

Animal Bite/Potential Rabies Exposure

Surveillance and Investigation Protocol

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I. ABOUT THE DISEASE

Rabies is a preventable viral disease most often transmitted through saliva from the bite of a rabid mammal.¹ Raccoon strain rabies is endemic in West Virginia, making animal bite reporting the first step in preventing human disease.²

A. Clinical Presentation

Clinical signs of rabies start out like the flu including general weakness or discomfort, fever, or headache. There may be discomfort around the bite area as well as cerebral dysfunction, anxiety, confusion, and agitation. As the disease progresses, the person may experience delirium, abnormal behavior, hallucinations, hydrophobia, and insomnia. The acute period lasts two to 10 days and once clinical signs appear the disease is almost always fatal.

B. Etiologic Agent

The rabies virus belongs to the order Mononegavirales, viruses with nonsegmented, negative stranded ribonucleic acid (RNA) genomes. Within this group, viruses with a distinct "bullet" shape are classified in the *Rhabdoviridae* family, which includes at least three genera of animal viruses, *Lyssavirus*, *Ephemerovirus*, and *Vesiculovirus*. The genus *Lyssavirus* includes the rabies virus.^{12,13}

C. Reservoir

Although all species of mammals are susceptible to rabies virus infection, only a few species are important as reservoirs for the disease.¹³ In the United States, several distinct rabies virus variants have been identified in terrestrial mammals, including raccoons, skunks, foxes, and coyotes. In addition to these terrestrial reservoirs, several species of insectivorous bats are also reservoirs for rabies. Raccoons serve as the primary reservoir of rabies in West Virginia.^{2,16}

D. Incubation Period

The incubation period for rabies usually ranges from one to three months after exposure but can range from a few days to several years. The type and intensity of exposure and location of the wound partly influences the incubation period.¹³

E. Mode of Transmission

Transmission of rabies virus usually begins when infected saliva of a host is passed to an uninfected animal. Various routes of transmission have been documented and include contamination of mucous membranes (i.e., eyes, nose, and mouth), aerosol

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transmission, and corneal or other tissue transplantations. The most common mode of rabies virus transmission is through virus-containing saliva contaminating the bite from an infected host.¹³

F. Period of Communicability

Rabies virus may be excreted in the saliva of infected dogs, cats, and ferrets during illness and/or three to seven days prior to illness or death; these are the only domestic animals with defined, reliable periods of communicability.¹³ The incubation period and number of days the rabies virus is shed in the saliva, prior to onset of clinical signs, are unknown for wild and exotic animals. Infected animals can transmit the rabies virus for an indeterminate number of days before clinical signs become apparent, as well as while clinically symptomatic.^{1, 12,13} **Therefore, it is never appropriate to confine and observe wild or exotic animals that are involved in a human bite incident.**

II. DISEASE CONTROL AND PREVENTION

A. Disease Control Objectives

Prevent human rabies through rapid identification of potentially exposed persons to the rabies virus so appropriate treatment or post-exposure prophylaxis (PEP) can be quickly administered.

B. Disease Prevention Objectives

To prevent rabies transmission through:

1. Education of the public about animal exposure prevention and vaccination of dogs, cats, and ferrets.
2. Education of the public on animal bite reporting and seeking medical attention.
3. Education of healthcare providers and other public health partners on appropriate management of animal bite cases.

C. Disease Prevention and Control Intervention

1. Administration of rabies PEP is a medical urgency and decisions must not be delayed.
2. Educate the public about pre-exposure vaccination if traveling to a country with endemic animal rabies.
3. Educate the public on vaccinating pets and keeping vaccinations up to date.
4. Educate the public on avoiding stray or wild animals. Wild/domestic crossbreeds (e.g., dog/wolf) should not be kept as pets.

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5. Educate the public that if bitten, scratched, or unsure, talk to a healthcare provider about the need for postexposure prophylaxis. Prompt wound care and administration of rabies immune globulin (RIG) and vaccine are highly effective in preventing human rabies following exposure.
6. Laboratory scientists, people who frequently handle bats, and veterinarians and veterinary support staff, who are frequently at risk for rabies exposures, should obtain pre-exposure rabies vaccinations.²² The Advisory Committee on Immunization Practices (ACIP) recommends titers on a schedule of every six months (laboratory scientists handling live rabies virus) or two years (people who handle bats) to assess protective immunity, with a single-injection booster vaccination recommended if the titer level is below 0.5 IU/mL). Veterinarians and veterinary staff should either 1) receive a single booster vaccination one to three years after the initial primary series if the titer level is below 0.5 IU/mL or 2) receive a single booster vaccination no sooner than day 21 or not later than year 3 after the initial primary series.
7. Educate clinical personnel to use standard precautions when providing care to people suspected of having clinical rabies, including wearing gowns, goggles, masks, and gloves, particularly during procedures that might result in splashes or sprays from body fluids.
8. For animal bites, wound care and cleaning is important to prevent infection and, depending on the status and species of the animal in conjunction with the type of exposure, postexposure prophylaxis (PEP) may be warranted.^{1, 3, 4, 13}

For guidance on PEP:

1. [Rabies Risk Exposure for Human Exposure to Animals Algorithm for PEP.](#)
2. [Summary of rabies postexposure prophylaxis \(PEP\) recommendations](#)¹. For unvaccinated people, the combination of RIG and vaccine is recommended for both bite and non-bite exposures, regardless of the time interval between exposure and initiation of PEP. If PEP has been initiated and appropriate laboratory diagnostic testing (direct fluorescent antibody test) indicates the animal that caused the exposure was not rabid, PEP may be discontinued.

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Postexposure Prophylaxis for Non-immunized Individuals

Treatment	Regimen
Wound cleansing	All postexposure prophylaxis should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as povidine-iodine solution should be used to irrigate the wounds.
RIG	If possible, the full dose should be infiltrated around any wound(s) and any remaining volume should be administered IM at an anatomical site distant from vaccine administration. Also, RIG should not be administered in the same syringe as vaccine. Because RIG might partially suppress active production of antibody, no more than the recommended dose should be given.
Vaccine	HDCV or PCECV 1.0 mL, IM (deltoid area), one each on days 0 , 3, 7, and 14.

** A 5th dose on day 28 may be recommended for immunocompromised persons.*

Postexposure Prophylaxis for Previously Immunized Individuals

Treatment	Regimen
Wound cleansing	All postexposure prophylaxis should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as povidine-iodine solution should be used to irrigate the wounds.
RIG	RIG should not be administered.
Vaccine	HDCV or PCECV 1.0 mL, IM (deltoid area), one each on days 0 and 3.

If exposed to rabies, previously vaccinated persons should receive two IM doses (1.0 mL each) of vaccine, one immediately and one three days later. Previously vaccinated persons are those who have received one of the recommended preexposure or postexposure regimens of HDCV, RVA, or PCECV, or those who received another vaccine and had a documented rabies antibody titer. RIG is unnecessary and should not be administered to these persons because an anamnestic response will follow the administration of a booster regardless of the pre-booster antibody titer.

3. Every attempt should be made to adhere to the [ACIP 4-dose vaccination schedule for rabies PEP](#).¹⁷
 - Dose 1= day 0
 - Dose 2= three days later
 - Dose 3= four days later
 - Dose 4= seven days later
 - a) If a dose is missed by a few days, give the next dose as soon as possible and give the subsequent doses in the appropriate number of days later as

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typically indicated.¹ Once vaccination is initiated, delays of a few days for individual disease are unimportant but the effect of longer lapses of weeks or more is unknown. For example, if a patient misses the dose scheduled for day 7 and presents for vaccination on day 10, the day 7 dose should be administered that day and the schedule resumed, maintaining the same interval between doses. In this scenario, the remaining last dose should be administered on day 17.

- b) When substantial deviations from the schedule occur, immune status should be assessed by performing serologic testing seven to 14 days after administration of the final dose in the series.¹
 - c) If rabies immunoglobulin (HRIG) is not available on the first visit, it can be given up to, and including, day seven from the first vaccine dose. Once seven days have passed the patient's antibody response to the vaccine occurs and can be altered if HRIG is given.¹
 - d) No routine testing of healthy patients completing PEP is necessary to document seroconversion.
 - e) For more information on delays/interruptions: [Human Rabies Prevention ACIP 2008](#).¹
- 4. [Rabies vaccine availability for uninsured/underinsured \(indigent\) populations](#).
 - 5. Pregnancy is not considered a contraindication to PEP. Certain studies have indicated no increase in abortion, premature births, or fetal abnormalities associated with rabies vaccination. If the risk of rabies exposure is substantial, PEP might be indicated during pregnancy. Rabies exposure or diagnosis of rabies in the mother should not be regarded as reasons to terminate the pregnancy.¹
 - 6. For patients taking corticosteroids, other immunosuppressive agents, antimalarials, and those who are immunosuppressed, rabies PEP should be administered using a five-dose vaccine regimen (i.e., one dose of vaccine on days 0, 3, 7, 14 and 28)¹⁷, with the understanding that immune response might be inadequate. Immunosuppressive agents should not be administered during rabies PEP unless essential for the treatment of other conditions. If possible, immunosuppressed patients should postpone rabies preexposure prophylaxis until the immunocompromising condition is resolved. When postponement is not possible, immunosuppressed persons who are at risk for rabies should have their virus neutralizing antibody responses checked after completing the preexposure series. Postvaccination rabies virus-neutralizing antibody values might be less than adequate among immunosuppressed persons with HIV or other infections. When rabies pre- or post-exposure prophylaxis is administered to an

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immunosuppressed person, one or more serum samples should be tested for rabies virus-neutralizing antibody by the Rapid Fluorescent Foci Inhibition Test (RFFIT) to ensure that an acceptable antibody response has developed after completing the series. If no acceptable antibody response is detected after the final dose in the pre- or postexposure prophylaxis series, the patient should be managed in consultation with their physician and appropriate public health officials.

See the [Rabies Surveillance, Management and Control Manual \(DC-4\)](#)⁷ for more information on management of suspect rabid animals following human and animal exposures.

D. Treatment

No proven medical treatment exists for symptomatic human rabies and the disease almost invariably results in death.

III. DISEASE INVESTIGATION

A. Case Definition and Case Classification

Human Exposure

A bite or scratch from a vector species or the introduction of saliva or central nervous system (CNS) tissue from a vector species into an open, fresh wound or mucous membrane (i.e., eye, mouth, or nose) of a human being.

Vector Species

Species include bats or terrestrial mammals, especially carnivores. Wild species known to be reservoirs of rabies include, but are not limited to, raccoons, skunks, foxes, coyotes, bobcats, wolves, or any hybrids between these wild species and domestic dogs and cats. Domestic species include, but are not limited to, dogs, cats, and ferrets.

Case Classifications

Confirmed: Human exposure from a vector species as defined above.

Other Classification Criteria

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Touching or handling a potentially rabid animal or another animal or inanimate object that had contact with a rabid animal does not constitute an exposure unless wet saliva or CNS material from the rabid animal was introduced into a fresh, open wound or had contact with a mucous membrane of a human being.¹⁵

Bats have small teeth which may leave marks that are not easily seen; therefore, any contact with a bat in which a bite cannot be ruled out is considered a potential exposure to rabies. A person sleeping in a room with a bat or finding a bat in the room with an unattended child, person with mental disability, or intoxicated person, are examples of possible exposures.

Laboratory Diagnosis

The Office of Laboratory Services (OLS) is responsible for screening animal brain tissue for the presence of the rabies virus. This is the only facility in the state of West Virginia that can screen animal brain tissue for the presence of the rabies virus following human exposure. A direct fluorescent antibody (DFA) staining technique is used. The standard protocol for accepting suspect rabid animals includes animals involved with biting or scratching humans, animals involved with biting or scratching domestic animals or livestock, occasional environmental 'spot checks' of areas (i.e., surveillance), and unusual situations involving the suspect animals such as atypical behavior.

Information for submitting specimens (including rabies specimen submission form) can be found at the [OLS website](#).

B. Reporting Timeframe to Public Health

Animal bites and other potential rabies exposures are reportable to the local health department within 24 hours.

C. Outbreak Recognition

A single case of human rabies is considered an outbreak.

D. Healthcare Provider Responsibilities

1. Report any animal bite/exposure to the local health department of the patient's county of residence within **24 hours**.
2. Complete the [Animal Encounter Report Form](#) to provide the victim and submit it to the local health department.

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3. If necessary, consult with the public health officers regarding the need for post-exposure prophylaxis (PEP). For more information about rabies PEP, see [ACIP 4-dose vaccination schedule for rabies PEP](#).¹⁷

E. Laboratory Responsibilities

1. All requests for animal rabies testing should be arranged through the local health department and the West Virginia Department of Health (WVDH) Office of Laboratory Services at (304) 558-3530, ext. 20135. Requests for human rabies testing are arranged through the Office of Epidemiology and Prevention Services (OEPS) at (304) 558-5358.
2. Report rabies positive results electronically to the Office Epidemiology and Prevention Services.

F. Local Health Responsibilities

1. Be familiar with the [Animal Bite/Potential Surveillance and Investigation Protocol](#).
2. Educate partners about the 24-hour reporting requirements to local health department and the use of the [Animal Encounter Report Form](#). Partners include emergency room personnel, urgent care personnel, local physician offices, hospital infection control personnel, animal control officers and sheriff's department personnel.
3. Document information from the completed [Animal Encounter Report Form](#) into the West Virginia Electronic Disease Surveillance System (WVEDSS). Ensure data is complete and correct, see section IV for required surveillance indicators. Attach the completed form to the Supplemental Info tab in the WVEDSS investigation.
4. Determine the confinement status of the animal, per [DC-4](#).⁷ See [West Virginia Code](#). Confinement guidelines can be found in [DC-4](#).⁷
 - i. For vaccinated dogs, cats, and ferrets, confine and observe the animal for 10 days for signs of rabies infection.
 - ii. For unvaccinated dogs, cats, and ferrets, confine and observe the animal for 10 days for signs of rabies infection.
 - iii. For livestock, confine and observe the animal for 14 days for signs of rabies infection.
 - iv. There are no confinement guidelines and rabies observation period for wildlife.

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During the rabies observation period ask the animal owner to contact the local health department if there is a change in animal condition. Provide the [Notice of Animal Quarantine](#) letter to the animal owner. After the rabies observation period, the owner should be instructed to contact the local health department if the animal's condition changes. Following the observation period, the owner must notify the local health department of the animal's outcome, which should be documented in WVEDSS by the local health department. If the animal has been killed or has died, and the animal brain is in good condition and available for testing, the LHD should arrange rabies testing for the animal at the Office of Laboratory Services.

5. Contact the bite victim.
 - i. Verify patient information, exposure information, species information, and known outcomes of the bite victim.
 - ii. Ensure animal bite victim receives medical attention.
 - iii. Follow up with the victim after the confinement period or after laboratory results are known and document findings in WVEDSS, including rabies post-exposure prophylaxis, and management.
 1. Discuss exposure management with bite victim. See [Rabies Risk Assessment for Human Exposure to Animals](#). Provide recommendations for [Post Exposure Prophylaxis \(PEP\)](#). For assistance contact the OEPS epidemiologist on-call at (304) 558-5358. An epidemiologist is available 24/7/365.
 2. Lost to follow-up (LTF) is defined as a patient who cannot be located or contacted by disease investigators, a case investigation can be deemed "Lost to Follow Up" by LHD staff after:
 - a. Three unsuccessful contact attempts* were made to the patient. Patients lost to follow up must be documented in the 'Patient lost to follow up' field in WVEDSS Public Health Actions. Animals responsible for exposure must be documented in the 'Human exposure to an animal that was lost to follow up' field in the WVEDSS Public Health Actions. Date of contact attempts must be documented in the WVEDSS General Comments.
 - b. Documentation of LTF status must be completed within 30 days of the investigation start date.

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**Avenues of contact the LHD can consider are phone calls, text messages, emails, in person visits or speaking with a medical power of attorney. For best practice, contact attempts can be made on three different days and times.*

G. State Health Responsibilities

1. Review and close animal bite encounter reports
2. Analyze data completeness and quality.
3. Provide evidence-based training on animal bite and other rabies exposure management to local health departments and other community health partners. Develop evidence-based education related to animal bite and rabies exposure prevention for dissemination to the public.
4. Provide consultation to local health departments and community health partners on PEP recommendations and rabies exposure management.
5. In the event of a Herpes B Virus exposure, facilitate and arrange testing following the Herpes B guidance in the [DC-4](#).⁷

H. Occupational Health

1. Ensure all staff are trained in basic infection control principles and use universal precautions and PPE when handling animals.
2. Ensure all staff have up-to-date vaccinations for other communicable diseases.
3. Ensure staff handling animals have current rabies vaccination (i.e., rabies pre-exposure prophylaxis vaccination).

IV. DISEASE SURVEILLANCE

A. Public Health Significance

Young children are a demographic group highly susceptible to animal encounters. In the United States, children between the ages of 5-14 were disproportionately affected by animal bites, with the highest incidence occurring in the 5-9 age group.⁴⁻⁶ In West Virginia, the 5-9 age group experienced the second highest incidence rate of animal encounters, at 184 per 1000,000 population; however, individuals aged 30-34 had the highest incidence rate of animal encounters in West Virginia, at 194 per 100,000 population.⁸

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Dogs and cats are the animal species most involved in animal encounters in the United States.⁹ In West Virginia, dogs (63%) and cats (29%) are also most frequently involved in animal encounters.⁸

Among domestic animal species, cats are also the most common vector of rabies. In the United States, free-ranging and feral cats are the most common vector of rabies in domestic animals.^{11,14} Cats are also the most frequently documented rabid domestic animal species in West Virginia.²⁰ In West Virginia, cats account for 74% of rabies among domestic animal species.²⁰

Although dogs and cats are the animal species most involved with animal encounters, wildlife (i.e., bats, raccoons, skunks) were the most frequently found rabid animal species. Among the 3,760 animal rabies cases documented in the United States in 2023, bats (35%) and raccoons (29%) were the most frequently documented rabid animal species.¹⁴ In West Virginia, raccoons (60%) and skunks (18%) are the animal species most frequently documented with rabies infection.²⁰

Although dogs and cats are the species most involved in animal encounters in the United States and West Virginia, most human cases of rabies are caused by encounters with bats. From 1960 – 2018, 62 of the 89 U.S.-acquired human rabies cases were caused by bat strain rabies.¹⁹ From 2011-2021, a total of 23 human rabies cases died from rabies, with all but three of the domestic exposures being due to bat-strain rabies.¹⁰ Of 23 individuals dying of rabies in the United States between 2011 and 2021, twelve (52.2%) had bat strain rabies, seven (30.4%) had dog strain rabies, three (13.0%) had eastern raccoon strain rabies, and one (4.3%) had mongoose strain rabies. All individuals with dog strain and mongoose strain rabies were exposed overseas.¹⁰ In West Virginia, the last case of human rabies was in 1994 following bat exposure.²¹

B. Disease Surveillance Objectives

1. Determine risk characteristics of patients potentially exposed to animals with rabies.
2. Determine the outcome (i.e., euthanized, ten day quarantine, LTFU) of the biting animal.
3. Determine outcome of patients potentially exposed to rabies.
4. Monitor geographic distribution of rabies infection in animal populations in West Virginia.

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C. Surveillance Indicators

1. Proportion of animal bites reported by the LHD to the state health department in a timely manner.
2. Proportion of cases with complete demographic, exposure information, reported species, and known outcomes for patients and animals.
3. Proportion of patients completing the recommended PEP administration.

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