

Prevention of Rabies in Humans:

Rabies Risk Assessment and Treatment Steps

When a person has been exposed to a potentially rabid animal, it is critical that a healthcare provider or public health nurse promptly perform a detailed **Rabies Exposure Risk Assessment** to determine if rabies post-exposure prophylaxis (rabies PEP) is necessary. First and foremost, the exposing animal should be captured by Animal Control and confined for observation (dog, cat, ferret or livestock) or euthanized and submitted for testing (wild animals other animals assessed as high-risk) *without delay*. If the animal is not available (lost to follow-up), a prompt risk assessment should be conducted by a healthcare provider or local health department to determine whether rabies post-exposure prophylaxis is needed. ***If indicated, rabies PEP should begin without delay.***

Outline of Risk Assessment & Treatment Steps

- STEP 1: WASH: Immediately wash wounds/exposed areas** with soap and clean running water for 15 minutes.
- STEP 2: CAPTURE the animal**, if possible, for testing or confinement (call Animal Control).
- STEP 3: ASSESS: Determine whether an EXPOSURE occurred; RISK LEVEL; NEED FOR PEP** (post-exposure prophylaxis).
- STEP 4: REPORT: Report exposure and circumstances to local health director.**
- STEP 5: TREAT: Begin PEP *immediately* if indicated by assessment.**

Detailed steps follow:

Rabies Risk Assessment & Treatment Steps

STEP 1

WASH: Immediately wash wounds/exposed areas with soap and clean running water for 15 minutes.

The patient should visit a physician or emergency department for wound care and assessment of the need for antibiotics, tetanus post-exposure prophylaxis (PEP) and for Rabies Risk Assessment for rabies PEP (Step 3).

STEP 2

CAPTURE the animal for testing or confinement, if possible. Contact local animal control, or ask someone to call for you, and provide the location and description of the animal). **If the animal cannot be captured**, go to Step 3, (“Should PEP be recommended?”).

- A. **Dogs, cats and ferrets** If the animal appears normal and healthy, regardless of vaccination status, Animal Control should place it in a **10-day confinement** for observation ([NCGS 130A-196](#)). Capturing the animal is important because it is the only way to determine if rabies post-exposure prophylaxis (PEP) is **not** needed:
- If the dog, cat or ferret remains normal and healthy for the entire 10-day confinement period, then PEP is not necessary.
 - If the dog, cat or ferret cannot be located and captured within 72 hours, the victim should consult with the local health department CD Nurses and a healthcare provider and begin PEP.
 - If the dog, cat or ferret is captured and the owner cannot be identified within 72 hours of the event, the local health director may authorize the animal be euthanized, and the head of the animal immediately sent to the State Laboratory of Public Health for rabies testing. If the rabies test is reported as anything other than negative, begin PEP.
 - If the dog, cat or ferret develops behavior changes or sickens with signs consistent with rabies as assessed by a veterinarian, or dies during the 10-day confinement it shall be submitted to the State Laboratory of Public Health for rabies testing (§ 130A-199). The victim should begin PEP without delay.
- B. **Wild and Exotic Mammals:** If the victim was bitten by a **wild or exotic mammal** that is assessed as high-risk for rabies transmission (see STEP 3), the animal should be euthanized and tested as soon as possible. The length of time from virus shedding to onset of clinical signs is not known in wild and exotic animals; therefore a confinement period for observation is not supported.
- If the animal is not available for testing, begin PEP.
- C. **Consult with the NC Communicable Disease Branch at 919-733-3419 (24/7)** if testing will be delayed for any reason (holiday, lack of transport, etc.) and for submission approval for all low risk mammals, monkeys and exotics.

STEP 3

ASSESS: Determine whether an EXPOSURE occurred; RISK LEVEL; NEED FOR PEP

1. Was there a potential EXPOSURE to rabies?

EXPOSURE: An exposure is defined as any bite, scratch or other situation in which saliva or nervous tissue from a potentially rabid animal enters an open or fresh wound, abrasion or break in the skin, or comes in contact with a mucous membrane by entering the eye, nose or mouth. Direct contact between a human and a bat is also considered an exposure (see #2 below).

Bite exposure - Any penetration of the skin by teeth.

Non-bite exposure – Introduction of saliva or brain/nervous tissue from a rabid or potentially rabid animal into an open wound (scratches, abrasions, breaks in the integrity of the skin) or onto a mucous membrane (the eyes, nose or mouth).

Other non-bite exposures, other than organ or tissue transplants, have almost never been proven to cause rabies, and post-exposure prophylaxis is ***not indicated unless*** the non-bite exposure met the definition of saliva or other potentially infectious nervous material being introduced into fresh, open cuts in skin or onto mucous membranes.

Bat exposure - Any **direct contact** between a human and a bat is considered an exposure, unless the person is certain a bite, scratch or mucous membrane exposure did not occur. **Finding a bat in the same room as a person who might be unaware that a bite or direct contact had occurred** is also considered an exposure (e.g., a deeply sleeping person awakens to find a bat in the room or a bat is seen in a room with a previously unattended child, mentally disabled person, or intoxicated person).

(See also "**Bat Exposure Assessments**" in this Manual http://epi.publichealth.nc.gov/cd/lhds/manuals/rabies/docs/bat_exp_assess.pdf)

NOT an EXPOSURE: Blood, urine or feces OR wet saliva on *intact* skin OR petting a dry animal (no saliva or neurological tissue on animal) do not constitute exposures, and NO PEP is warranted. Rabies virus is inactivated by desiccation, ultraviolet irradiation, and other factors and does not persist in the environment. In general, ***if the suspect material is dry, the virus can be considered noninfectious.***

2. What SPECIES OF ANIMAL exposed the person? Determine rabies RISK LEVEL of the animal species.

HIGH-RISK wild/stray/feral animals.

These ***rabies vector species*** are animals that are likely to be infected with and transmit rabies:

- Raccoon, fox (red and grey), skunk, coyote, bobcat, woodchuck (groundhog), beaver, and other large carnivores.
- Bats – all species. Bat exposures require special consideration. "**Bat Exposure Assessments**"
- Wolf hybrids and other wild hybrids.
- Stray or feral cats.

LOW-RISK wild animals.

Low risk animals are unlikely to be infected with rabies.

- **Wild rodents** including squirrels, rats, mice, voles, moles, chipmunks, etc.
- **Exotic pets** including rabbits, rodents (hamsters, guinea pigs, rats, mice, etc.) are considered low-risk if born and maintained in captivity and free from exposure to rabies vectors.
- **Opossums** are not as susceptible to rabies as wild high risk rabies vector species and domestic species. However, several have tested positive to rabies in North Carolina. Opossums are large enough to survive an attack from a wild predator. We recommend that the risk level of opossums that expose humans and domestic

animals be assessed on a **case-by-case basis** in consultation with the Communicable Diseases Branch (919-733-3419).

A Low-Risk wild mammal that is exhibiting signs consistent with rabies is reclassified as High-Risk (see below).

LOW-RISK domestic animals (dog, cat, ferret, livestock and horses) are required to be confined for observation (10 days for dogs/cats/ferrets; 15 days for livestock).

NO-RISK animals do not directly transmit rabies – no confinement or testing necessary. No PEP necessary.

- Birds
 - Reptiles (e.g., lizards and snakes)
 - Amphibians (e.g., frogs)
 - Fish
 - Insects
- **When LOW-RISK mammals are considered HIGH-RISK: Low-risk mammals that are exhibiting signs consistent with rabies or have a history of potential of exposure to rabies should be considered high-risk.**

Was the animal sick and/or showing neurological signs of rabies? *Clinical signs of rabies:* decreased appetite, difficulty swallowing (choking), cranial nerve deficits, abnormal behavior, looks drunk, weak, dragging a leg or paralyzed in rear legs, altered vocalization, seizures; rapid progression to death.

Was the animal's behavior unusual and inconsistent for the animal/species?
Examples: a dog that was friendly becomes aggressive, scratches or attacks without being provoked; a wild animal that appears unexpectedly friendly and/or approaches humans or domestic animals readily (does not maintain a safe distance).

Were there unexplained bite wounds (either fresh or old) **on the animal's body?**
Example: history or evidence of a bite abscess in an outdoor cat.

Was there a situational history of potential exposure to a rabies vector species?
Examples: a potentially rabid bat was found on the floor in the house with a cat; a raccoon carcass was found in a pasture with livestock or in a dog's backyard; a skunk was seen in close proximity to some horses.

Was the bite an unprovoked attack on the person?
An unprovoked attack by an animal might be more likely than a provoked attack to indicate that the animal is rabid. Example of a provoked bite is a bite sustained by a person attempting to feed or handle an apparently healthy and normal wild animal (squirrel).

If YES to the any of the above questions, submit animal for rabies testing

OR

If animal not available, consider PEP

3. Should PEP be recommended?

If YES to any of the following, BEGIN PEP.

A. IF THE EXPOSING ANIMAL IS NOT AVAILABLE FOR TESTING OR CONFINEMENT (high-risk wild animal is not captured immediately, a domestic animal is not captured within 72 hours) and is:

- A HIGH-RISK WILD MAMMAL, WILD-HYBRID, or FERAL ANIMAL
- A LOW-RISK WILD MAMMAL (squirrels, rats, mice, voles, moles, etc.) exhibiting signs of rabies infection, aggressive or abnormal behavior, previous bite wounds, unprovoked attack, etc.
- A LOW-RISK DOG, CAT OR FERRET, or other domestic animal, livestock or horse, that was not captured within 72 hours and was exhibiting signs of rabies infection, aggressive or abnormal behavior, unprovoked attack, etc., at the time of the exposure.
- A LOW-RISK DOG, CAT OR FERRET (healthy animal, provoked bite), regardless of rabies vaccination status, that was not captured by animal control within 72 hours of exposure.

B. IF THE EXPOSING ANIMAL IS CAPTURED by Animal Control, PEP is indicated if

- At the ONSET or DURING CONFINEMENT the Low-Risk dog, cat, ferret, livestock or horse BEGINS TO EXHIBIT SIGNS CONSISTENT WITH RABIES and is submitted for testing.
- Any submitted ANIMAL TESTS POSITIVE or UNSATISFACTORY to rabies direct fluorescent antibody (DFA) testing or the TEST IS NOT PERFORMED.

***Summary: In all cases, if the exposing animal
TESTS POSITIVE OR UNSATISFACTORY
to rabies direct fluorescent antibody (DFA) testing, or the
TEST IS NOT PERFORMED, or the
EXPOSING ANIMAL IS NOT AVAILABLE for testing and is high-risk,
YES, PEP!***

NO PEP is required in the following situations:

- If EXPOSING ANIMAL tests NEGATIVE to rabies direct fluorescent antibody (DFA) test; the animal was not shedding rabies at the time of the exposure. No PEP.

- **Dogs, cats and ferrets that remain normal and healthy** throughout the 10-day confinement period were not shedding rabies virus at the time of the exposure. No PEP.
- **Livestock that remain normal and healthy** throughout the 15-day confinement period were not shedding rabies virus at the time of the exposure. No PEP.

RESOURCES:

- See CDC, “When Should I Seek Medical Attention?” (<http://www.cdc.gov/rabies/exposure/index.html>).
- Refer to the ALGORITHMS: Evaluation of Animal Bites for Rabies Risk: [Domestic Dogs, Cats & Ferrets](#) and/or [Wild Animals & Bats](#)
- Consult with N.C. Communicable Diseases Branch: (919) 733-3419 (24/7)

STEP 4

REPORT: Report exposure and circumstances to local health director.

Report the bite or exposure to the local health director in the jurisdiction in which the exposure occurred (per [NCGS 130A-196](#)).

- **Persons required by law to immediately report** a bite by a dog, cat or ferret are:
 - **Person bitten or the parent/guardian** of the person bitten (if a minor)
 - **Owner or person in possession** of the animal.
- A **physician** who attends a person bitten is required to **report a bite by an animal known to be a potential carrier of rabies**; this includes *any mammal* as well as dogs, cats and ferrets. The incident shall be reported **within 24 hours** to the Local Health Director. The report must include the name, age, and sex of the bitten person.
- Give the name and address of the person bitten and the owner of the animal to the Health Director. If the animal that bites a person is a stray or feral animal, the local agency responsible for animal control shall make a reasonable attempt to locate the owner of the animal.

STEP 5

TREAT: Begin PEP as soon as it is determined to be indicated by the assessment.

There are four possible regimens (A-D below), depending on the health and immune status of the exposed individual AND whether or not a complete rabies pre- or post-exposure prophylaxis regimen was given in the past (see CDC, www.cdc.gov/rabies/medical_care/vaccine.html).

RABIES POST-EXPOSURE PROPHYLAXIS REGIMENS

- A. NORMAL AND HEALTHY EXPOSED INDIVIDUAL AND never completed a rabies pre- or post-exposure prophylaxis regimen in the past.**

Regimen:

- **4 doses of rabies vaccine - Days 0, 3, 7, and 14** administered IM in the deltoid, or, if an infant, may use the anterolateral thigh muscle. Never use the gluteal area.
- **Human Rabies Immune Globulin (HRIG) on Day 0 (20 IU/Kg) infiltrated into and around the wound(s), OR if no evident wound, give IM into the deltoid or anterolateral thigh muscles;** never the gluteal area. HRIG can be given up to and through Day 7, if omitted at onset. (See Figure 1 below.)

B. IMMUNE-COMPROMISED EXPOSED INDIVIDUAL AND never completed a rabies pre- or post-exposure prophylaxis regimen in the past (requires a fifth dose of rabies vaccine, on Day 28).

Regimen:

- **Five doses of rabies vaccine - Days 0, 3, 7, 14 and 28** administered IM in the deltoid, or, if an infant, may use the anterolateral thigh muscle. Never use the gluteal area.
- **Human Rabies Immune Globulin (HRIG) on Day 0 (20 IU/Kg) infiltrated into and around the wound(s) OR if no wound, give IM into the deltoid or anterolateral thigh muscles, never** the gluteal area. HRIG can be given up to and through Day 7, if omitted at onset.
- **Rabies serological titer** (Rapid Fluorescent Focus Inhibition Test RIFFIT) **to verify seroconversion is adequate** – one to two weeks after last does of rabies vaccine.

C. NORMAL AND HEALTHY EXPOSED INDIVIDUAL AND completed a rabies pre- or post-exposure prophylaxis regimen in the past.

Regimen:

- **2 doses of Rabies Vaccine – Days 0 and 3** administered IM in the deltoid, or, if an infant or small child, may use the anterolateral thigh muscle. Never use the gluteal area.
- **No HRIG**

D. IMMUNE-COMPROMISED EXPOSED INDIVIDUAL AND completed a rabies pre- or post-exposure prophylaxis regimen in the past.

Regimen:

- **2 doses of rabies vaccine – Days 0 and 3** administered IM in the deltoid, or, if an infant may use the anterolateral thigh muscle. Never use the gluteal area.
- **No HRIG**
- **Rabies serological titer** (Rapid Fluorescent Focus Inhibition Test RIFFIT) **to verify seroconversion is adequate, one to two weeks after last rabies vaccine dose.**

For additional guidance, see:

- CDC rabies exposure web site, www.cdc.gov/rabies/exposure
- ACIP recommendations, *Human Rabies Prevention --- United States, 2008*, www.cdc.gov/mmwr/preview/mmwrhtml/rr57e507a1.htm.
- CDC information on testing animals, www.cdc.gov/rabies/exposure/testing.html.