



Rabies Postexposure Prophylaxis (PEP) 101

A Training Course Based on the 2010 Advisory Committee on Immunization Practices (ACIP) Guidelines



Course Developers and Disclosure

This course was developed by the Maryland Department of Health in collaboration with the Centers for Disease Control and Prevention (CDC). Assistance was provided by a doctoral student at the University of Nebraska Medical Center School of Public Health.



Course Goals and Audience

- The goal of this course is to educate clinicians and public health professionals about rabies, the approach used to evaluate patients for rabies virus exposure, and the correct administration of rabies postexposure prophylaxis (PEP), as recommended by the Advisory Committee on Immunization Practices (ACIP).
- The target audience for this course includes medical providers, pharmacists, veterinarians, and public health practitioners who may be called upon to evaluate and/or manage a patient for rabies virus exposure.
- Please note that the state regulations and contact information provided in this training are specific to Maryland. While ACIP recommendations apply nationally, local regulations and contacts differ. Please consult with your local or state health department.



Course Description

- This course comprises an introduction to rabies, followed by six learning modules. Each module focuses on the epidemiology of a different animal vector and includes a case study focusing on one aspect of conducting a rabies virus exposure risk assessment and PEP administration. Module 6 focuses on PEP deviations and other considerations.
- Before starting this course, learners are encouraged to complete the pretest to assess their baseline knowledge.
- There is a knowledge check at the end of each module. Upon completion, learners will be directed to a final learning evaluation.



Course Outline

Module 1: Rabies Overview

Module 2: Bat Exposures: A Tricky Situation

Module 3: Dog Exposures: When Friendly Faces Turn Fierce (Focus on animal observation and wound cleaning)

Module 4: Raccoon Exposures: More Than Just Masked Mischief (Focus on RIG administration)

Module 5: Cat Exposures: Claws and Consequences (Focus on rabies vaccination)

Module 6: Other considerations (Common PEP deviations)

Module 7: Recap



Module 1: Rabies Overview

- After completion of this module, learners will have a better understanding of rabies:
 - Transmission
 - Incubation
 - Symptoms
 - Diagnosis
 - Local and global disease burden
 - Basic prevention steps



(CDC, 2024)

What is Rabies?



- Rabies is a fatal but preventable viral disease transmitted by the bite or non-bite (ex., scratch) of an infected mammal.
- Rabies has been recognized since ancient times as a source of profound suffering and death.
- The disease is characterized as an acute progressive encephalomyelitis. Once symptoms start, the clinical course is almost always irreversible, with most humans dying within 22 days of symptom onset.
- Thanks to rabies control programs and PEP, rabies is rare in people in the United States, with less than 10 cases reported annually.

However, each year about 100,000 Americans receive PEP following an exposure.



Transmission

Rabies virus infects a new host **when saliva or neurological material** (brain and spinal cord tissue) from an **infected animal** comes into contact with broken skin or mucosa (eyes, nose, mouth).

Rabies IS Transmitted through:

- Animal bites (most common)
- Being scratched by claws contaminated with saliva/brain matter
- Contact between saliva/brain matter and eyes/other mucus membranes
- Saliva entering a fresh open wound

Note: Inhalation of aerosolized rabies virus in a laboratory setting is a known, though rare, route of transmission



How Rabies is NOT Transmitted

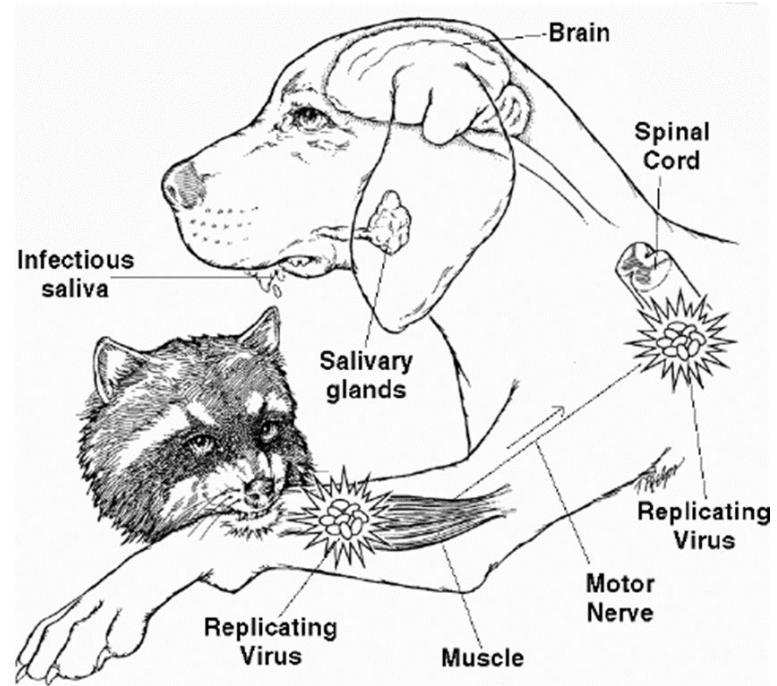
Rabies CANNOT be transmitted through:

- Feces
- Urine
- Blood
- Skunk Spray
- Dried Saliva (not a hearty virus outside of the body)



Incubation

- The incubation period for rabies is typically 1-3 months but can be considerably longer or shorter.
- The rabies virus is neurotropic, which means it has a strong preference for nerve tissue.
- The rabies virus may be found in saliva up to 10 days before the onset of clinical symptoms.



(CDC, n.d.)



Clinical Manifestations

Initial/First Symptoms:

- Non-specific including fever, malaise, and headache.
- Some persons exhibit some form of paralysis, parathesis, or spasms early in the illness course.

Late/End Stage Symptoms :

- Ataxia/Weakness/Paralysis
- Seizures and coma
- Confusion and agitation
- Hydrophobia- anxiety when presented with water
- Hypersalivation
- Other signs of autonomic dysfunction
- Difficulty swallowing



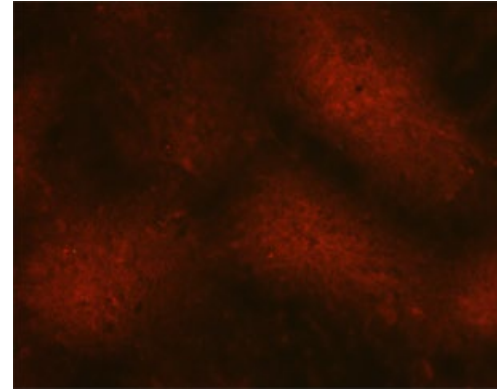
Diagnosis

Humans

- Several tests are necessary to rule out rabies ante-mortem (before death) in humans; no single test is sufficient.
- Tests are performed on samples of saliva, serum, spinal fluid, and skin biopsies of hair follicles at the nape of the neck.
- Postmortem (after death) testing requires the collection of brainstem and cerebellum tissues.

Animals

- The test requires that the animal be humanely euthanized.
- There are no approved methods for ante-mortem rabies testing of animals.
- A diagnosis of rabies can be made after detection of rabies virus from any part of the affected brain, but to rule out rabies, the test must include a full cross-section of tissue from both the brainstem and cerebellum

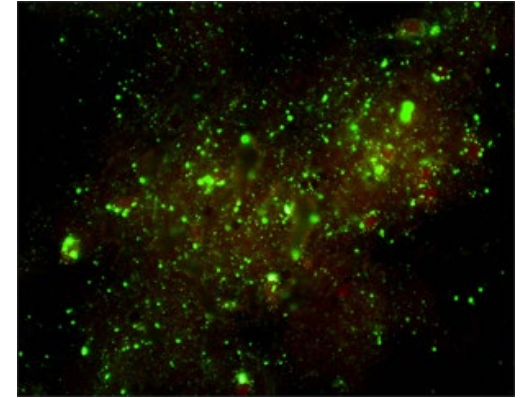


Negative DFA tests shows no rabies virus antigens (CDC, 2024)



Diagnostic Testing

- In Maryland, rabies testing is performed at the state public health laboratory; in other states, it may be performed by state or academic veterinary diagnostic laboratories. Contact your local public health agency for more information.
- Because of its high sensitivity and specificity, the direct fluorescent antibody test (DFA) is one of several "gold standard" diagnostic methods for detecting rabies and has been rigorously evaluated by international, national, and state health laboratories.
- Other approved tests include immunohistochemistry, realtime reverse transcription-polymerase chain reaction, and rabies serology.

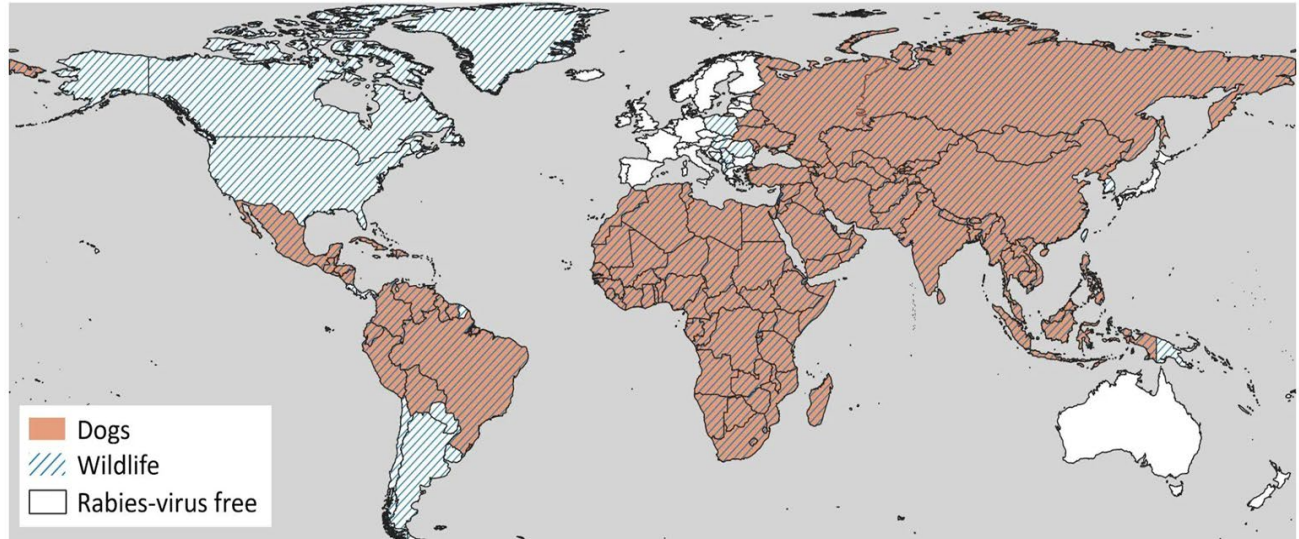


Positive DFA test showing rabies antigens as fluorescent-apple-green areas (CDC, 2024)



Worldwide Disease Burden

Worldwide, an estimated 74,000 humans die from rabies infection annually, mainly from dog exposures in Asia and Africa.

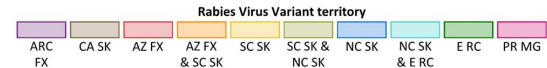
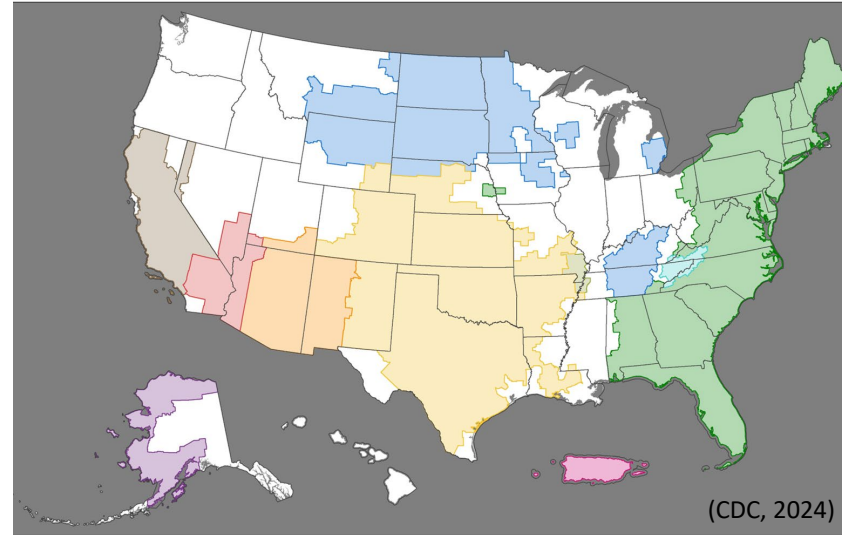


(CDC, 2024)



U.S. Disease Burden

- The canine rabies virus variant was eliminated from the United States in 2007 (dogs can still become infected with other variants!)
- Wildlife reservoirs have become the primary source of domestic human rabies exposures, with bats being the source of 70% of cases between 1960 and 2018.
- The last case of human rabies in Maryland was transplant-associated in 2013.





Prevention

Although rabies is almost always incurable after symptom onset, it is highly PREVENTABLE through timely administration of rabies postexposure prophylaxis (PEP)!

- The 2010 ACIP Rabies PEP Regimen includes:
 - Wound cleaning
 - Rabies immunoglobulin (RIG) **IF NOT PREVIOUSLY VACCINATED**
 - A series of rabies 1.0 mL IM vaccinations based on previous rabies vaccination status and immune status.



Knowledge Check Module 1

TRUE OR FALSE?



Knowledge Check Question 1

TRUE OR FALSE?

Rabies symptoms in humans
present within hours of
exposure



Knowledge Check Question 1 Answer

If you answered FALSE, you were correct.

The incubation period for rabies is typically 1-3 months but can be considerably longer or shorter.



Knowledge Check Question 2

TRUE OR FALSE?

Only mammals can transmit the
rabies virus



Knowledge Check Question 2 Answer

If you answered TRUE, you were correct.

Other animals such as birds are not known to transmit the rabies virus



Knowledge Check Question 3

TRUE OR FALSE?

The rabies virus is transmitted
by contact with the blood of an
infected animal



Knowledge Check Question 3 Answer

If you answered FALSE, you were correct.

Rabies is transmitted through infected saliva and neurologic material



Module 1

Conclusion

Exit and continue to next module