

Investigation of Human Rabies in a School-Aged Medina County Resident, Texas 2021

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Outline

- Rabies Overview
- Case Investigation
 - Hospital Exposures
 - Community Exposures
- Outcomes
- Summary & Conclusion



Rabies Overview



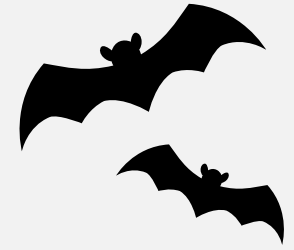
Rabies Overview

Rabies is a Fatal Viral Zoonotic Disease

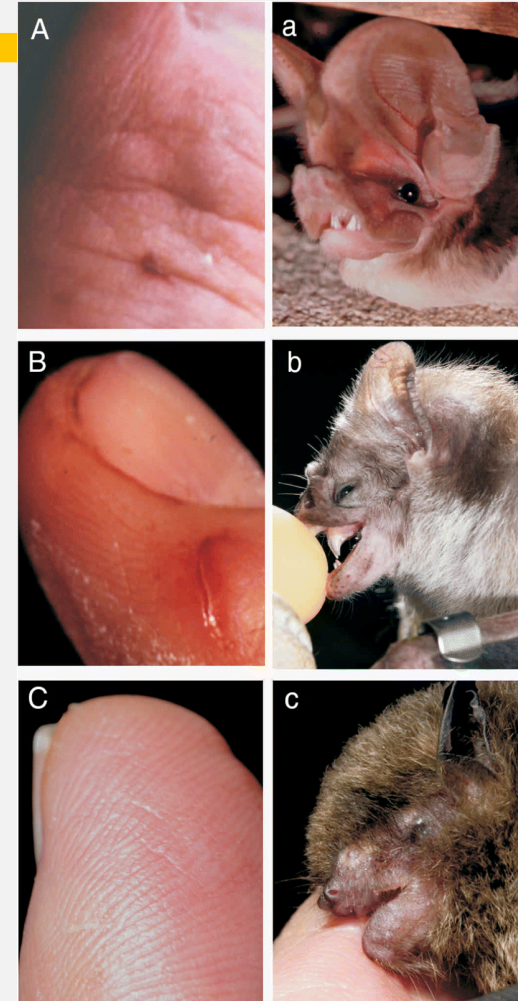
- Virus is shed in secretions of infected mammals:
 - Saliva
 - Central Nervous System (CNS) tissues
- Transmission:
 - **Bites** or **scratches** containing infectious saliva
 - Contact of **mucous membranes** or **broken skin** with infectious material
- 100% fatal without post-exposure treatment



Rabies Overview



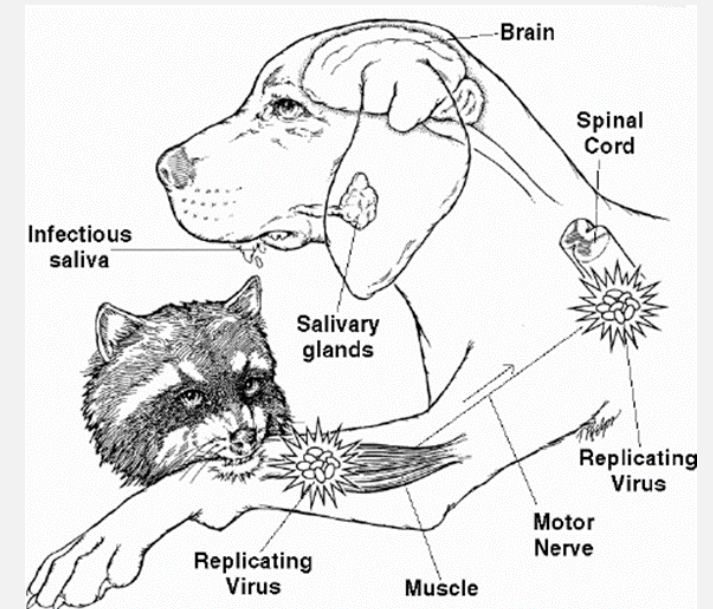
- Contact with a **bat** is considered high risk for rabies exposure, even if the person does not recall a bite or scratch.
 - Bites are hard to detect and/or feel
 - Humans infected with bat rabies rarely have a documented or visible bite
- Consider a potential exposure if:
 - A known bite or scratch from a bat
 - Person wakes to bat in bedroom
 - Bat flying into, against, or landing on a person
 - Bat found near unattended child or a person who is sensory or mentally challenged



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Incubation Period

- Rabies virus is highly *neurotropic*
 - Travels through peripheral nerves to the CNS
- Incubation period (time from exposure to signs of infection):
 - Variable incubation period
 - Average 3-8 weeks
- Rabies virus mainly infects neurons, and neuroinvasiveness is the major defining characteristic of a classical rabies infection.



Rabies in Animals

- Initial signs:
 - Apprehension, restlessness, diet changes, vomiting, salivation
 - Neurologic signs and/or behavior change
- Two common presentations:
 - Furious Form – agitation, aggression, seizures
 - Paralytic Form – paralysis, coma, death

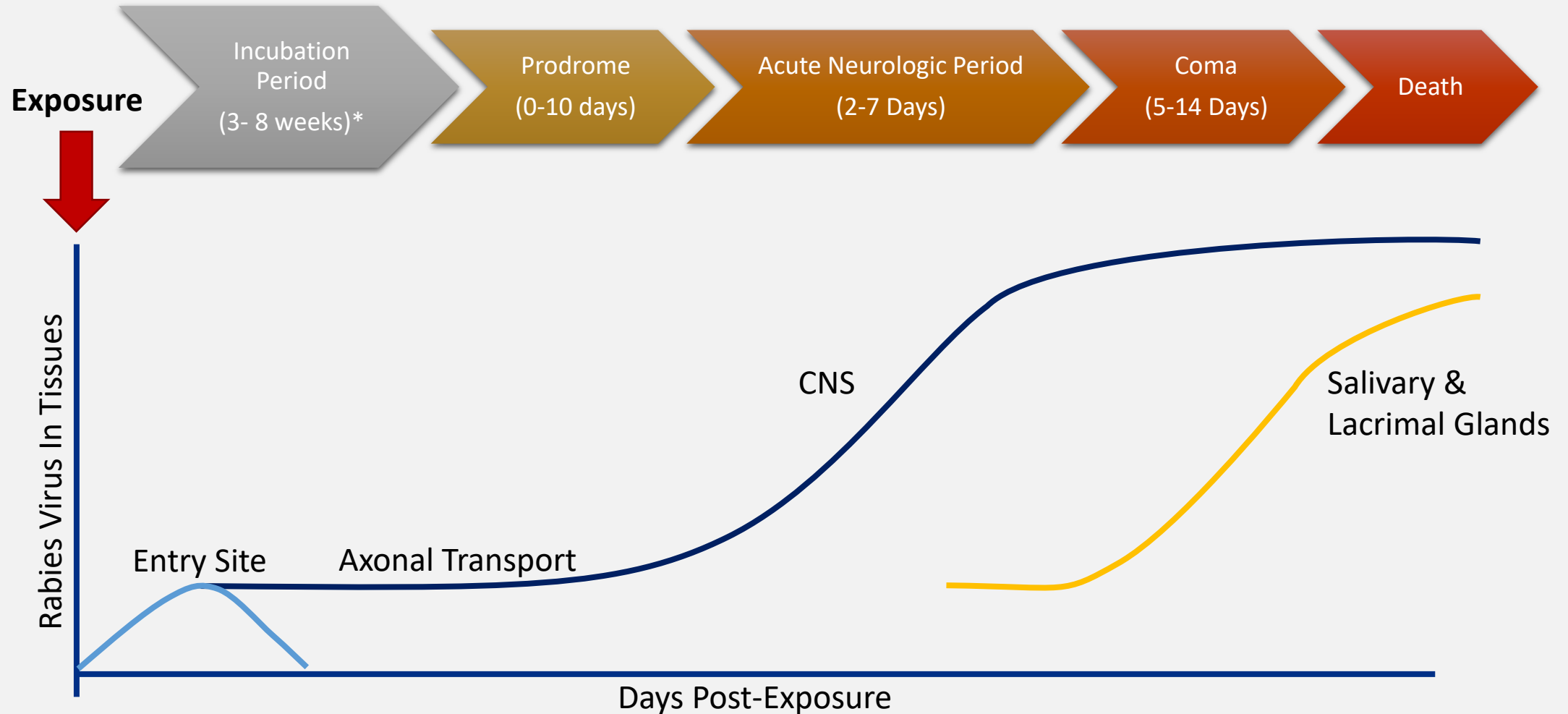


Rabies in Humans

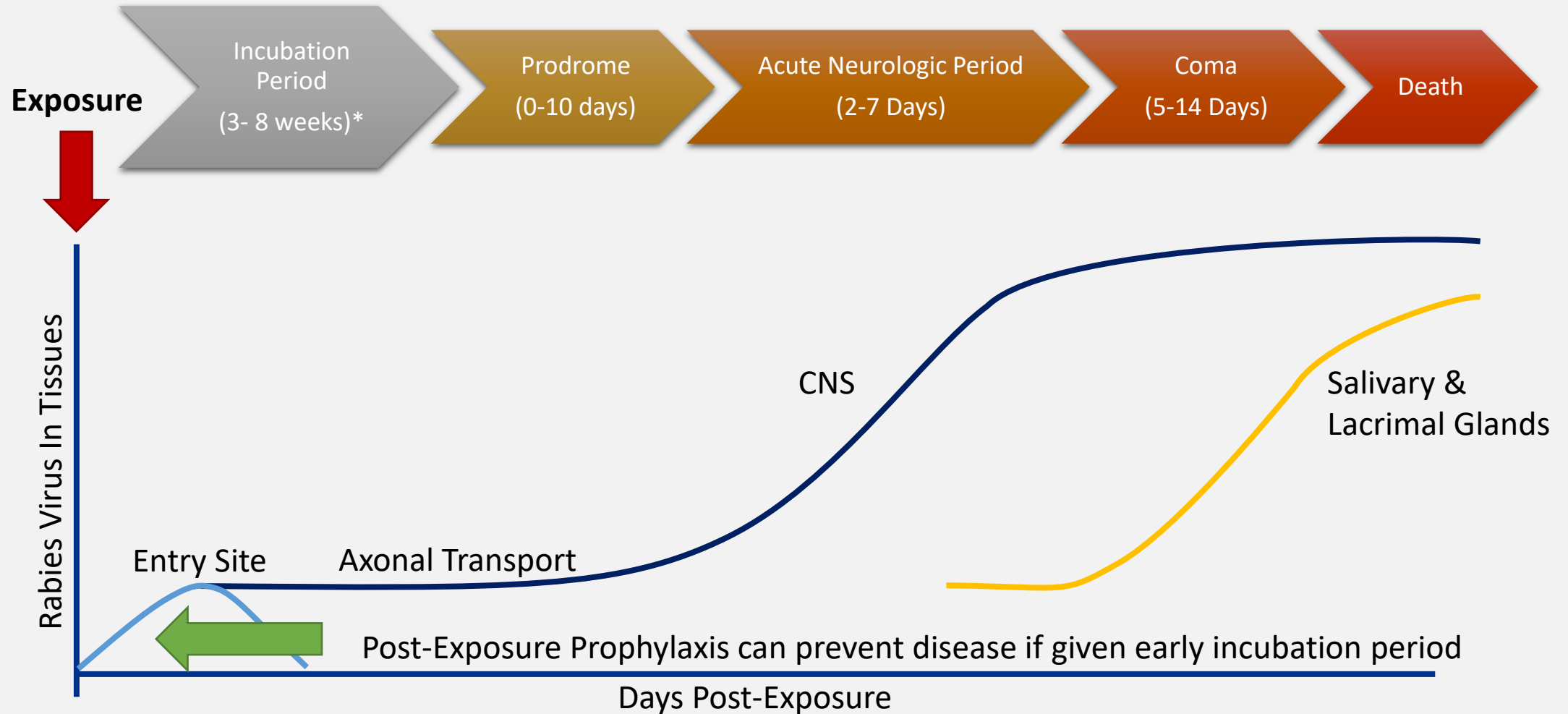
- Rare in United States – 0-3 cases per year
- Initial Symptoms:
 - Flu-like illness (headache, fever, fatigue)
 - Unusual sensation or itching at bite site
- Rapid progression of neurologic dysfunction
 - Anxiety, confusion, agitation
 - Delirium, hallucinations, insomnia
- Death within days to weeks after symptom onset



Rabies Pathogenesis



Rabies Pathogenesis



Management of Human Rabies

- No single effective treatment once clinical signs have started
- Supportive therapy
- Experimental/combination treatments
 - Rabies Vaccine
 - Rabies immunoglobulin
 - Monoclonal antibodies
 - Antivirals: Ribavarin
 - Immunomodulators: Interferon- α



Human Rabies Suspects

- **What is the date of onset?**
 - Rabies infection is unlikely in a patient who has an extended duration of illness.
- **Is the patient comatose/intubated or has their condition improved?**
 - The course of rabies is typically rapidly progressive and fatal. Rabies can usually be ruled out in the majority of patients whose conditions improve.
- **Has limited access to the patient been established?**
 - If the health care facility is considering rabies as a differential, the patient should be placed on isolation precautions immediately.
- **Is there a history of animal exposure?**
 - If the answer is no, why is rabies being considered? Important to identify the possible route of exposure.



Human Rabies Suspects

- CDC Rabies Epi Group Consultation & Testing Approval
- Specimen Submission
 - Saliva
 - Nuchal Biopsy
 - Serum & CSF
- Submission Guidelines Available at CDC

http://www.cdc.gov/rabies/specific_groups/doctors/ante_mortem.html
<https://www.cdc.gov/rabies/pdf/rorform.pdf>



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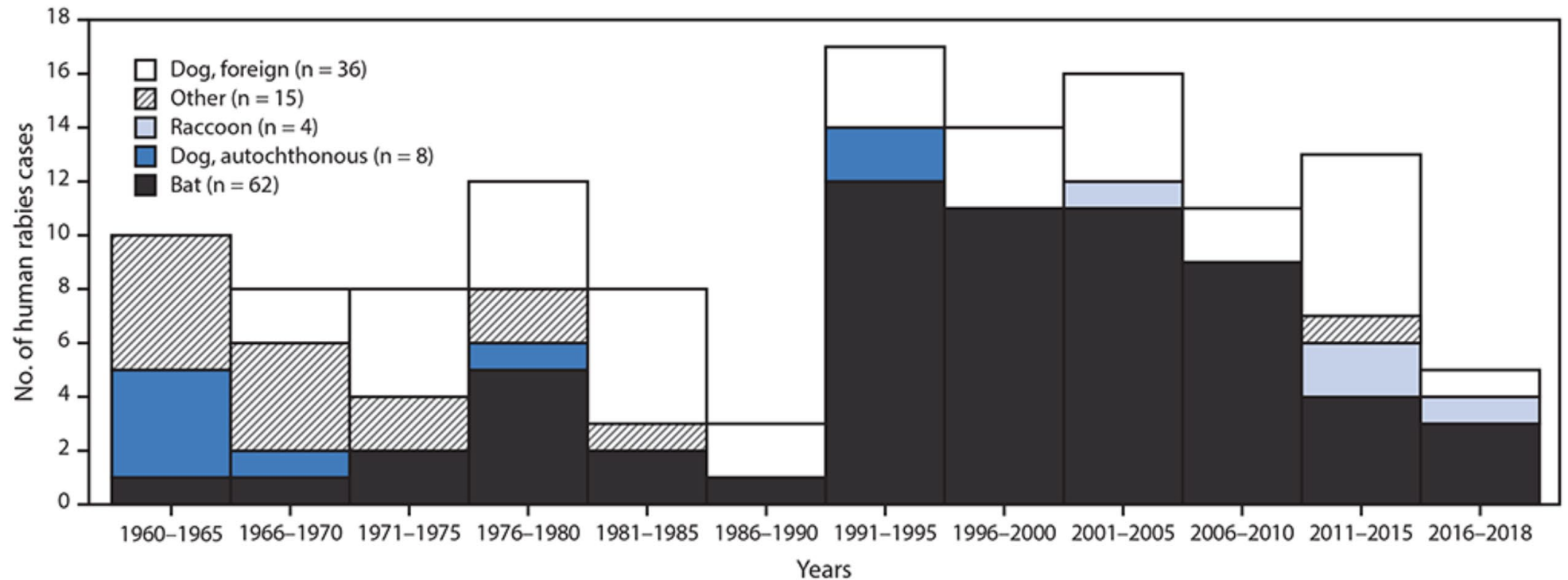
Human Rabies Exposures

- There has never been a confirmed case of human-to-human transmission of rabies virus, with the exception of organ/tissue transplantation.
- If the patient tests positive for human rabies, immediate contact tracing for PEP will be necessary
- Considerations:
 - Patient confidentiality
 - Availability of PEP
 - Contact definitions
 - Risk stratifications
 - Original animal source



Human Rabies Cases in the US

FIGURE 2. Rabies virus variants* associated with human rabies cases (N = 125)[†] — United States, 1960–2018



* Other rabies virus variants included skunk, fox, and unknown.

Pieracci EG, Pearson CM, Wallace RM, et al. *Vital Signs: Trends in Human Rabies Deaths and Exposures — United States, 1938–2018*. MMWR Morb Mortal Wkly Rep 2019;68:524–528. DOI: <http://dx.doi.org/10.15585/mmwr.mm6823e1external icon>



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Human Rabies Cases in Texas

YEAR (onset)	Female	Male	Exposure Source	Variant	Total
1972		1	Laboratory Aerosol	Unknown	1
1976		1	Dog	DDC	1
1978		1	Unknown	Unknown	1
1979	1	1	Dog	DDC	2
1984	1		Dog	Not Typed	1
1985		1	Dog	DDC	1
1990		1	Bat	Tb	1
1991	1		Dog	DDC	1
1993		1	Bat	Ln/Ps	1
1994		1	Dog	DDC	1
1997		1	Bat	Ln/Ps	1
2004*	2	1	Bat	Tb	3
2006		1	Bat	Tb	1
2009^	1		Bat	Not Typed	1
2013		1	Dog	Not Typed	1
2021		1	Bat	Tb	1
Grand Total	6	13			19

Variant: DDC=Domestic Dog/Coyote; Tb=*Tadarida brasiliensis*; Ln/Ps=*Lasionycteris noctivagans*/*Perimyotis subflavus*

***Transplantation acquired** [Centers for Disease Control and Prevention (CDC). Investigation of rabies infections in organ donor and transplant recipients--Alabama, Arkansas, Oklahoma, and Texas, 2004. *MMWR Morb Mortal Wkly Rep.* 2004;53(26):586-589.]

^**Survived** [Centers for Disease Control and Prevention (CDC). Presumptive abortive human rabies - Texas, 2009. *MMWR Morb Mortal Wkly Rep.* 2010;59(7):185-190.]



Prevention of Rabies

- **Pre-Exposure Prophylaxis** for those most likely to have contact with virus
- **Post-Exposure Prophylaxis** for those exposed to potentially infectious virus
- Additional Strategies:
 - Prompt reporting of animal bites
 - Quarantine and/or testing of suspect animals
 - Vaccination of domestic animals



Post-Exposure Prophylaxis (PEP)

- **HRIG – Human Rabies Immunoglobulin**
 - Given on Day 0
 - Infiltrated at the site of a bite or wound
 - Provides human antibodies, and immediate, temporary protection
- **Rabies Vaccination**
 - Vaccine given at days 0, 3, 7, 14, +/- 28 in deltoid

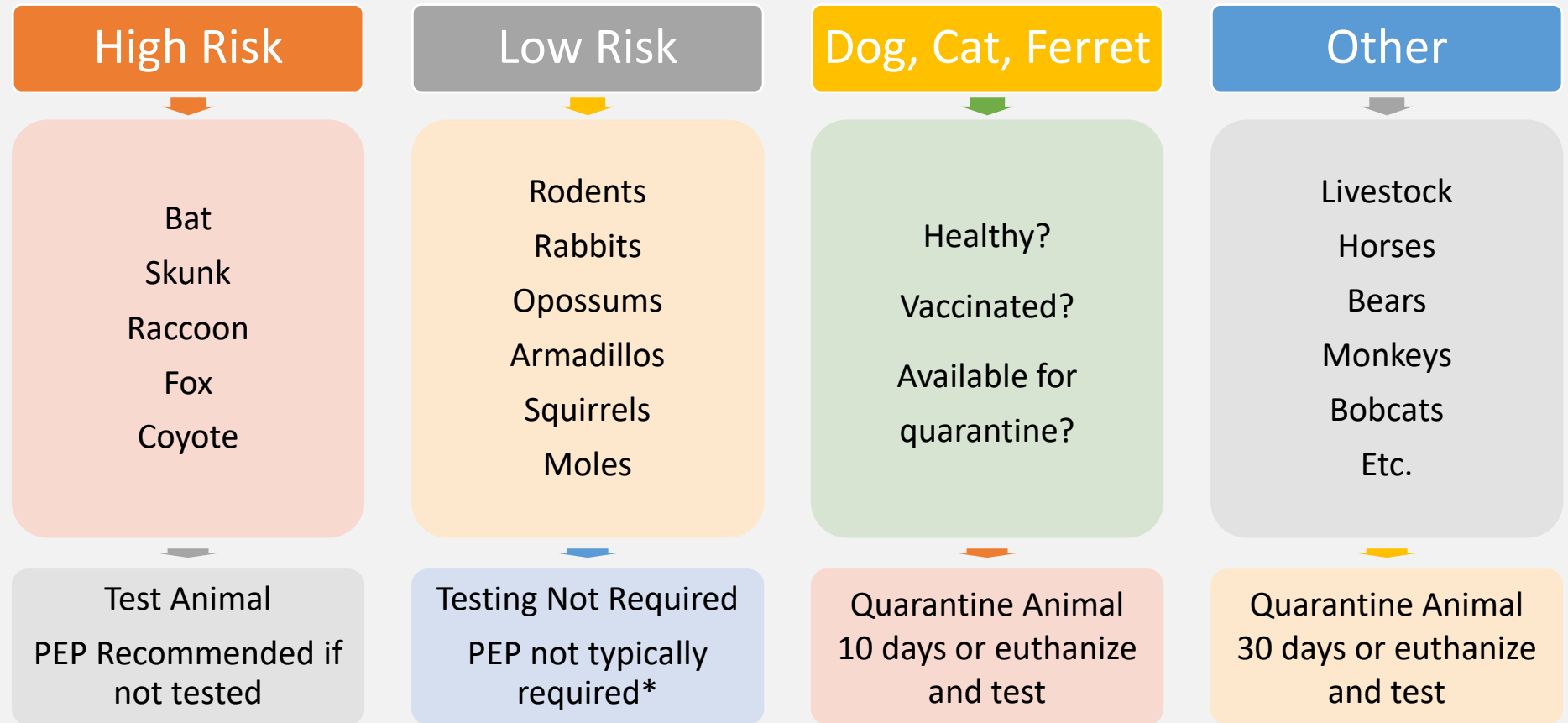


Post-Exposure Prophylaxis (PEP)

- Who needs Post-Exposure Prophylaxis?
 - Anyone with a valid rabies exposure
- ACIP Guidelines
 - For unvaccinated persons, the combination of both HRIG and vaccine is recommended for both bite and non-bite exposures, regardless of the time interval between exposure and initiation of PEP.
 - If HRIG was not given when rabies vaccination was begun, it can be given up to and including day 7 of the PEP series



Human Rabies Exposures



PEP recommended if animal:
→ Shows rabies symptoms
→ Tests positive for rabies
→ Unavailable for quarantine or testing



Case Investigation



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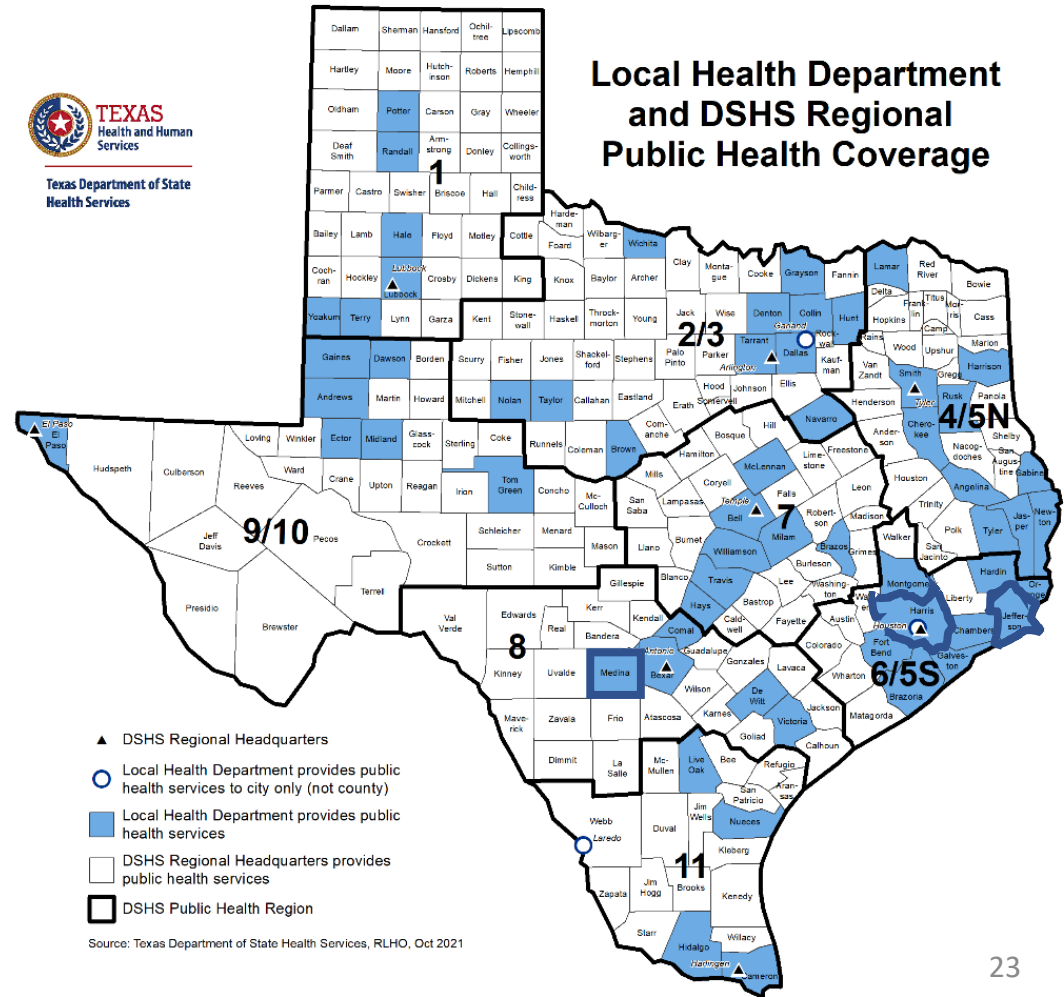
2021 Human Rabies Case, TX

- Case Introduction
- Diagnosis
- Clinical Course
- Contact Investigation
 - PHR 6/5 – Healthcare
 - PHR 8 – Community & Family
- Summary & Conclusions



Case Introduction

- 7-year old, male
- Medina Co. resident



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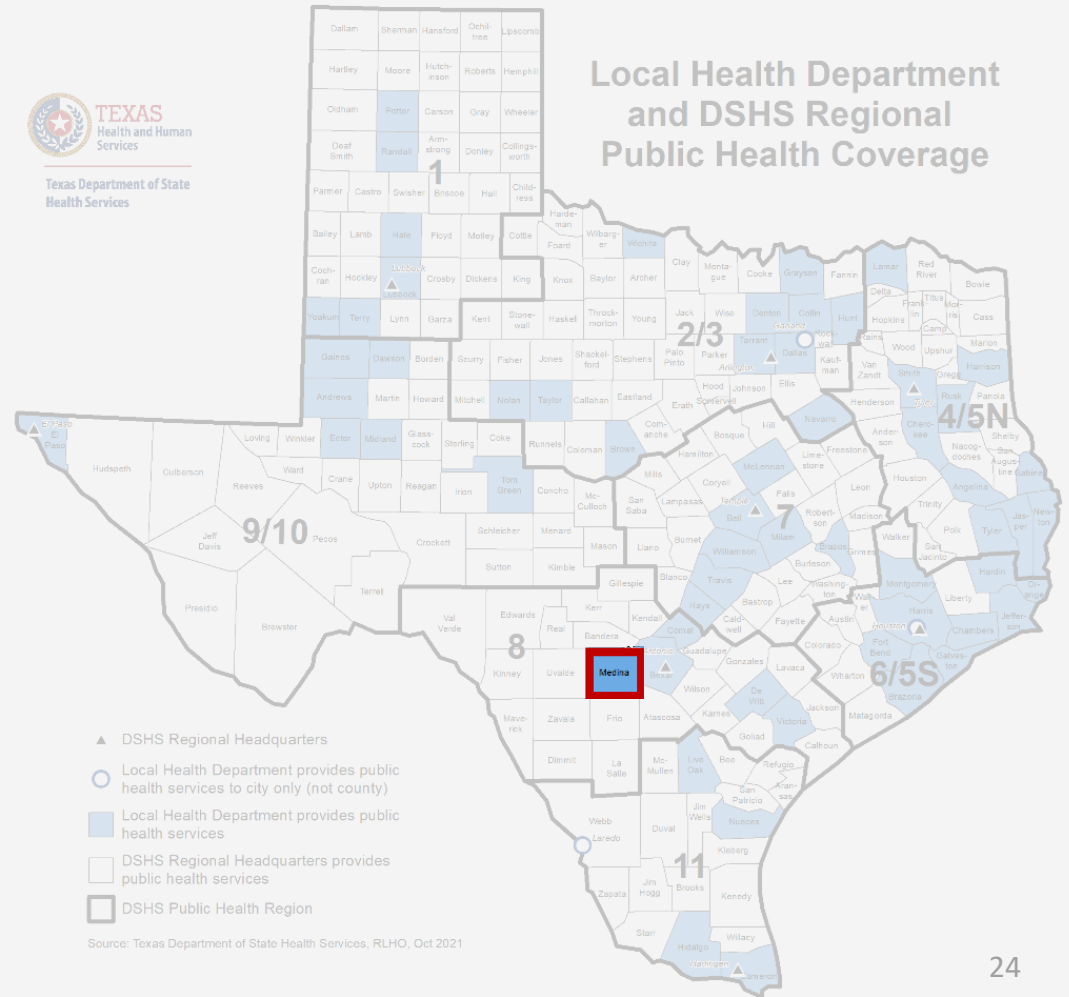
Case Introduction

Rabies exposure

- Late summer 2021
- Bitten by bat
- No visual bite marks
- No medical care
- No PEP



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Case Introduction

October 2021

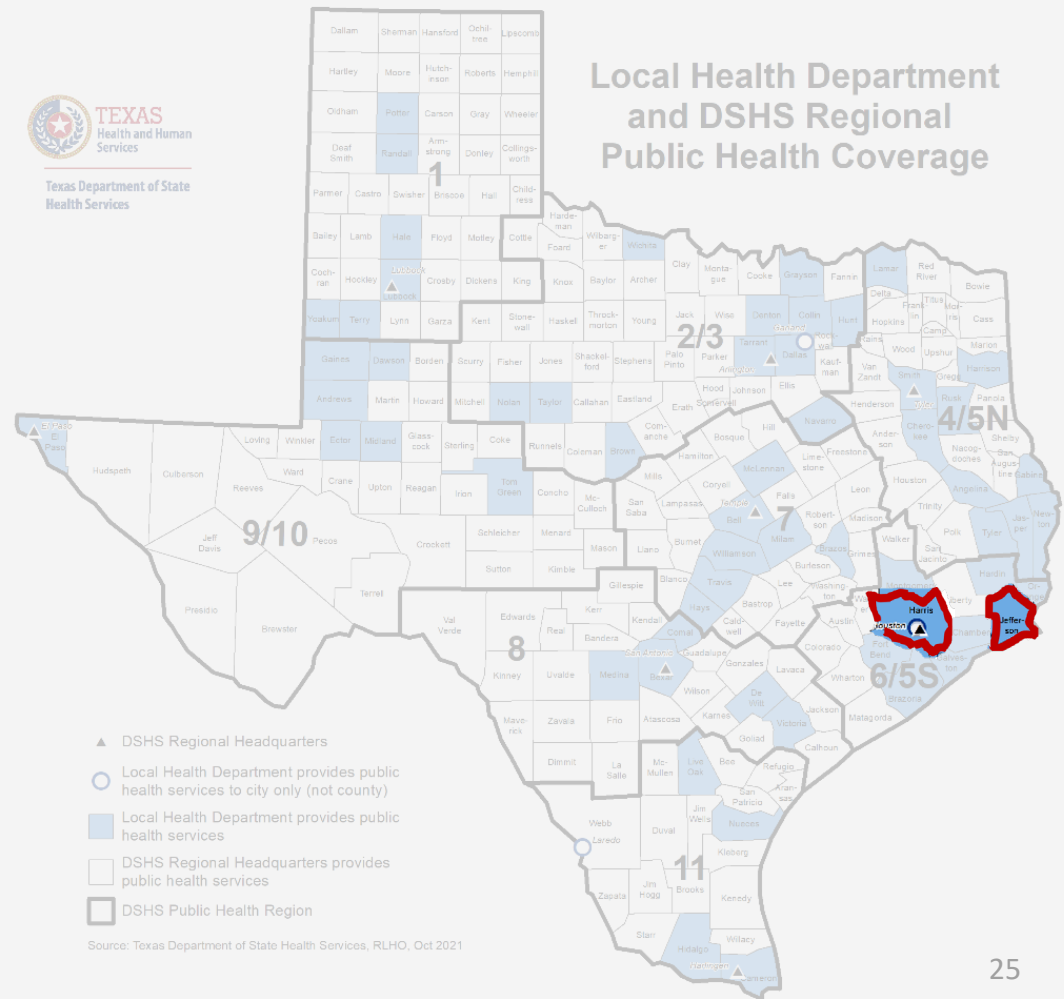
Hospital A – x1

Hospital B – x3

Hospital C – admission



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Diagnosis and Care

- Encephalitis suspected
- Infectious disease consult elicited bat exposure history
 - Rabies became primary differential
 - CDC consult and approval for sample submission
- Rabies confirmed via PCR
 - WGS identified Mexican free-tailed bat variant
- Experimental therapies
 - Patient expired on hospital day 18



Contact Tracing

Infectious Period

2 weeks before symptom onset.

Contact

Individual having any contact with patient during infectious period.

Exposure

Any contact with known or suspected exposure to infectious secretions.



Specific Exposure Criteria: Healthcare

- Contact with tears, saliva, respiratory secretions, or CSF
 - Self contamination with infectious material
 - No PPE within 6ft of aerosol generating procedure
 - [Bites]
-
- Reviewed each assessment
 - Identified High Risk referred for PEP



Specific Exposure Criteria

Close Contacts:

- Close Contacts
 - Kissing patient on the mouth
 - Sharing food, drinks, gum or oral hygiene products
 - Mucous membrane or broken skin contact with saliva or tears
 - Bitten by the patient
 - [Sharing a cigarette]



Exposure Assessments

- Interview-Based Assessment Survey Tool
- Criteria for Interview:
 - Contact with patient during infectious period AND
 - Contact with the patient's saliva or tears during infectious period
- Yes, No, or Unknown Responses



Healthcare Exposures

Setting	Contacts	Met Exposure Criteria	Received PEP
Hospital A	5	5	1
Hospital B	29	0	0
Hospital C	84	0	0
Healthcare Totals	118	5	1



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Community Exposures

- Community & Family Contacts:
 - Public School Staff & Students
 - Martial Arts Program Staff & Students
- Patient attended public school and an extra-curricular martial arts program every weekday within infectious period
- Advisories sent to identified contacts
- DSHS press release informing public that at-risk contacts had been identified



DSHS Investigates Rare Human Case of Rabies

News Release

Oct. 29, 2021

The Texas Department of State Health Services is investigating a case of rabies in a child who was bitten by a bat. The child is a resident of Medina County and is currently receiving care in a Texas hospital.

Public health personnel have identified all places where someone could have come into contact with the bat or the rabies patient and directly contacted anyone who may have been exposed. Health officials are assessing them to determine their risk and whether they should receive post-exposure vaccination to prevent them from getting sick with rabies. People who need to be assessed have received a phone or written notification from DSHS. Those who were not contacted have no need for concern over this situation.

Rabies is a viral illness that usually spreads through the bite of an infected animal. It may also be possible to transmit the virus if infected saliva enters the eyes, nose or mouth or a break in the skin. Once someone becomes sick with rabies, it is almost always fatal. However, the illness is preventable if rabies vaccine and immune globulin are administered before symptoms start.

There are a number of things people can do to help stop the spread of rabies:

- Never approach wild animals.
- If bitten or scratched by a bat or any other animal, wash the wound immediately with soap and water. Then, seek medical attention to be assessed for potential rabies exposure.
- Ensure domestic dogs and cats are up to date on rabies vaccination, as required by state law.
- Consider protecting livestock and domestic ferrets by vaccinating them.

In Texas, skunks and bats account for most animal rabies cases, but any mammal can become infected and potentially spread it to other animals or humans. Last year, nearly 600 animals tested positive for rabies across all regions of the state; about half were bats.

The last human case of rabies in a Texas resident was in 2009. DSHS will not release any additional information about the current rabies patient to protect the patient's identity. Additional information on rabies in Texas is available at dshs.texas.gov/idcu/disease/rabies.aspx.



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Risk Assessments

Risk Stratification	Contact During Infectious Period	Contact with Saliva or Tears	# of Answers to Exposure Questions
High	Yes	Yes	1 or more Yes answers
Medium	Yes	Yes or Unknown	1 or more Yes or Unknown answers
Low	Yes or Unknown	No or Unknown	No to all
None	No or Unknown	No	No to all

Exposure Criteria:

- Known or suspected exposure to infectious secretions during the infectious period



Post Exposure Prophylaxis

- All clients that met exposure criteria (regardless of risk) were advised to consult with a medical provider about whether PEP was indicated
- ACIP Guidelines & Resources
- Local hospitals and physicians advised of potential increased demand for PEP in their communities
 - Email notice to infection preventionists
 - STRAC alert to area physicians
 - Phone calls to closest hospitals



Funeral Considerations

- Recommendation
 - Closed casket
 - No embalming or cremation
- Embalming
 - $\geq 2\%$ formalin concentration; 10% sodium hypochlorite solution
 - Full personal protective equipment
- Funeral
 - Avoid physical contact



Exposures

Setting	Contacts	Met Exposure Criteria	Received PEP
Community	49	46	34
Family	10	6	7
Hospital A	5	5	1
Hospital B	29	0	0
Hospital C	84	0	0
Totals	177	57	42

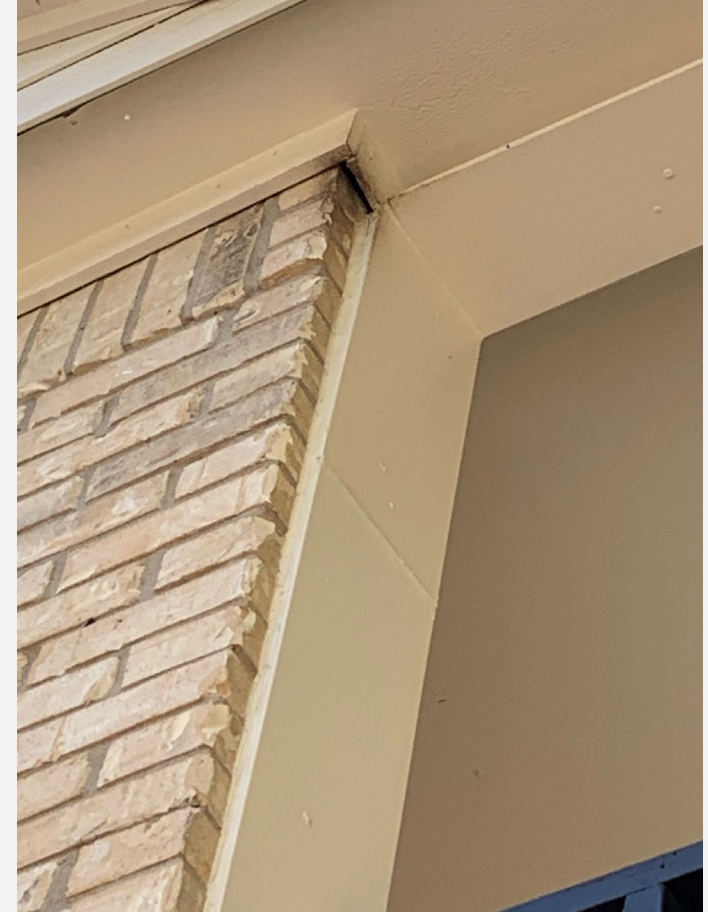


Apartment Complex Investigation

- Apartment complex where family resided and where bat exposure occurred
- Advisories sent via email and hard copy to notify residents of rabies risk from bat contact
- Advisories followed up with direct phone contact
- Of 175 residents, 124 responded for interview
 - 0 reported contact or exposure to bats
 - 24 reported sightings of bats in or around the complex
 - Animal control was able to identify bat colony location



Apartment Complex



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Apartment Complex



Outcomes

- This case marked the first human rabies death in a Texas resident since 2009, and one of five reported US human rabies deaths in 2021.

CDC Reports Increase in Human Rabies Cases Linked to Bats in the U.S.

Three U.S. rabies deaths in just five weeks

Press Release

Embargoed Until: Thursday, January 6, 2022, 1:00 p.m. ET

Contact: [Media Relations](#)

(404) 639-3286

The Centers for Disease Control and Prevention (CDC) is raising awareness of the risks of [rabies](#) from bats in the U.S. after three people, including one child, died from rabies between late September and early November 2021. The three cases, described in the January 6, 2022, Morbidity and Mortality Weekly Report, bring the total number of cases in 2021 to five, compared to no reported rabies cases in people during 2019 and 2020.

Conclusions

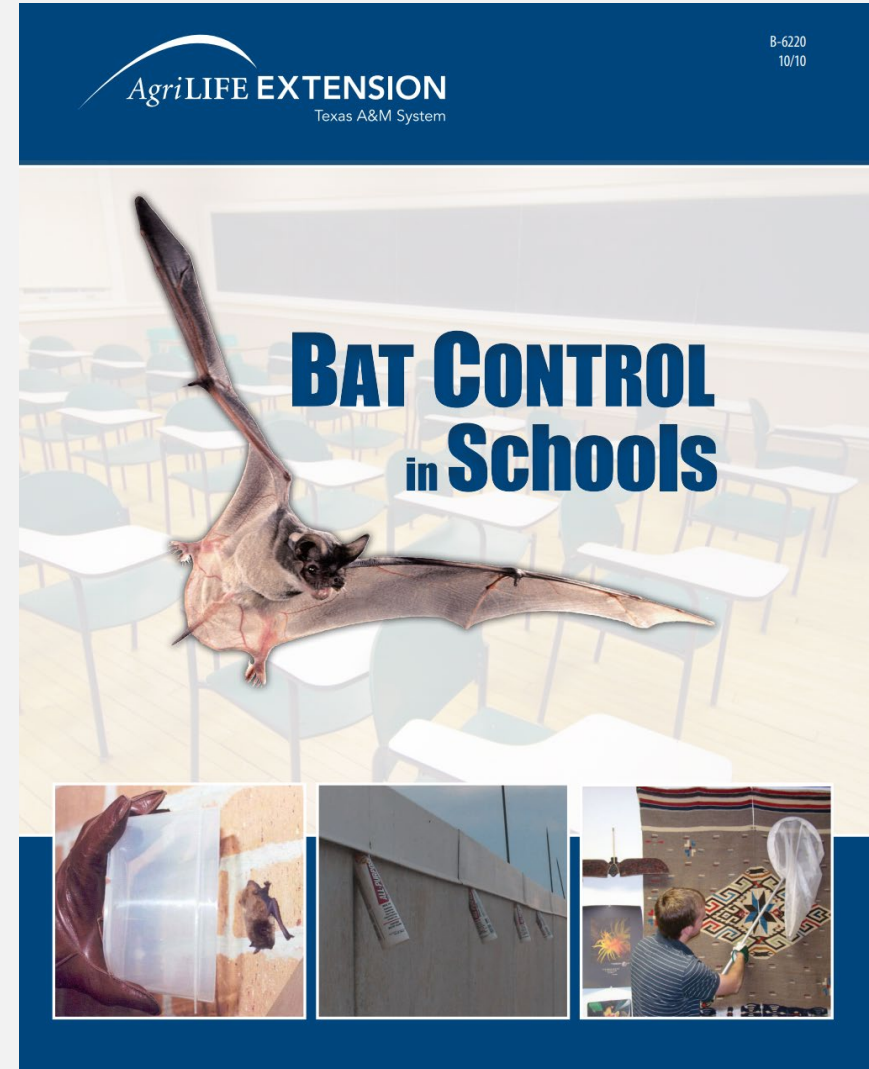
- 5 Human Rabies Deaths in 2021
 - TX, ID, IL, MN, NY
- Exposures
 - 4 out of 5 deaths were caused by bats
 - 2 did not report their exposure or seek PEP
 - 1 refused PEP
 - 1 received PEP but PEP failed due to previously unknown immune condition
 - 1 death caused by dog bite in Philippines

Conclusions

- Rabies is most commonly transmitted to humans after contact with rabid animals. Death is preventable when postexposure prophylaxis (PEP) is promptly administered.
- Bats are the most common source of rabies in the United States
- There has been no documented case of human-to-human transmission of rabies in the United States
- The public, including pediatricians, parents, and children, should know to avoid contact with bats and wild animals and to seek medical care or consultation if a bite or any other contact occurs

Public Health Follow-Up

- Community Engagement
- DSHS Website:
 - <https://dshs.texas.gov/idcu/disease/rabies/>
- Rabies Prevention in Texas
 - <https://www.dshs.texas.gov/grandrounds/Rabies-Prevention-in-Texas/>
- CDC Website:
 - <https://www.cdc.gov/rabies/index.html>
- Animal Management Resources
 - <https://agrilife.org/batsinschools/>
 - <http://ischoolpestmanager.org/>



Acknowledgements

- CDC Poxvirus and Rabies Branch
- TX Department of State Health Services
 - Region 6/5S
 - Region 8
 - Zoonosis Control Branch
- Healthcare Providers

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Questions?



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