Adapted from: CDC, MMWR. January 8, 1999 / Vol. 48 / No. RR-1. and Massachusetts Department of Public Health).

## **Outbreaks**

More than one related case of rabies in a human or domestic animal such as dogs, cats, or ferrets in a year will constitute an outbreak.

## **Identifying Case Contacts**

Rabies exposures are often identified on a case-by-case basis. If you are unsure whether an exposure occurred, contact UDOH for consultation.

## **Case Contact Management**

Rabies is transmissible from person to person through secretions. All individuals who come into contact with secretions during the infectious period are considered contacts. These contacts should receive vaccine and PEP as appropriate.

## ✓ REFERENCES

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## ✓ VERSION CONTROL

Updated August 2015: Inserted Reporting and Case Classification Tables. Inserted minimum data sets.

Updated October 2015: Inserted instructions and reference in regard to disposal of a human body confirmed with rabies.

Updated November 2015: Incorporated comments regarding HRIG and immunosuppressed individuals receiving PEP.

Updated July 2017: Updated the Compendium of Animal Rabies Prevention and Control, 2016 and updated the quarantine criteria. Added post-exposure prophylaxis chart.

Updated January 2018: Updated UT-NEDSS Naming Conventions for Animals

Updated July 2018: Updated HRIG links regarding potency and dose information for new products.

Updated December 2019: Updated Critical Clinical Information and Laboratory Test Rules

## ✓ Rabies, Human Rules for Entering Laboratory Test Results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

### Test-Specific Rules

*Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.*

Test Type	Test Result	Create a New Event	Update an Existing Event
IgM antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
	Other	Yes	Yes
IgG Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
	Other	Yes	Yes
PCR amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
	Other	Yes	Yes
Total Antibody (by EIA, IFA, TRF, etc)	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
	Other	Yes	Yes

### Whitelist Rules

*Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.*

**Rabies, human Morbidity Whitelist Rule:** Never a new case.

**Rabies, human Contact Whitelist Rule:** Never added to contact.

### Graylist Rule

*We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.*

**Rabies, human Graylist Rule:** If the specimen collection date of the laboratory result is 30 days before to 7 days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

**Other Electronic Laboratory Processing Rules**

- If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.

## ✓ UT-NEDSS Minimum/Required Fields by Tab

### Demographic

- County
- State
- Street Name
- Street Number
- City
- Date of Birth
- Birth Gender
- Ethnicity
- Race
- Last Name
- First Name

### Clinical

- Date Diagnosed
- Died
- Date of Death
- Disease
- Onset Date
- Hospitalized
- Anxiety?
- Dysphagia?
- Hydrophobia?
- Localized pain/paraesthesia?
- Agitation/combativeness?
- Was patient in a coma?
- Coma, date of onset?
- Encephalitis?
- Myocarditis?
- Pain at wound site?
- Paralysis, flaccid, ascending?
- Paralysis, Asymmetric?
- What was the admitting diagnosis?
- Death certificate lists rabies as a cause or contribution to death?

- Healthcare record contains a diagnosis of rabies

### Laboratory

- Organism
- Specimen Source
- Test Result
- Test Type
- Collection Date

### Epidemiological

- Occupation
- Imported From

### Investigation

- Has the patient traveled to any foreign country in the past 6 months?
- List countries and length of time visited
- Has there been any suspicious animal exposure?
- List dates of exposure
- What species was involved?
- Type of exposure

### Contacts

- Name
- DOB

### Reporting

- Date First Reported to Public Health

### Administrative

- Outbreak Name
- Outbreak Associated
- State Case Status

## ✓ UT-NEDSS Naming Convention for Animals

Only positive animal rabies test results are needed in EpiTrax. Negative results and bite reports are not required, but can also be placed in EpiTrax. Please use the following naming convention when placing animals into EpiTrax.

### Naming Convention

Last Name: animal & species

First Name: county location abbreviation & report date (mmddyyyy) – last four of case morbidity report number

County location abbreviations:

Bear River Health Department: BR  
Southeast Utah Health Department: SE  
San Juan County Health Department: SJ  
Davis County Health Department: DA  
Central Utah Public Health Department: CU  
Tri-County Health Department: TR  
Weber Morgan Health Department: WM  
Salt Lake County Health Department: SL  
Tooele County Health Department: TO  
Utah County Health Department: UT  
Wasatch County Health Department: WA  
Southwest Utah Public Health Department: SW  
Summit County Health Department: SU

Example:

Last Name: Dog Pit Bull

First Name SL06152016 – 1234

Example:

Last Name: Bat Silver-hair

First Name: DA02202016 – 1432

Example:

Last Name: Cat Unknown

First Name: BR07152016 – 4321