March 2022

Animal Bite/Potential Rabies Exposure

Surveillance and Investigation Protocol

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

Healthcare Provider Responsibilities

1. Report any animal bite/exposure to the local health department of the victim's residence within **24 hours.**
2. Provide victim and exposing animal information using the Animal Encounter Report Form. This form can be found here.
3. If necessary, consult with the local or state public health officers regarding the need for post exposure prophylaxis (PEP). Additional guidance is available in the Morbidity and Mortality Weekly Report (MMWR) (Volume 59, No. RR-2) linked here.

Laboratory Responsibilities

1. All requests for animal rabies testing should be arranged through the local health department and the West Virginia Department of Health and Human Resources' (DHHR) Office of Laboratory Services at (304) 558-3530, ext. 20135. Requests for human rabies testing are arranged through DHHR's Division of Infectious Disease Epidemiology (DIDE) at (304) 558-5358, ext. 1.

Local Health Responsibilities

1. Identify the offending animal for confinement (as appropriate) or testing ASAP, following guidelines in the DC-4 available here.
2. Provide up-to-date information concerning PEP to animal bite victims and physicians. Guidance available here.
3. Enter case information in WVEDSS. The following information should be included, at minimum (items in bold required for case ascertainment):
    a) Patient identifying and demographic information
    b) County of patient
        1) If resident of another county -- enter into WVEDSS and the case will be assigned to the county of the patient.
        2) If resident of another state -- do not enter in WVEDSS; contact resident state of victim to report the case or contact DIDE for interstate notification.
    c) Exposure date
    d) Exposure type

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e) Species
f) Outcome (animal): Confined, tested (including results), lost, etc.
g) Outcome (human): Post-exposure prophylaxis received (if any)

Disease Control Objectives

Prevent rabies through rapid identification of cases potentially exposed to the rabies virus so appropriate treatment or post exposure prophylaxis can be quickly administered.

Disease Prevention Objectives

To prevent rabies transmission through:

1. Education of the public about animal bite prevention, vaccination of dogs, cats, and ferrets.
2. Education of the public on animal bite reporting and seeking medical attention.
3. Education of physicians on appropriate management of animal bite cases.

Disease Surveillance Objectives

1. Characterize demographic and risk characteristics of exposed victims
2. Characterize risk characteristics of biting animals
3. Assess appropriateness of PEP administration and quality of management of animal bites

Public Health Significance

One of every two Americans will be bitten by an animal at some point.[3] Mammalian bites account for approximately 1% of all visits to emergency rooms, resulting in about 2 million bite wounds costing $30 million dollars yearly.[4] Annual mortality rate from dog bites is reported as 6.1 per 100 million population, based on a yearly average of 19 reported deaths from dog bites per year in the United States.[5, 6] Children are largely the victims of animal bites, particularly in cases involving serious injury.[7,8]

Although 90% of animal bites are perpetrated by dogs and cats, most human rabies cases are caused by bat exposures.[9] From 2009 – 2019, a total of 25 human cases were reported (with a 92.0% case-fatality rate), with all but three of the domestic exposures being due to bat-strain rabies.[10] The first case of raccoon-strain rabies in a human occurred in Virginia in 2003. Animal bite surveillance provides the first step in identifying the need for PEP in order to prevent rabies in humans.[18]

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The incidence of animal bites is considerably higher among children, particularly those five to nine years of age.[4-6] Incidence decreases as age increases. Injuries inflicted by dogs are most common (80%-90%), with cats being the next most common species involved.[3, 4] Doberman pinschers, German shepherds, and pit bull terriers are the most common purebred canines implicated in fatal attacks.[6, 11]

Clinical Description

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 2 to 10 days and once clinical signs appear the disease is almost always fatal.

Etiologic Agent

Rabies virus belongs to the order Mononegavirales, viruses with nonsegmented, negative-stranded 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] Several other pathogenic organisms may also be present in the saliva of an exposing animal, including but not limited to *Pasteurella multocida, Eikenella corrodens, Capnocytophaga spp, Neisseria weaveri, Weeksella zoohelcum, Neisseria canis,* and *Staphylococcus intermedius.*[14,15]

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]

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

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Incubation Period

The incubation period for rabies usually ranges from 1 to 3 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]

Period of Communicability

Rabies virus may be excreted in the saliva of infected dogs, cats, and ferrets during illness and/or 3 - 7 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 while clinically sick and for an indeterminate number of days before clinical signs become apparent.[1, 12,13] **Therefore, it is never appropriate to confine and observe wild or exotic animals that are involved in a human bite incident.**

Outbreak Recognition

Outbreaks of animal rabies may be recognized as an increase in the number of cases over or above baseline incidence.

Case Definition

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 (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 Classification

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

Comment

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 check' of areas (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: https://dhhr.wv.gov/ols/labs/Pages/Rabies.aspx.

Preventive Interventions

1. Educate the public about pre-exposure vaccination if traveling to country with endemic animal rabies.
2. Educate the public on vaccinating pets and keeping vaccinations up-to-date.
3. Educate the public on avoiding stray or wild animals. Wild/domestic crossbreeds (ex. dog/wolf) should not be kept as pets.
4. Educate the public that if bitten or 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.

5. Veterinarians and veterinary support staff at frequent-risk groups for rabies exposure should be administered pre-exposure rabies vaccinations, followed by periodic titer checks and rabies vaccine boosters. The ACIP recommends titers on a schedule of every two years to assess protective immunity, with a single-injection booster vaccination recommended if the titer level is below 1:5 serum dilution (0.1-0.2 IU/mL).
6. Use standard precautions when providing care to persons 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.

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, available here.
2. ACIP recommendations on PEP, available here.[17]
3. Summary of rabies postexposure prophylaxis (PEP) recommendations from CDC here[1] and below.

For unvaccinated persons, the combination of RIG and vaccine is recommended for both bite and nonbite 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.

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.

4. Every attempt should be made to adhere to the recommended vaccination guidelines. 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 # of days later as typically give.[1]

    Dose 1= day 0
    Dose 2= 3 days later
    Dose 3= 4 days later
    Dose 4= 7 days later

    When substantial deviations from the schedule occur, immune status should be assessed by performing serologic testing 7-14 days after administration of the final dose in the series.[1]

    If rabies immunoglobulin (HRIG) is not available on the first visit, it can be given up to, and including, day 7 from the first vaccine dose. Once 7 days have passed the patient's antibody response to the vaccine occurs and can be altered if HRIG is given.[1]

    No routine testing of healthy patients completing PEP is necessary to document seroconversion.

    For more information on delays/interruptions in PEP schedule see here.

5. Information from CDC on rabies vaccine for uninsured/underinsured (indigent) population is available here.
6. 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]
7. For patients taking corticosteroids, other immunosuppressive agents, antimalarials, and those who are immunosuppressed, rabies PEP should be administered using a 5-dose vaccine regimen (i.e., 1 dose of vaccine on days 0, 3, 7, 14 and 28), 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 immunosuppressed person, one or more serum samples should be tested for rabies virus-neutralizing antibody by the 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 post-exposure prophylaxis series, the patient should be managed in consultation with their physician and appropriate public health officials.

Additional information about rabies surveillance management of suspect rabid animals following human and animal exposures: https://oeps.wv.gov/rabies/documents/lhd/RABIES_GUIDE.pdf.

Treatment

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

Surveillance Indicators

1. Completeness of the key variables in WVEDSS:
    a) Demographic information

i. County of residence
ii. Age
iii. Sex
iv. Race
v. Ethnicity

b) Exposure information
i. Date of exposure
ii. Type of exposure
iii. Bodily location of exposure (for bites)

c) Species information
i. Species of the exposing animal
ii. Classification of the animal as owned or non-owned (e.g., wild or stray).
iii. For owned animals, rabies vaccination status

d) Known outcomes for victim
i. Initiating PEP
ii. Completing PEP

e) Known outcomes for exposing animal
i. Animal confined
ii. Animal killed/died
iii. Animal tested
iv. Animal test results (if tested)
v. Animal lost

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