



Rabies Virus

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Agenda

- Rabies in Delaware
 - Animal Rabies
 - Human Rabies
- Rabies Exposures
 - Exposure Reporting
 - Risk Assessment
 - Wound Care Treatment
 - Pre-exposure Prophylaxis (PrEP) Rabies vaccine
 - Post-exposure Prophylaxis (PEP) Rabies vaccine
 - Precautions or Contraindications for Rabies Vaccine
- Human Rabies Cases
 - Indicators
 - Diagnostic Testing
 - PPE

Objectives

- Understand the risk for rabies infection.
- Be familiar with wound care treatment and proper personal protective equipment (PPE) use.
- Understand protocol recommendations, dosages, precautions, contraindications, and adverse reactions of the rabies vaccines.
- Utilize the digital rabies exposure reporting form
- Identify indicators of human rabies cases.

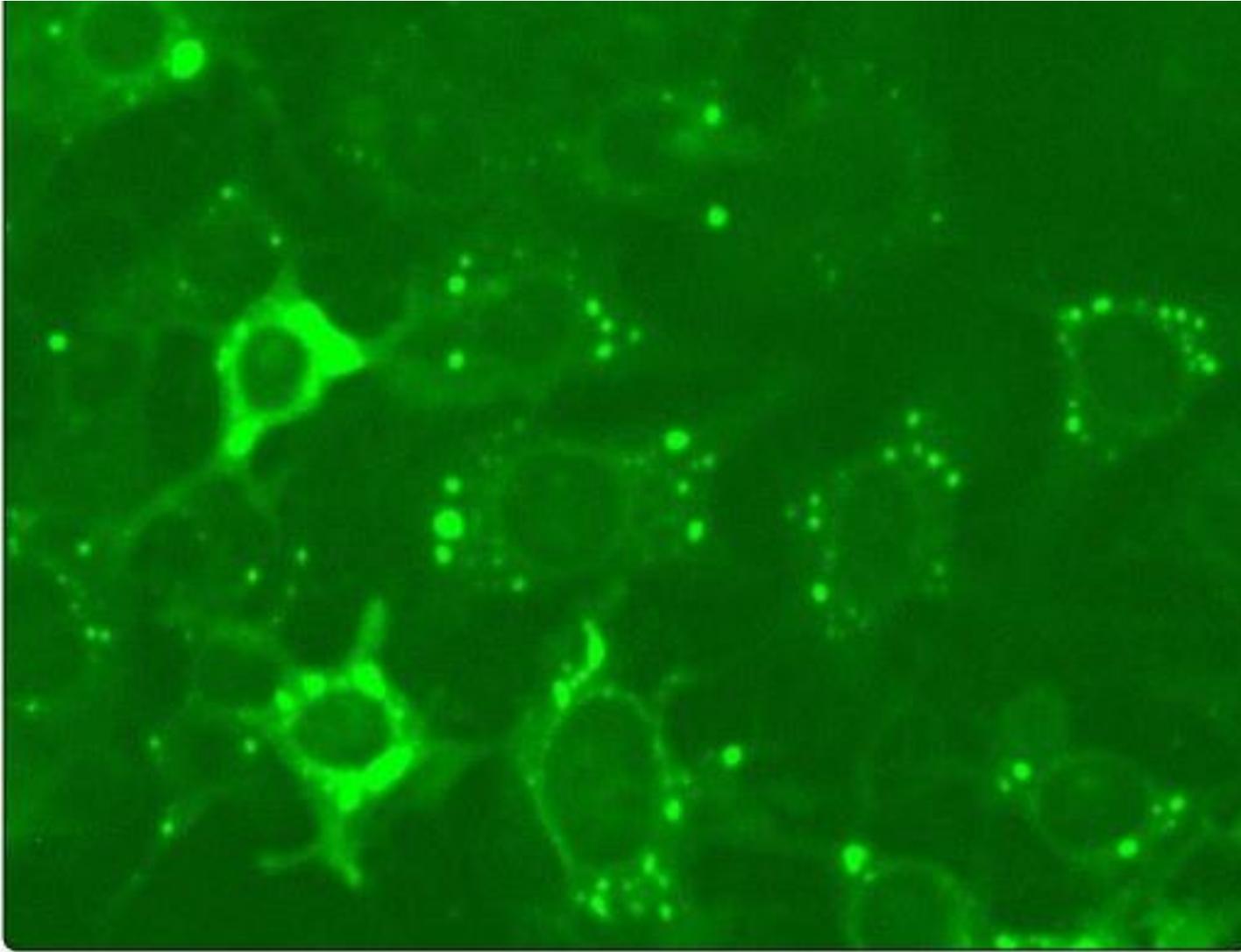


Figure 1a. Neuro 2-A cells with positive fluorescence.

What is Rabies?

**Douglas Riley, DVM,
International Health**

*State Public Health
Veterinarian*

[Delaware Department of
Health and Social Services](#)

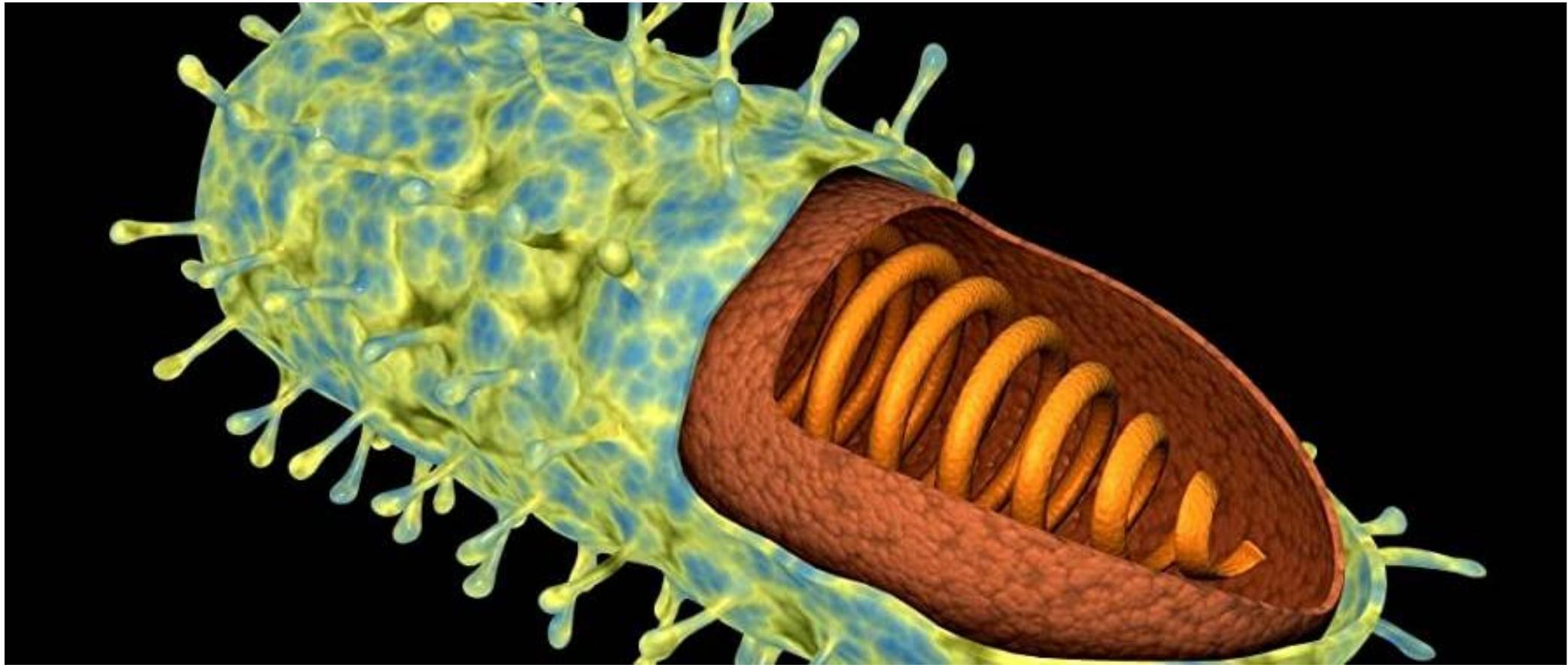
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Rhabdovirus

Rabies

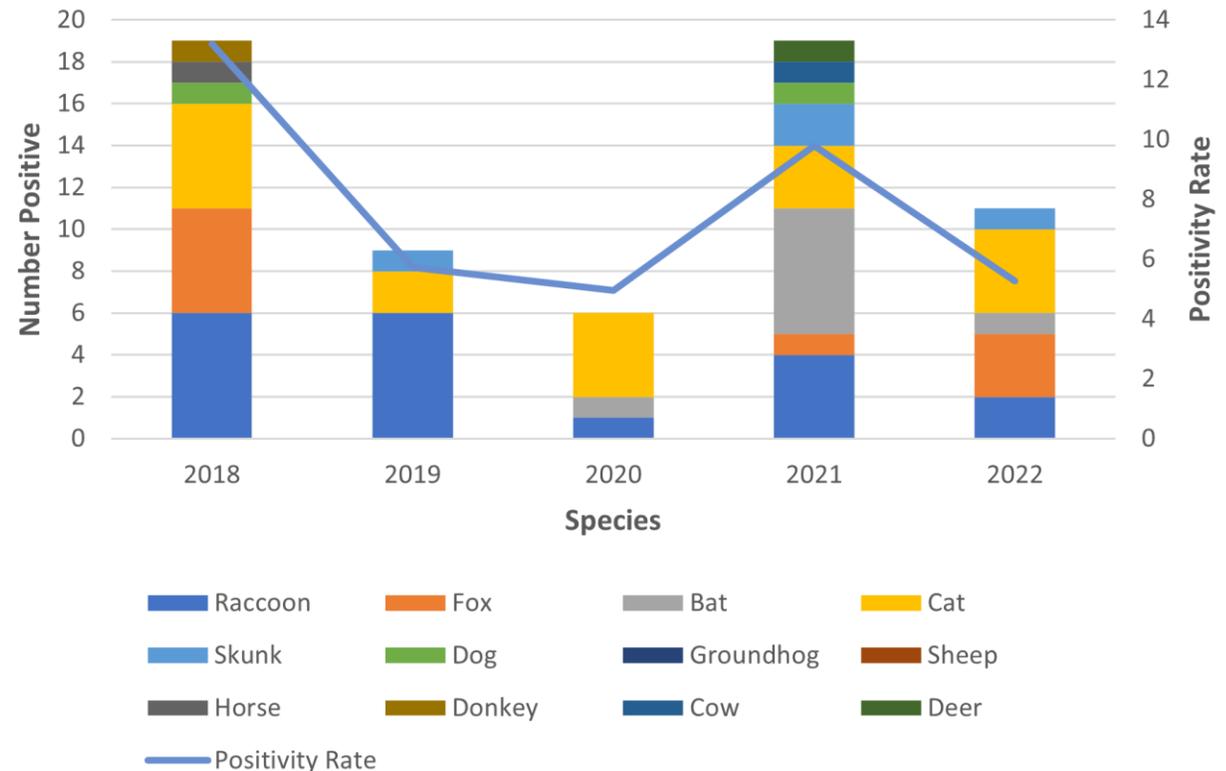
Nearly always fatal zoonotic
disease



Animal Rabies in Delaware

- In 2022...
 - 11 animal specimens tested positive for rabies
 - 198 animal specimens were tested in total
- Rabies Vectors
 - The raccoon, bat, cat and fox are some of most common rabies vectors for the state of Delaware
 - Stray/feral cats are frequently diagnosed with rabies due to human-animal interactions

Confirmed Rabies Cases by Year and Species with Positivity Rate, 2018-2022



*DISCLAIMER: The Delaware Public Health Laboratory primarily tests rabies vectors with a known human exposure(s). There have been a few exceptions where an animal suspected of having rabies was tested without a reported human exposure (i.e., animal v animal exposure, no exposure- surveillance purposes) although these are uncommon.

Human Rabies in Delaware

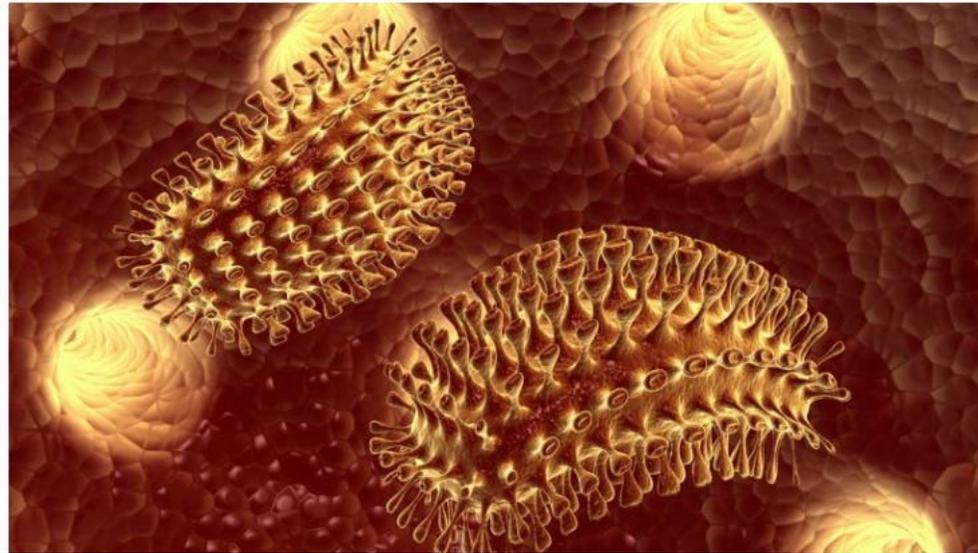
- In 2022...
 - 2,360 reports of potential human exposure to rabies
 - 637 recommendations for PEP provided by DPH
- In 2018...
 - Delaware detected its first case of human rabies since 1941
 - Kent County woman found to be infected with rabies
 - It is unknown how the woman contracted rabies, but stray cats were found to be living on her property

First confirmed human rabies death reported in Delaware since 1941

It's been 77 years since Delaware had a confirmed human death from rabies; the second in the United States this year.



By [Cris Barrish](#) · August 28, 2018

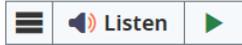


 The rabies virus. A Delaware woman died last week from the disease. It was the first human case in the state since a boy died in 1941. (Via shutterstock)

<https://why.org/articles/first-confirmed-human-rabies-death-reported-in-delaware-since-1941/>

Report of Potential Exposure to Rabies

- Potential human exposures to rabies are defined as situations where the saliva or brain/nervous system tissue of a potentially infectious animal is introduced into a bite wound, open cuts in skin (scratches from nail OR tooth), or onto mucous membranes such as the mouth or eyes. All exposures, regardless of vaccination status, should be reported to DPH within 24 hours.
- The Delaware Division of Public Health began collecting data on potential human exposures to rabies in a REDcap survey effective Jan. 1, 2022. This eliminates the need to complete and fax the exposure report to DPH. REDCap is a secure web application for building and managing online surveys and databases. To report a potential exposure to rabies please visit the link below and select 'Report a Potential Rabies Exposure'
<https://www.dhss.delaware.gov/dhss/dph/dpc/rabies.html>



Rabies

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It is the mission of the Bureau of Epidemiology to prevent and control the transmission of rabies to residents and visitors of Delaware.

For Providers

The Delaware Division of Public Health (DPH) will be collecting data on potential human exposures to rabies in a REDcap survey effective Jan. 1, 2022. This will eliminate the need to complete and fax the exposure report to DPH. REDCap is a secure web application for building and managing online surveys and databases. To report a potential exposure to rabies, please select 'Report a Potential Rabies Exposure' below.

Report a Potential Rabies Exposure

Rabies exposures are defined as situations where the saliva or brain/nervous system tissue of a potentially infectious animal is introduced into a bite wound, open cuts in skin (scratches from nail OR tooth), or onto mucous membranes such as the mouth or eyes. All exposures, regardless of vaccination status, should be reported to DPH in a timely manner. If you experience any technical difficulties completing the online survey, complete the PDF below and fax to 302-622-4149.

Potential Human Exposure to Rabies PDF

<https://www.dhss.delaware.gov/dhss/dph/dpc/rabies.html>



Resize font: Enable speech

Report of Potential Exposure to Rabies

Please complete the survey below.

Thank you!

For each exposure incident, complete the requested information for all persons exposed. A separate form must be utilized for each individual exposed. The Division of Public Health Rabies Epidemiologist can be consulted to determine the appropriateness of post-exposure prophylaxis (PEP). For human rabies disease prevention information contact the DPH Rabies Hotline 888-295-5156 (24/7) or 302-744-4990. Potential human exposures to rabies are defined as situations where the saliva or brain/nervous system tissue of a potentially infectious animal is introduced into a bite wound, open cuts in skin (scratches from nail OR tooth), or onto mucous membranes such as the mouth or eyes. All exposures, regardless of vaccination status, should be reported to DPH within 24 hours.

NOTE: An animal control officer will be visiting the residence of both the bite victim AND the pet owner in an effort to aid in the determination of risk and need for rabies post-exposure prophylaxis (PEP).

Incident type
** must provide value*

- Human Victim
- Animal Victim
- Human & Animal Victim

Submit

What animals can get rabies?

- Any mammal is capable of contracting the rabies virus
- The most common wild reservoirs of rabies are raccoons, skunks, bats, and foxes.
- Domestic mammals can also get rabies. Cats, cattle, and dogs are the most frequently reported rabid domestic animals in the United States.
- Small rodents (like squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, and mice) and lagomorphs (including rabbits and hares) are almost never found to be infected with rabies and have not been known to transmit rabies to humans.
- Birds, snakes, and fish are not mammals, so they can't get rabies and they can't give it to you.

Post Exposure Quarantine

- The Office of Animal Welfare will coordinate a ten-day post exposure quarantine for domestic animals identified as having potentially exposed a human
- The purpose of this quarantine is to determine risk of rabies
- Research shows that once the rabies virus is in the saliva of the animal, they will show signs of rabies and die within 10 days.
- As long as the offending animal is alive and well after day 10, there is no risk of rabies from the exposure. If the animal presents with symptoms of rabies and dies, it will need to be submitted for rabies testing.
- This does not work for animals other than cats, dogs and ferrets. Wild animals will need to be sent in for rabies testing.

Risk Assessment

What kind of animal was it?

Was the animal that bit or scratched you exhibiting symptoms of rabies? Ex: Stumbling, excessive drooling, and/or aggression.

If the offending animal is a domestic animal (cat, dog, ferret) is it current on its rabies vaccination?

Was this a provoked or unprovoked exposure?

Has the victim received the rabies vaccine in the past?

Positive Indicators for Rabies in Humans

- The first symptoms of rabies may be similar to the flu, including weakness or discomfort, fever, or headache.
- There also may be discomfort, prickling, or an itching sensation at the site of the bite
- Symptoms then progress to cerebral dysfunction, anxiety, confusion, and agitation.
- As the disease progresses, the person may experience delirium, abnormal behavior, hallucinations, hydrophobia (fear of water), and insomnia. The acute period of disease typically ends after 2 to 10 days.
- Negative test results for other etiologies of encephalitis
- Once clinical signs of rabies appear, the disease is nearly always fatal, and treatment is typically supportive.

Diagnostic Testing for Rabies in Humans

- No one specific test is sufficient for testing.
- Rabies is NOT a blood borne disease
- Samples collected for testing include, saliva, serum, spinal fluid, and skin biopsies of hair follicles

Saliva

- Virus Isolation/Reverse Transcription
- Followed by polymerase chain reaction (RT-PCR)

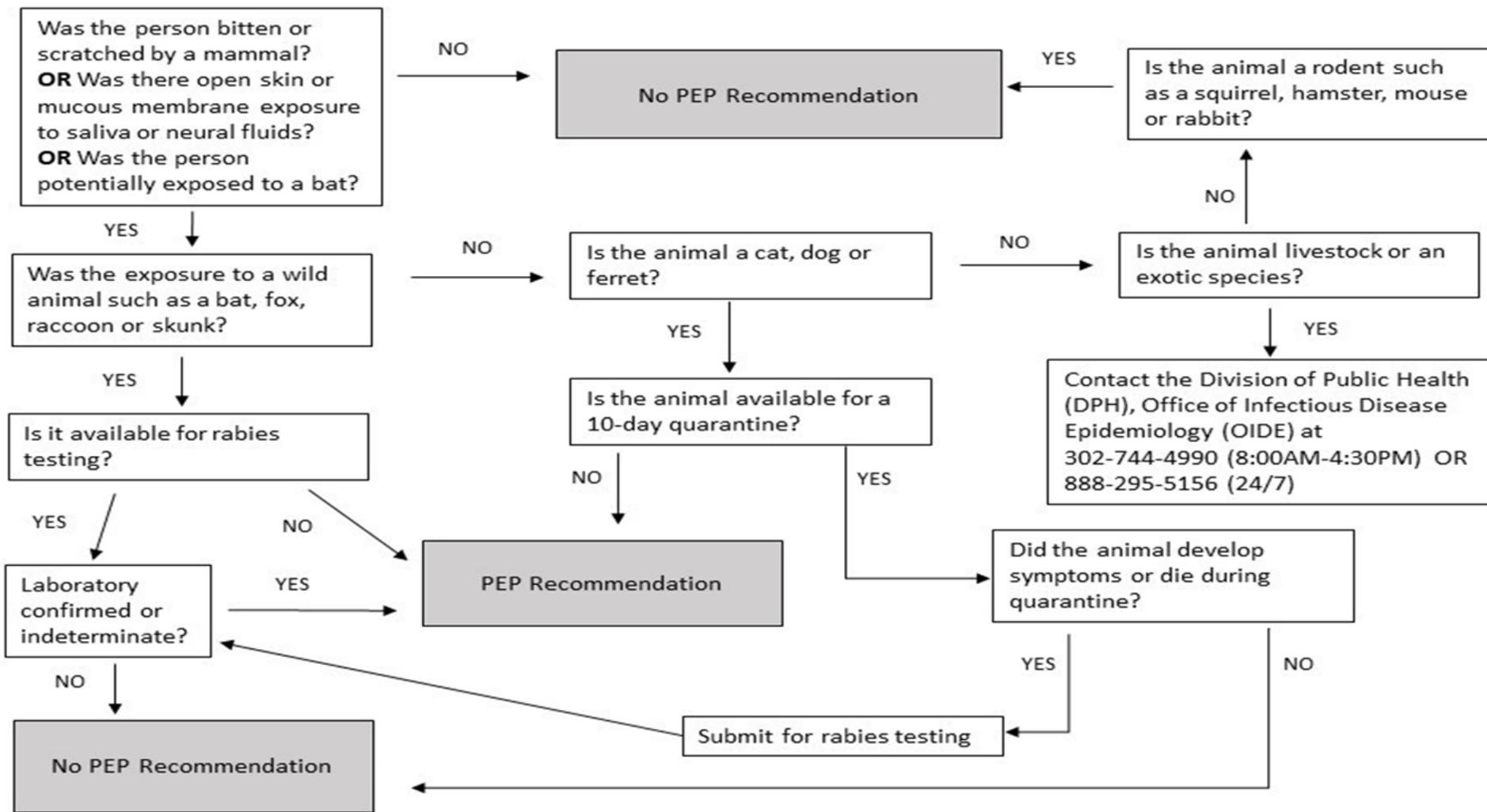
Serum and Spinal Fluid

- Tested for antibodies to rabies virus

Skin Biopsy Specimens

- Examined for rabies antigen in the cutaneous nerves at the base of hair follicles.

Human Rabies Post-Exposure Prophylaxis (PEP) Protocol



Rabies Biologics-Rabies Immunoglobulin

| Biologic | Product Name/Manufacture | Potency | Dose |
|---|--|-----------|----------|
| Human Rabies Immunoglobulin (HRIG) | <ul style="list-style-type: none"> Imogam®Rabies-HTexternal icon / Sanofi Pasteur KEDRABexternal icon™3 / Kedrion Biopharma and Kamada Ltd HyperRab™S/Dexternal icon / Grifols3 | 150 IU/ml | 20 IU/kg |
| Human Rabies Immunoglobulin (HRIG) | HyperRab®external icon3,4 / Grifols3 | 300 IU/ml | 20 IU/kg |
| Administration Route | Local infiltration around wound, with remaining immunoglobulin administered intramuscularly in an anatomical site distant from where vaccine was placed. | | |
| Indication | PEP for people have not received PrEP and have not received PEP previously according to APIC recommendations. https://www.cdc.gov/rabies/specific_groups/hcp/biologic.html | | |

Rabies Biologics-Rabies Human Vaccine

| Biologic | Product Name/Manufacture | Potency |
|--|---|--|
| Human diploid cell vaccine (HDCV) | Imovaxexternal icon [®] / Sanofi Pasteur | > 2.5 international units (IU) of rabies antigen |
| Purified chick embryo cell vaccine (PCECV) | RabAvertexternal icon [®] / GlaxoSmithKline | >2.5 IU of rabies antigen |
| Dose | Single dose vial of vaccine should be reconstituted with accompanying sterile diluent to final volume of 1mL before administration. | |
| Administration Route | Intramuscular in the deltoid area for adults, in the deltoid area or the anterolateral aspect of the thigh for children. Do NOT use the gluteal area for HDCV or PCECV. | |
| Indications | Pre-exposure AND post-exposure prophylaxis. | |

https://www.cdc.gov/rabies/specific_groups/hcp/biologic.html

Rabies Post-Exposure Prophylaxis (PEP)

| Vaccination Status | Intervention | Regimen* |
|----------------------------------|-------------------------------------|--|
| Not Previously Vaccinated | Wound Cleansing | All PEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent (e.g., povidone-iodine solution) should be used to irrigate the wounds. |
| | Human Rabies Immune Globulin (HRIG) | Administer 20IU/kg body weight. If anatomically feasible, the full dose should be infiltrated around and into the wound(s), and any remaining volume should be administered at an anatomical site (intramuscular [IM]) distant from the vaccine administration. Also, HRIG should not be administered in the same syringe as vaccine. Because RIG might partially suppress active production of rabies virus antibody, no more than the recommended dose should be administered. |
| | Vaccine | Human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (PCEV) 1.0mL, IM (deltoid area [†]), 1 each on days 0, [§] 3, 7 and 14. [¶] |
| Previously Vaccinated** | Wound Cleansing | All PEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent (e.g., povidone-iodine solution) should be used to irrigate the wounds. |
| | HRIG | HRIG SHOULD NOT BE ADMINISTERED |
| | Vaccine | HDCV or PCECV 1.0mL, IM (deltoid area [†]), 1 each on days 0 [§] and 3. |

Wound Care Treatment

- **Site Wound Care Treatment**

- Clean well with soap and water (do not scrub as it may damage tissue)
- Gently hold pressure with clean cloth to stop bleeding.
- If anatomically feasible, Human rabies immune globulin (HRIG) full dose of 20 IU/kg should be infiltrated around and into the wounds.
- Apply an antibacterial ointment to the clean wound.
- Apply a sterile dressing.
- Monitor for signs and symptoms of infection.

- **Personal Protective Equipment (PPE)**

- Standard Precautions
 - Gloves
 - Gown
 - Goggles
 - Mask



Pre-Exposure Prophylaxis (PrEP) Rabies vaccine

| Risk Categories | Who this typically affects | Recommendations |
|-----------------|---|---|
| Risk Category 1 | People who work with live concentrated rabies virus in laboratories | 2 doses, days 0 and 7 Check titer every 6months |
| Risk Category 2 | People who handle/have contact with bats/work in high-density bat environments, or perform animal necropsies | 2 doses, days 0 and 7 Check titer every 2 yrs |
| Risk Category 3 | People who interact with other mammals(other than bats) that have a high risk for carrying rabies, for a period longer than 3yrs after receiving PrEP | 2 doses, days 0 and 7 plus: One-time titer after 1yr and up to 3yrs following first 2-dose vaccination. OR 1-dose booster between 3wks and 3yrs following first 2-dose vaccination |
| Risk Category 4 | Same as Risk Category 3, but at a higher risk for less than 3yrs after receiving PrEP | 2 doses, days 0 and 7 |
| Risk Category 5 | General U.S. population | NONE |

Precautions or Contraindications for Rabies Vaccine

- **Immunosuppression**

- Treatments should be held during postexposure therapy unless necessary to treat other condition.
 - Corticosteroids, other immunosuppressive agents, anti-malarials, and immunosuppressive illnesses can interfere with the development of active immunity after vaccination
- PEP Recommendation: 4 dose vaccines schedule with an additional dose of vaccine on day 28 (1mL IM in deltoid on days 0, 3, 7, 14, and 28), & also HRIG on day 0.
- Rabies antibody should be evaluated by collecting/testing serum sample to determine effectiveness.

- **Pregnancy**

- Not contraindicated related to the potential consequences of rabies without postexposure prophylaxis.
- According to the CDC, Several studies have shown no indication of increased incidence of abortion, premature births, or fetal abnormalities associated with rabies vaccination.

- **Allergies**

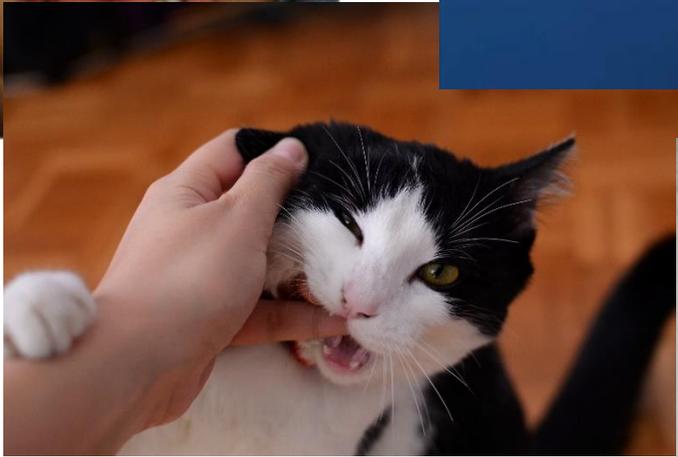
- Those that have a history of severe hypersensitivity to the rabies vaccine should be revaccinated with caution. It is ideal to vaccinate with the same vaccine (HDCV or PCEC), but if there is an allergic reaction with one, the other may be used to complete the series.

Rabies Vaccine Adverse Reactions

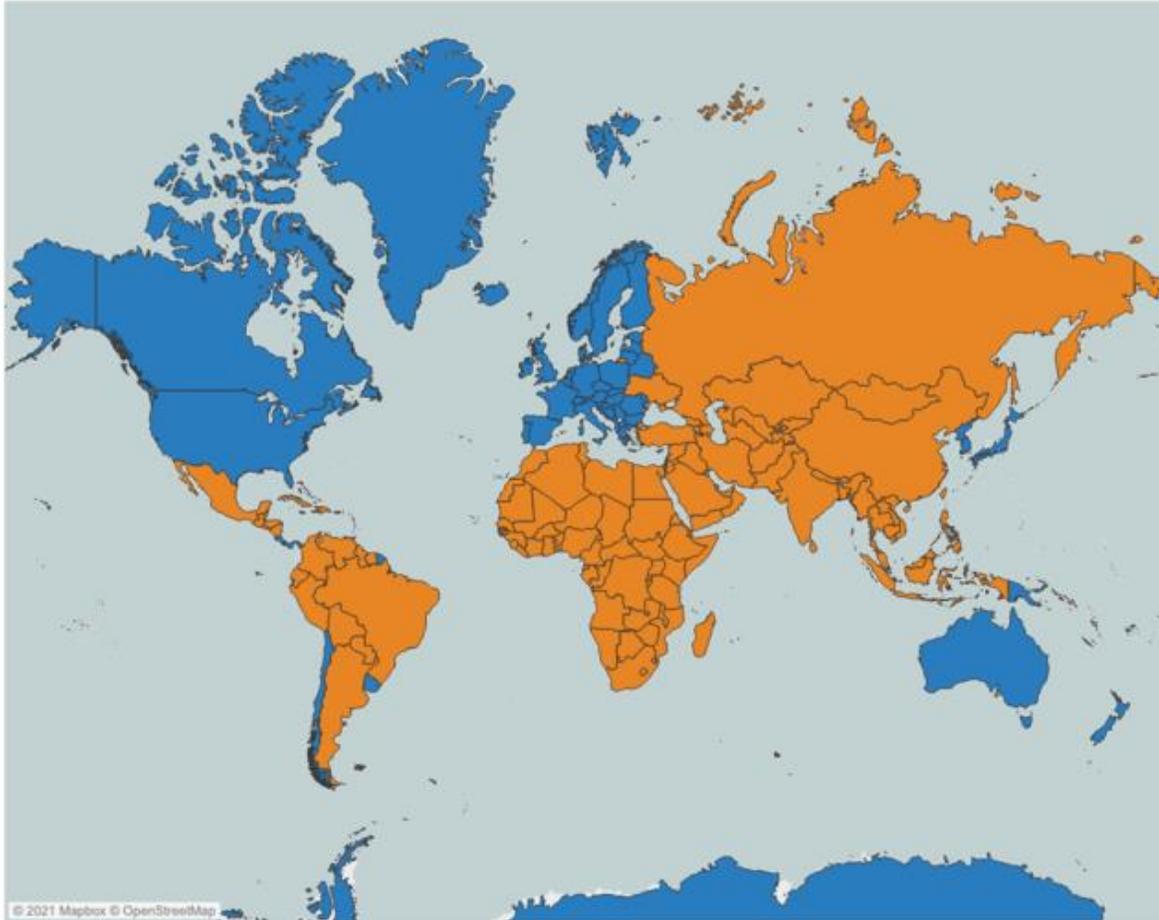
- **Human Diploid Cell Vaccine (HDCV)**
 - Injection site redness, pain, swelling, induration
 - Mild systemic reactions (e.g., fever, headache, dizziness, gastrointestinal symptoms)
 - Immediate systemic hypersensitivity reactions
 - Rare: Neurological reactions resembling Guillain-Barré syndrome and seizures
 - Other central and peripheral nervous system disorders have been temporally associated with HDCV vaccine.
- **Purified Chick Embryo Cell Vaccine (PCEC)**
 - Similar adverse events as HDCV with lower incidence
- **Human Rabies Immune Globulin (HRIG)**
 - Local reactions: pain/tenderness, erythema, and induration
 - Most common systemic reaction is headaches
 - Rare: seizure activity



Transmission of the virus



Global Rabies



This is the Global Dog-Rabies Endemicity Map. Orange countries are dog-rabies endemic, while Blue countries are free from dog-mediated rabies.

Note that some countries are free from dog-mediated human rabies, but remain dog-rabies Endemic.

Questions??



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Resources

- Centers for Disease Control and Prevention: [Information for Healthcare Providers | Specific Groups | CDC](https://www.cdc.gov/rabies/specific_groups/hcp/index.html);
https://www.cdc.gov/rabies/specific_groups/hcp/index.html
- Centers for Disease Control and Prevention: [Use of a Modified Preexposure Prophylaxis Vaccination Schedule to Prevent Human Rabies: Recommendations of the Advisory Committee on Immunization Practices — United States, 2022 | MMWR \(cdc.gov\)](https://www.cdc.gov/mmwr/volumes/71/wr/mm7118a2.htm?s_cid=mm7118a2_w);
https://www.cdc.gov/mmwr/volumes/71/wr/mm7118a2.htm?s_cid=mm7118a2_w
- Delaware Health and Social Services: [DPH Disease Information: Rabies - Delaware Health and Social Services - State of Delaware](https://www.dhss.delaware.gov/dhss/dph/dpc/rabies.html);
<https://www.dhss.delaware.gov/dhss/dph/dpc/rabies.html>
- [World Health Organization: Rabies \(who.int\)](https://www.who.int/news-room/fact-sheets/detail/rabies); <https://www.who.int/news-room/fact-sheets/detail/rabies>

