

A. Agent:

The rabies virus belongs to the order Mononegavirales, viruses with a nonsegmented, negative-stranded RNA genome. Within this group are viruses with a distinct "bullet" shape classified as the Rhabdoviridae family. This family includes at least three genera of animal viruses, Lyssavirus, Ephemerovirus, and Vesiculovirus.^{1, 2}

The genus Lyssavirus includes the rabies virus, Lagos bat virus, Mokola virus, Duvenhage virus, European bat virus 1 & 2 and Australian bat virus. Lyssavirus viruses are antigenically related, but monoclonal antibody and nucleotide sequencing has revealed differences (i.e., variants) according to animal species.^{1, 2}

B. Clinical Description:

Rabies is a preventable viral disease of mammals most often transmitted through the bite of a rabid animal. Today, the vast majority of rabies cases reported each year to the CDC occur in wild animals and only occasionally in domestic pets and livestock.^{3, 4}

The rabies virus infects the central nervous system, eventually causing disease in the brain and death. The early symptoms of rabies in humans are similar to that of many other illnesses, including fever, headache, and general weakness or discomfort. As the disease progresses, more specific neurologic symptoms appear including anxiety, confusion, slight or partial paralysis, hallucinations, agitation, hypersalivation, difficulty swallowing and hydrophobia. Death usually occurs within days of the onset of symptoms.^{2, 5, 6} The full range of symptoms associated with rabies is listed in Table 1.2.

Hydrophobia	Aggression
Lethargy	Loss of appetite
Change in voice	Chewing on bite site
Constant growling	Dilated pupils
Unexplained biting	Seizures
Biting objects/breaks teeth	Salivating/foaming
Choking; unable to swallow	Unexplained death
Dropping of jaw or paralysis of jaw, throat masseters	

*As determined by a veterinarian.

C. Reservoirs:

The principal rabies hosts today are wild carnivores and bats.^{4, 7} In the U.S. and its territories, distinct reservoir rabies virus strains have been identified in insectivorous bats, foxes, raccoons, skunks, and mongoose (Puerto Rico).^{2, 8, 9, 10}

In Arizona, the greatest rabies risk to humans, domestic pets and livestock are three wild animal reservoir species: bats, skunks and foxes.¹¹ Coyotes and bobcats are the most common non-reservoir species to be reported rabid and combined represent 6% of the total number of rabid wild animals reported during 1944–2013. The remaining 1% comprises, in descending order of occurrence, the coatimundi, ringtail cat, javelina, mountain lion, badger, bear, and raccoon.¹²

Another potential, though infrequent, source of human rabies infections are pets and livestock. During 1944–2013, 989 domestic pets and livestock were confirmed rabid. Of these, 75% were dogs, 12% cattle and 11% cats. Horses, llamas and pigs compose the remaining 2%. However, the majority (863, or 87%) of rabid domestic animals were identified during 1944–1965, and in the successive decades rabies in dogs, cats and livestock has become increasingly sporadic and rare. Today, when rabid domestic animals are encountered their infections are usually (but not always) associated with epizootics in reservoir species, primarily skunks and foxes.¹²

Large rodent species such as beaver, porcupines, and woodchucks (groundhogs) are able to survive attacks and eventually develop rabies. CDC reports that of 737 rabid rodents reported in the U.S. from 1995 to 2010, woodchucks accounted for 663 (90%) of the cases. Beaver accounted for 31 (4%) of cases, while a mixture of smaller rodents and rabbits comprises the remaining 6% of cases.¹³ Possums/opossums can develop rabies, contrary to the thought that their body temperature is too low to allow rabies infection.

D. Mode of Transmission:

Transmission is through the introduction of virus-containing saliva via the bite of an infected host. However, infectious saliva may also be introduced through cuts and abrasion in the skin. Similarly, transmission has occasionally been documented via other routes such as contamination of mucous membranes (i.e., eyes, nose, mouth), aerosol transmission, and corneal and organ transplantations.^{2, 3, 11, 14, 15}

E. Incubation Period:

Rabies-infected animals usually die within a few days after onset of clinical signs. Factors that may contribute to the transmission, incubation period and development of rabies infection include: the amount of viral inoculum (amount of rabies virus introduced into the body) and the anatomic location of the bite.²

The incubation period and duration of rabies in dogs and cats generally involves four phases: (1) An incubation period averaging 2–9 weeks with a range 9 days to 8.5 months (not >6 months in U.S.); (2) A prodromal or initial stage lasting 1–3 days; (3) an excitation (furious) stage lasting an average of 1–7 days (some animals do not exhibit this stage); and (4) a paralytic stage of 1–4 days duration. If a dog or cat has not shown any signs of abnormality on the tenth day after inflicting a bite, it is safe to assume that the animal was not shedding virus in its saliva at the time of the bite.¹¹ The incubation and duration phases for rabies in livestock and other animals are present in Table 2.

Table 2. Incubation Period and Duration of Disease in Other Species ¹¹		
SPECIES	INCUBATION PERIOD	DISEASE DURATION
Horses / Mules	Average 3–14 weeks, range <6 months	2–8 days
Cattle	Average 2–15 weeks, range <6 months	Usually 1–6 days, rarely as long as 14 days
Sheep / Goats	2–17 weeks	5–7 days
Wild / Exotic Animals	Unknown	Unknown

F. Period of Communicability

The period during which a patient is considered infectious begins up to ten days before symptom onset and lasts until death.

G. Susceptibility and Resistance:

All mammals, including humans, are susceptible.

H. Treatment:

There are three facets of medical treatment for animal bites and the prevention of rabies: wound care, post-exposure prophylaxis (PEP) and pre-exposure prophylaxis.

Wound Care

For many types of bite wounds, immediate gentle irrigation with water or a dilute water povidone-iodine solution has been shown to markedly decrease the risk of bacterial infection, and has even been shown in animal studies to significantly reduce the likelihood of rabies.¹⁶ Bite victims should receive a tetanus shot if they have not been immunized in ten years. Decisions regarding the use of antibiotics, and primary wound closure should be decided together with a doctor.¹⁶

Rabies Post-Exposure Prophylaxis (see Table 3)

For people who have never been vaccinated against rabies previously, post-exposure anti-rabies vaccination should always include administration of both passive antibody and vaccine. Vaccine given after a rabies exposure event is often referred to as post-exposure prophylaxis (PEP) for short.^{11, 16}

The combination of human rabies immune globulin (HRIG) and vaccine is recommended for both bite and non-bite exposures, regardless of the time between exposure and initiation of treatment. However, people who have been previously vaccinated or are receiving pre-exposure vaccination for rabies should receive only vaccine.^{11, 16}

Rabies PEP consists of a dose of HRIG and 4 doses of rabies vaccine. The first day vaccine is given is referred to as ‘day 0’ and is subsequently administered on days 3, 7, and 14 (add an additional dose on day 28 for immunocompromised individuals who should also have serum tested for rabies virus neutralizing antibody to ensure an acceptable antibody response developed). The vaccine is given in a muscle, usually in the upper arm (or the anterolateral

part of the upper thigh for small children). PEP is highly effective at preventing rabies if given as soon as possible following an exposure.¹⁷ The vaccine should be given at the above recommended intervals for best results, per the current guideline published by the Advisory Committee on Immunization Practices (ACIP).¹⁸ Patients should talk to their physicians or state or local public health officials if they will not be able to have the vaccine at the recommended interval.^{16, 18}

HRIG is only administered once and involves local infusion at the wound site, with any remaining amount injected intramuscularly in the opposite deltoid to the site of vaccination. If HRIG is not given on day 0, it can be given up to 7 days after starting the rabies vaccine.^{18, 19}

If a person has previously received PEP or pre-exposure rabies vaccinations, only 2 doses of vaccine (on the day of exposure and 3 days later) are needed. HRIG is not warranted.^{16, 18}

Rabies Pre-Exposure Prophylaxis (PrEP)

People who work with rabies in laboratory settings and animal control and wildlife officers are just a few of the people who should consider rabies pre-exposure vaccination. If people are traveling to a country where rabies is widespread, they should consult their doctor about the possibility of receiving rabies PrEP.²⁰

Arizona residents should consider PrEP if they: (1) have a planned activity will bring them into contact with wild or domestic animals (e.g., a biologist, veterinarian, or specialist working with animals); (2) will be visiting remote areas where medical care is difficult to obtain or may be delayed (e.g., hiking through remote villages where dogs are common); or (3) stay longer than 1 month in an area where dog rabies is common.²⁰

Although PrEP doesn't eliminate the need for additional therapy after a rabies exposure, it simplifies management by eliminating the need for HRIG and reducing the doses of vaccine needed.²⁰ PrEP may also protect people whose post-exposure therapy is delayed and provide protection to people who are at risk for unapparent exposures to rabies.²⁰

Boosters should be given based on a person's exposure risk and titer level as shown below:²⁰

Continuous: Virus present continuously, often in high concentrations. Specific exposures likely to go unrecognized. Bite, nonbite, or aerosol exposure. Includes rabies research laboratory workers and rabies biologics production workers. After the primary course of vaccination, should receive serologic testing every 6 months; booster vaccination should be given if the antibody titer is below the acceptable level.

Frequent: Exposure usually episodic, with source recognized, but exposure also might be unrecognized. Bite, nonbite, or aerosol exposure. Includes rabies diagnostic lab workers, spelunkers, vets and staff, and animal-control and wildlife workers in rabies-enzootic areas, and all persons who frequently handle bats. After the primary course of vaccination, serologic testing every 2 years is recommended; booster vaccination should be given if the antibody titer is below the acceptable level.

Infrequent: Exposure nearly always episodic with source recognized. Bite or nonbite exposure. Includes veterinarians and terrestrial animal-control workers in areas where rabies is uncommon to rare, veterinary students, and travelers visiting areas where rabies is enzootic and immediate access to appropriate medical care including biologics is limited. After the primary course of vaccination, no serologic testing or booster vaccination is recommended.

Disease Management

I. Clinical Case Definition

None (see laboratory criteria for diagnosis section below)

J. Laboratory Criteria for Diagnosis

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

K. Classification of Import Status

Rabies is found on all continents except Antarctica, and Arizona residents may suffer biting events while traveling outside of the U.S. It is important for public health staff to ask which country they were visiting when they were bitten, what type of animal bit them, and what kind of prophylaxis or other medical care, if any, they received. If PEP was received internationally, try to ascertain information about the type of vaccine and vaccine schedule to determine if an approved vaccine was used. Typically, PEP can be finished in the U.S. even if different products were used.

L. Laboratory Testing

Rabies testing in Arizona is performed in accordance with the established national standardized protocol for rabies testing by the virology section Arizona State Public Health Laboratory (ASPHL), located in Phoenix. The direct fluorescent antibody test (dFA), the most frequently used test to diagnose rabies, is the test performed by ASPHL. This test has been thoroughly evaluated for more than 40 years, and is recognized as the most rapid and reliable of all the tests available for routine use. All rabies laboratories in the United States perform this test on animals suspected of having rabies.²¹

The dFA test requires brain tissue (primarily the cerebellum, brainstem, and hippocampus) from suspect rabid animals and can only be performed post-mortem after the suspect animal is euthanized or has died (there are currently no reliable, standardized ante-mortem or 'live animal' tests that can be used to determine if an animal is rabid). Euthanasia should be accomplished in such a way as to maintain the integrity of the brain so that the laboratory can recognize and extract the appropriate brain tissue.²²

ASPHL Submission Guidelines¹¹

The ASPHL is the only laboratory in the state that is able to confirm rabies infection in animals where exposures to humans or animals have occurred. It is important the brain tissue be maintained fresh or frozen in good condition and NOT placed in formalin or alcohol (questions regarding testing of fixed tissues should be directed to the local rabies laboratory or public health department). Potentially decomposed or destroyed brains should be submitted to the laboratory for evaluation of whether they can be

tested if there was a human or pet exposure. Any animal that is excreting rabies virus in their saliva should have detectable virus by dFA examination. Always keep in mind that ASPHL staff should make the final decision as to whether a specimen is testable or not.

Animals that should be submitted for testing are: (1) wild animals involved in human exposures (bites or otherwise); or (2) pet exposures or domestic animals showing neurological symptoms of rabies that have become ill or died during quarantine.

All animal specimens must have approval by the appropriate public health agency after a rabies risk assessment has been conducted in order to be tested at ASPHL. This is usually done at ADHS, however, first review of specimens may be delegated to staff at a local health department or animal control agencies. Regardless, final approval authority rests with ADHS (call 602 364-3676 for assistance).

Submission forms should be filled-out as thoroughly as possible. The form is available at: <https://azdhs.gov/documents/preparedness/state-laboratory/public-health-microbiology/rabies-lab-submission-form.pdf>.

Special Notes:

1. County epidemiologists and animal control officers should NOT tell clients that rabies testing will be done. Inform them that there is a provisional period that involves submitting the completed form to the correct authority and for ADHS to make final approval.
2. PETS MAY BE REJECTED FOR TESTING AT THE ASPHL FOR THE FOLLOWING REASONS:
 - There was no bite to a human or other exposure.
 - The animal was up-to-date on its rabies vaccine or has a history of rabies vaccination.
 - The animal was an indoor pet or lived in a highly urbanized area with little or no potential for interaction with wild animals.
 - The animal did not exhibit neurological symptoms or other signs of rabies, or its symptoms can reasonably be explained by another condition (e.g., injury, cancer, etc).
 - The bite was clearly provoked (i.e., it involved someone harming or antagonizing the animal, or the animal was protecting its territory).
3. Animal heads arriving at the ASPHL without prior approval WILL NOT be tested until an approved form is submitted. The lab will automatically hold the specimen for 10 days until a form is approved and received. After 10 days, the head will be destroyed if not approved or redeemed by the submitter; specimens cannot be shipped back to submitters.

Remember: When determining whether a domestic animal should be submitted for testing, consider the following:

1. If an animal bites a human, and the animal is healthy, it should be quarantined and not euthanized.
2. Determine if the animal is currently vaccinated for rabies.
3. Determine if the animal could have come in contact with a potentially rabid wild animal in the past six months.
4. Determine if the animal is exhibiting signs consistent with rabies infection.
5. Determine if the animal is from an urban or rural area.

When there is very low suspicion of rabies or when there are no human or pet exposures, a domestic animal does not need to be submitted for rabies testing.

Removal of Animal Heads: Only veterinarians, animal control officers, AZ Game and Fish officials, and others who have been appropriately trained and have pre-exposure prophylaxis should remove animal heads. For guidance on decapitation procedures, see the rabies manual at: <https://azdhs.gov/preparedness/epidemiology-disease-control/rabies/#manual>

With the exception of bats, ASPHL requires the submittal of pet and wild animal heads ONLY (the entire carcass is needed to accurately identify the bat species). ASPHL does not have the ability to remove brain material from larger animals such as horses or cattle (or any other similarly sized species) due to their dense, thick cranial bones. THEREFORE FOR LARGE ANIMALS, ASPHL REQUIRES SUBMITTAL OF BRAINS ONLY. If veterinarians or animal control agencies cannot remove an animal's brain they should consult the Arizona Veterinary Diagnostic Laboratory in Tucson (520-621-2356).

Refrigeration versus freezing head: Refrigeration and immediate shipment is preferred. The head of a freshly euthanized/killed animal will store well in a refrigerator for 3-4 days. If shipment will be delayed due to the weekend or a holiday, refrigerating the head and shipment with ample ice on Monday for receipt by Tuesday is recommended. If the animal begins to decompose or has been dead for more than one day, has not been refrigerated and shipping will be delayed, then freezing the head is recommended. Freezing the head will only delay the results due to requiring thawing at the lab. Freezing should not affect the performance of the dFA test, as long as the head has not been repeatedly frozen and thawed.

Packing, storing and shipping samples:

1. The head of the animal (except bats which should be submitted whole) should be removed from the body and placed in a plastic bag. Seal the bag.
NOTE: The specimen should be refrigerated until time of shipment and be properly labeled with the correct (and legible) specimen id number(s).
2. Place the bag containing the animal head inside a larger plastic bag.
3. Place at least two FROZEN gel packs on top of the specimen and seal this bag.
4. Place the double-bagged head in a sturdy, LEAKPROOF container (preferably metal or styrofoam).
5. Fill out the submission form and place it in an envelope and tape onto the outside of the container/box (NOT on the inside of box). Address the box (see below).
6. IF MORE THAN ONE HEAD IS SENT IN A CONTAINER, MAKE SURE LAB STAFF ARE ABLE TO PROPERLY MATCH THE FORMS WITH THE SUBMITTED HEADS.
7. Specimens should be shipped or delivered to the lab as quickly as possible (overnight mail or same-day bus service are commonly used transport methods).

Specimen Submission & Shipping: Routine submissions can be received at the laboratory between 8AM and 4:30PM Monday - Friday. DO NOT ship specimens to ADHS offices as this may lead to a delay in delivery to the lab especially if personnel are not readily available.

Ship specimens to:
Arizona State Public Health Laboratory
VIROLOGY

250 N. 17th Ave
Phoenix, AZ 85007
(602) 542-6134

Other Testing Options¹¹

Another testing mechanism available to Arizona animal control agencies is the direct rapid immunohistochemical test (dRIT). This type of testing is not to be used when human or animal exposures to a potentially rabid animal have occurred or are suspected (these cases should be tested at ASPHL).

Currently in Arizona, USDA's Wildlife Services is the only agency that has dRIT capability. Only wild animals may be submitted for testing and again should be free of any human, pet, or livestock contact. Results may not be reported out for several weeks. Regardless, they are accurate and reliable. To submit a specimen for dRIT testing, call USDA staff at 602-870-2081.

For domestic pets rejected for rabies testing at the ASPHL there are alternative labs that can perform rabies testing for a fee listed below.

Colorado State University - Veterinary Diagnostic Laboratory
Phone: 970-297-1281 Fax: 970-297-0320 <http://dlab.colostate.edu>

Colorado Department of Public Health - Virology Lab
Phone: 303-692-3485 <http://www.cdphe.state.co.us>

Oregon State University – Veterinary Diagnostic Laboratory
Phone: 541-737-3261 Fax: 541-737-6817 <http://oregonstate.edu>

M. Assessing Laboratory Results:

The submitter of an animal(s) for rabies testing will receive one of the following results: (1) confirmed positive, (2) confirmed negative and (3) not testable.

Confirmed Positive: The public health or animal control authority in charge of the case proceeds with either PEP for an exposed human or place the exposed pet or livestock under the appropriate quarantine period or, if warranted, euthanize the animal.

Confirmed Negative: The patient does not need to start PEP or can discontinue the series if already started. Similarly, pets or livestock do not need to be placed under quarantine or may be released from quarantine.

When notifying a bite victim or pet owner that a submitted animal is negative for rabies, public health staff/animal control officers can (when appropriate) turn the event into a 'learning experience'. For example, if the case involves an individual who works with wild animals on a regular basis, they should be urged to consider PrEP. Likewise, immediate vaccination of unvaccinated domestic animals should be recommended to owners of pets or livestock that have just avoided quarantine or euthanasia.

Not Testable: This designation is given when the submitted specimen is not viable for testing, namely insufficiently preserved brain material due to decomposition or physical injury (gunshot to the head, etc. such that the brain structures cannot be accurately identified). If the specimen was desiccated (too dried), the public health worker or animal control officer can proceed as if the specimen was negative as there is no risk of viable rabies virus. Otherwise, the specimen should be assumed positive and PEP administered as appropriate.

N. Outbreak Definition:

In Arizona enzootic rabies in wildlife may result in periodic epizootics. When they become widespread, it may be necessary for county authorities to invoke a county-wide quarantine.

Local authorities will establish control of the area affected through quarantine under authority of the state laws, regulations and ordinances, in cooperation with appropriate state, county, and/or municipal authorities.

Increased vaccination of dogs and cats through officially sponsored, free or low-cost rabies vaccination clinics in community locations should occur. Livestock should also be vaccinated, particularly those that are important for work and recreation (e.g., horses and mules) as well as other valued livestock. In urban areas, strict enforcement of regulations requiring collection, detention, and euthanasia of ownerless or stray/feral dogs and cats, and of non-vaccinated pets found off premises. Education of pet owners should occur.

Investigation Guidelines

O. Reporting Time Frame:

Immediately.

P. Forms:

<http://www.azdhs.gov/lab/documents/microbiology/rabies-lab-submission-form.pdf>

Q. Investigation Steps:

Local animal control agency (most often the first responder):

- Contact your local health department to coordinate the investigation of animal bites/saliva exposures involving humans or pets.
- Fill-out and submit lab form to ADHS (vbzd@azdhs.gov).
- As needed: impound, euthanasia, decapitation, and shipping of animal heads (wild or domestic) for shipment to ASPHL or the USDA for dRIT testing.
- Apply and manage quarantine for pets when appropriate.

Local veterinary clinics and hospitals (can also be a first responder):

- Communicate with local animal control agencies, the local health dept, or ADA to coordinate the investigation of animal bites/saliva exposures involving humans, pets or livestock.
- Fill-out and submit lab form to ADHS (vbzd@azdhs.gov).
- As needed: impound, euthanasia, decapitation, and shipping of animal heads (wild or domestic) to ASPHL, or to the AVDL for decapitation and brain removal.
- Apply and manage quarantine for vaccinated and unvaccinated pets when appropriate.

Arizona Game and Fish Department/AGFD (can also be a first responder):

- Communicate with ADHS to coordinate the investigation of wild animal bites/saliva exposures involving humans, pets or livestock.
- Fill-out and submit lab form to ADHS (vbzd@azdhs.gov).
- As needed: impound, euthanasia, decapitation, and shipping of wild animal heads to ASPHL.

Arizona Department of Agriculture-Office of the State Veterinarian/ADA (can also be a first responder):

- Communicate with ADHS to coordinate the investigation of wild animal bites/saliva exposures involving livestock and subsequent exposures to owners, family members and attending veterinarian and staff.
- Fill-out and submit lab form to ADHS (vbzd@azdhs.gov).
- Impound suspect rabid livestock and apply and manage quarantine when appropriate.
- When required, euthanize and prepare suspect rabid livestock for shipment to ASPHL.

University of Arizona Veterinary Diagnostic Laboratory/AVDL:

- Remove and ship the brains of large animals to the ASPHL to coordinate the investigation of wild animal bites/saliva exposures involving livestock and subsequent exposures to owners, family members and attending veterinarian and staff.
- Fill-out and submit lab form to ADHS (vbzd@azdhs.gov).

Local health department:

- Communicate with ADHS or local animal control agencies to coordinate the investigation of animal bites/saliva exposures to humans based on available information.
- Advise bite victims on medical treatment for bites including PEP when required.
- Work with ADHS and other partners to implement control measures or provide educational information, as needed.

R. Clinical Case Management:

Management of rabies exposures is needed for both people and pets/livestock. These are not always mutually exclusive. In such cases, management involves getting the offending wild animal tested for rabies, recommending proper medical treatment for the person and quarantine for the exposed pet.

Public health management of bite cases may have multiple agencies working together. The state veterinarian, for example, has purview over livestock issues including potential rabies exposures (ARS Title 3, Chapter 2, Article 4, R3-2-408) and also designates the type(s) of rabies vaccines that may be used in the state (ARS Title 11, Chapter 7, Article 6, 11-1002). Similarly, AGFD staff have authority over wildlife (ARS Title 12, Chapter 4) and may be instrumental in recovering wild animals that are ill or have attacked people, pets, or livestock.

The U.S. Department of Agriculture's Wildlife Services Division not only provides additional rabies surveillance through their dRIT services, but also plays a critical role during epizootics through distribution of oral rabies vaccine baits and trap/vaccinate/release rabies programs.

HUMAN EXPOSURES

An exposure is deemed any bite, scratch, or other incident in which saliva, central nervous system (brain or spinal cord) tissue, or cerebral spinal fluid of a potentially rabid animal enters an open wound, or comes in contact with mucous membranes by entering the eye, mouth, or nose, can be considered a rabies exposure. The species of the animal involved must be considered when determining the exposure risk level. For instance, a bite from a healthy caged rodent is not considered a rabies exposure, while a bite or saliva into wound contact from an untested or rabies positive skunk, bat, or wild carnivore is always considered an exposure. Children that have had direct contact with a bat or have been sleeping in a room with a bat should be considered as exposed unless the bat tests negative for rabies at the ASPHL. People who have been bitten by or exposed to dogs in countries that are endemic for canine rabies should consider prophylaxis unless the dog has either tested negative for rabies or remains healthy upon completing a quarantine of 10 days.^{2, 3, 11, 14, 15}

Non-Exposures: There are several types of human-to-animal interactions that are not considered rabies risks. Some of the more common ones are:

1. Petting or touching the body/fur of a potentially rabid animal (as long as contact with the head is ruled out).
2. Touching an inanimate object that has had contact with a rabid animal does NOT constitute an exposure unless wet saliva or CNS tissue entered a fresh, open wound or contacted a mucous membrane.
3. Being sprayed by a skunk.
4. Having contact with blood, urine, or feces of a rabid or suspect rabid animal does not constitute an exposure.
5. Being in the vicinity of a rabid animal; rabies is not transmitted by aerosols.^{11, 14}

Bat exposures: Recent epidemiologic data suggest that seemingly insignificant physical contact with bats may result in viral transmission, even without a clear history of animal bite. In all instances of bat-human contact where rabies transmission is under consideration, the bat in question should be collected if possible, and submitted for rabies testing.⁹

Rabies PEP is recommended for all individuals with bite, scratch, or mucous membrane exposure to a bat, unless the bat tests negative for rabies. Investigators may be unable to solicit information surrounding potential exposures due to reported limited injury inflicted by a bat bite or by circumstances that hinder accurate recall of events by the victim.^{9, 11}

RECOMMENDED VACCINE SCHEDULE FOR PETS AND LIVESTOCK

Determining the rabies vaccine history of pets and livestock is critical in evaluating human and animal medical and prophylactic treatment for wild animal bites and for the appropriate quarantining of domestic species that have bitten humans. For the following discussion please consult the current edition of the *ADHS Manual for Rabies and Bite*

Management, Compendium of Animal Rabies Prevention and Control, and ARS Title 9, Chapter 6, Article 5: Rabies Control and ARS, Title 11, Chapter 7, Article 6, 11-1001-11-1020.^{6, 11}

Dog and Cat Rabies Vaccine Schedule: Per the 2016 Compendium, dogs and cats should be initially immunized at 3 months of age and re-immunized 12 months after with either a 1- or 3-year licensed rabies vaccine. The animal will require boosters thereafter. In order to improve rabies vaccination coverage, use of 3 year rabies vaccines is encouraged for dogs and cats. An animal is not considered immunized until 28 days after the first vaccine as this is the period of time it takes for the vaccine to reach efficacy. A licensed veterinarian must administer the vaccine, and the licensed veterinarian administering the vaccine must sign the rabies certificate.

Livestock Vaccine Schedule: Rabies vaccines are available for cattle, horses, and sheep, and they should be vaccinated annually against rabies. There are no rabies vaccines currently licensed for use in swine, goats, camelids (llamas, alpacas), bison, red deer, fallow deer, elk or exotic species of livestock, although rabies vaccines have been off-label by licensed veterinarians. Livestock maintained in areas with epizootic rabies activity in foxes or skunks should be especially considered for vaccination.

QUARANTINE FOR ANIMALS THAT HAVE BITTEN OR EXPOSED A HUMAN^{6, 11}

Dogs and Cats: Any dog or cat (vaccinated or unvaccinated) that bites a person must be confined and observed for 10 days. The quarantine period starts on the day of the bite or exposure. If the dog or cat is currently vaccinated against rabies, a home quarantine is permitted at the discretion of the animal control official. Owners should be given clear instructions including the clinical signs of rabies to be reported. If the animal is not currently vaccinated or has an unknown vaccination status, the quarantine may be done in an animal control facility or veterinary clinic.

If the animal does not die or develop clinical signs of rabies infection during the quarantine period, the dog/cat did not have rabies virus in its saliva at the time of the exposure, and there is no further risk to the person. The person should not receive post-exposure treatment. If an animal develops signs of rabies infection during the quarantine period, humanely euthanize the animal and submit the head for testing. If an animal dies during the quarantine period, submit the head for rabies testing.

Canine/Wolf-Hybrids and Feline Hybrids: If a hybrid bites a human (regardless of the hybrid's vaccination history) it should be treated as a wild animal exposure. This includes humanely euthanizing the hybrid and submitting the head for rabies testing regardless of its vaccination history. If it is not available for testing, consider PEP for the bite victim.

Wild Animals: Incubation periods for species of wild animals are not known (they are highly variable at best) and quarantines therefore cannot be established for them. Consequently, wild animals involved in biting events to humans, pets, and livestock **CANNOT BE QUARANTINED AND SHOULD BE ROUTINELY EUTHANIZED AND SUBMITTED FOR RABIES TESTING.** An exception to this is rodents and rabbits. These small mammals

are at low risk of contracting or transmitting rabies and do not need to be routinely tested for rabies. Rodents may be submitted for rabies testing under special circumstances if discussed with ADHS staff.

Non-Mammals: Rabies is a disease of mammals only and therefore bites to humans, pets or stock by non-mammals (e.g., birds, turtles, snakes, etc.) are not a rabies issue.

DETERMINING PET EXPOSURE TO WILD ANIMALS^{6, 11}

When a domestic animal has direct wild animal, it is considered to have had a potential exposure to rabies. It is very important to capture and submit the offending animal for rabies testing if possible. Wild mammals that are not available for laboratory testing should be presumed rabid. Domestic animals that bite other domestic animals are not usually considered as potentially rabid unless they are exhibiting signs compatible with the disease.

Assessing the risk of exposure and the proper quarantine and prophylactic routine for pets:
Determine whether the dog or cat is vaccinated against rabies:

1. Find out if the wild animal to which the dog/cat was exposed is available for rabies testing.
2. If the wild animal is not available for testing, presume the wild animal is positive.
3. If the wild animal tests positive for rabies (or presumed positive), proceed as follows:

If the dog/cat is currently vaccinated or OVERDUE against rabies (ARS Title 9, Chapter 6, Article 5, R9-6-502):

1. Notify local animal control.
2. Immediately take the dog/cat to a veterinarian for a booster rabies vaccination.
3. Confine the dog or cat under the owner's control and observe closely for 45 days. The animal should be kept in a building, pen, or escape proof enclosure. The animal should only be removed from confinement on a leash and under supervision of a responsible adult. (Some town or county ordinances may be more restrictive than state law and not allow home quarantine).
4. At the first sign of illness or behavioral change, the animal should be taken to a veterinarian, and the health department and animal control should be contacted.

If the exposed dog/cat has never been vaccinated against rabies: (ARS Title 9, Chapter 6, Article 5, R9-6-502):

1. Notify local animal control.
2. Consider immediate humane euthanasia OR;
3. Animal control will quarantine the animal for 120 days (4 months) in an approved facility run by either a veterinarian or an animal shelter.
4. The owner is responsible for payment of all expenses related to the quarantine.
5. A veterinarian should vaccinate the animal against rabies upon entry into isolation or one month prior to release to comply with pre-exposure vaccination recommendations (See Part I B.5 of Compendium). The quarantine is completed 120 days after the exposure.

S. Bioterrorism Potential:

The CDC currently does not list the rabies virus as a potential bioterrorism agent.

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