# Rabies and Vectorborne Disease Updates

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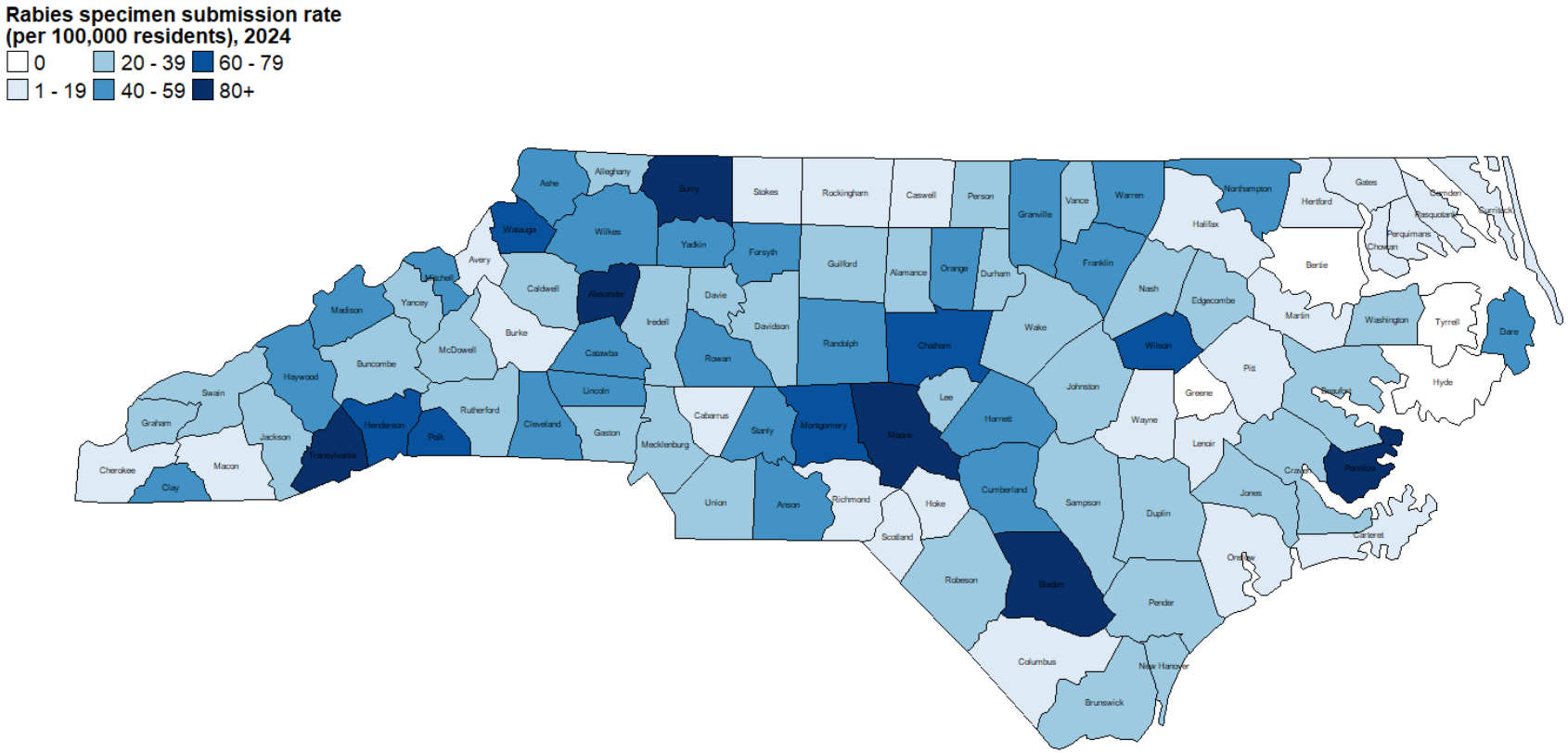
## TATP Webinar

June 12, 2025

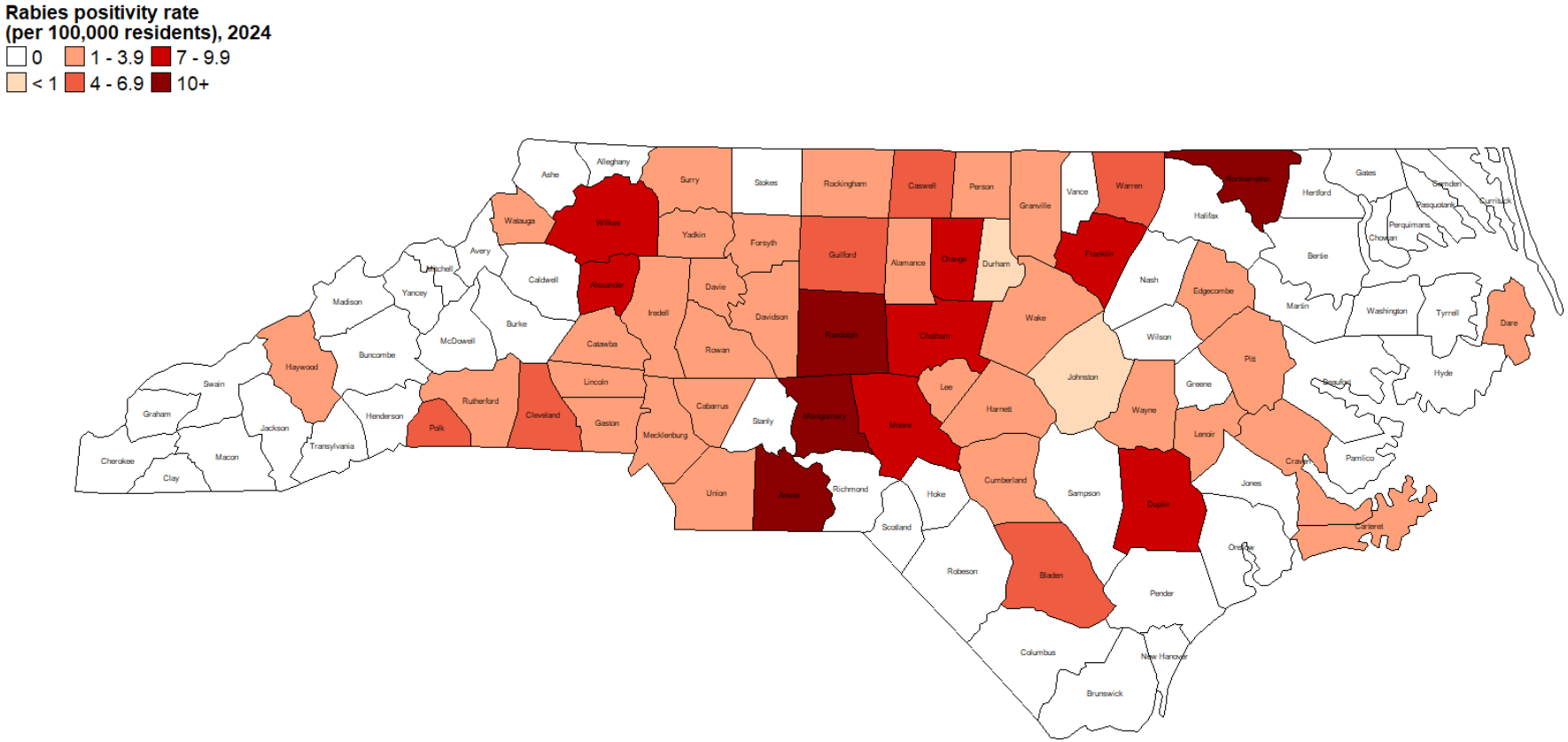
# Rabies in NC, 2024

## Rabies specimen submission rates by county



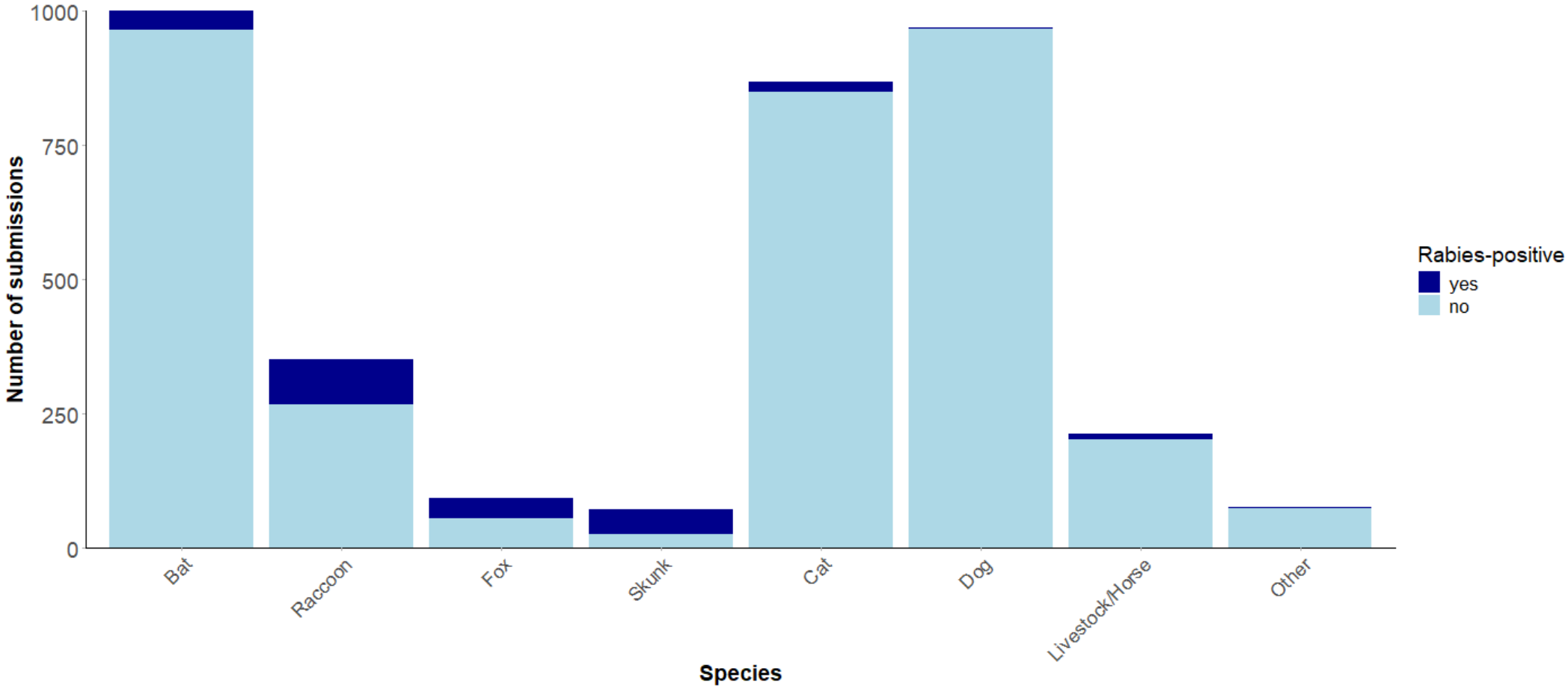
# Rabies in NC, 2024

## Rabies specimen positivity rates by county



# Rabies in NC, 2024

## Number of rabies-positive specimens by species



WSOC Charlotte + Follow 16.2K Followers

Gaston

## Eighth rabies case confirmed in Gaston County after cat dies

Story by WSOCTV.com News Staff • 3d • 1 min read

Cumberland

## Rabid fox bites NC house inspector's foot, pet owners urged to get animals vaccinated

Thursday, June 5, 2025 5:25PM

Person

## Man strangles coyote to death after it follows, attacks him; animal tests positive for rabies

By Tom George

Saturday, May 17, 2025

Surry

## North Carolina pets at risk of rabies as 'aggressive' fox runs rampant

Angeli Gabriel

Tue, May 13, 2025 at 2:06 PM EDT · 1 min read

# Animals are tested for rabies when…

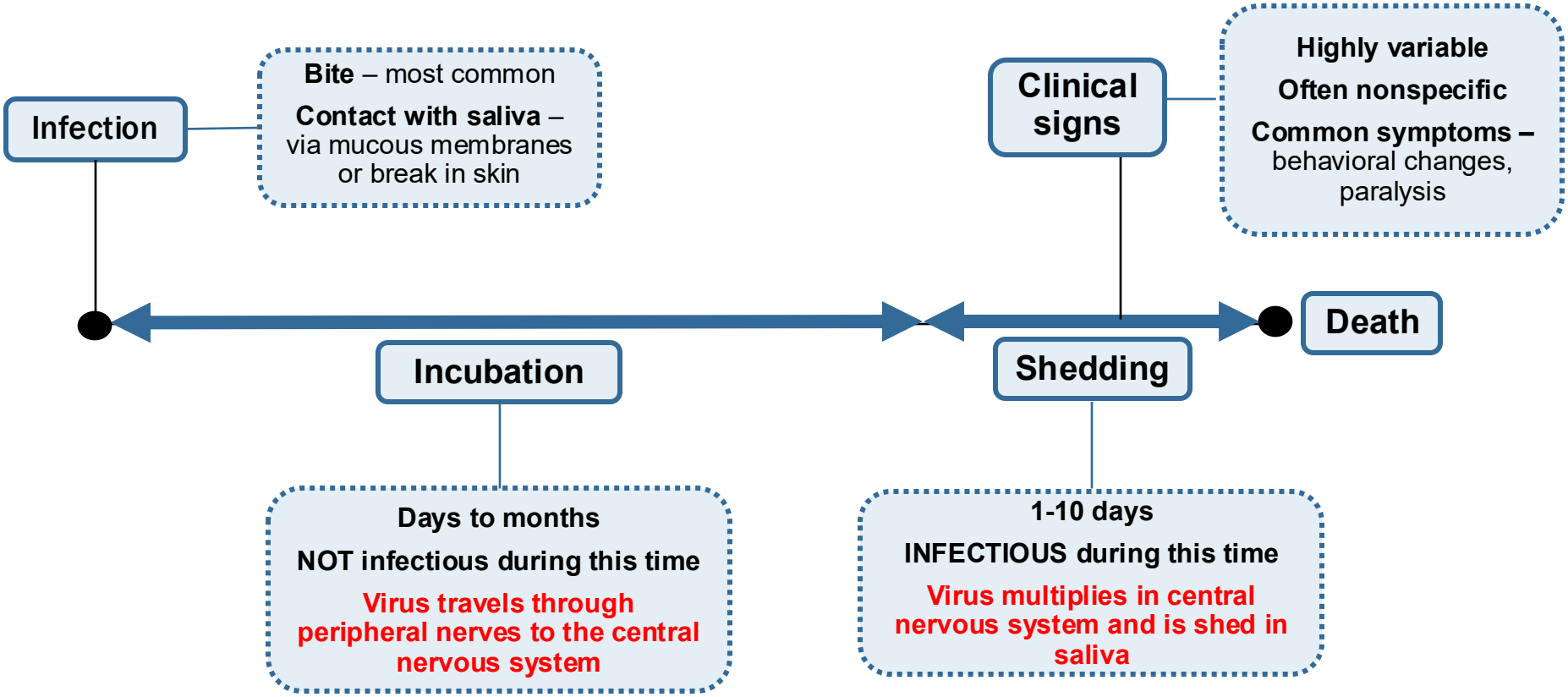
An animal has potentially exposed a human or domestic animal (pet, livestock, horse) to rabies.

OR

A veterinarian has clinical suspicion of rabies in a patient.

**What constitutes a human rabies exposure?**

# Rabies infections in animals




**Infectious materials = saliva and nervous tissue**

Spickler 2021, Rabies, CSFPH

Rupprecht et al. 2002, Lancet Infect Dis 2

# What is a Rabies Exposure?

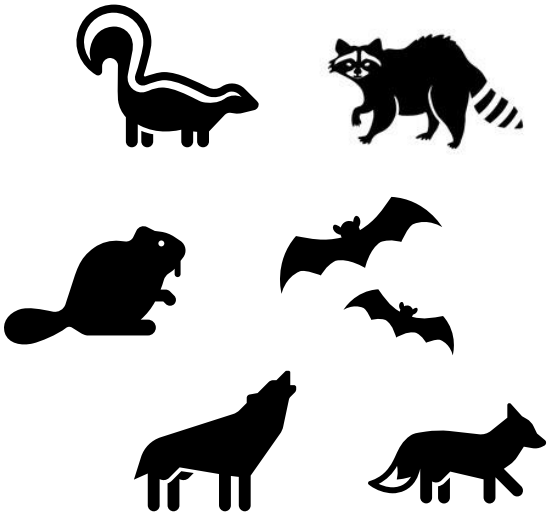
- *Bite exposure:* Any penetration of the skin of a person by the teeth of a rabid or potentially rabid animal
- *Open wound exposure:* Introduction of saliva or other potentially infectious material (cerebrospinal fluid, spinal cord, or brain tissue) from a rabid or potentially rabid animal into an open wound (e.g., broken skin that bled within the past 24 hours)
- *Mucous membrane exposure:* Introduction of saliva or other potentially infectious material (cerebrospinal fluid, spinal cord, or brain tissue) from a rabid or potentially rabid animal onto any mucous membrane (eyes, nose, mouth)

# How Does NC Law Define Exposure?

- **For people, it really does not define exposure**
- **Instead…it states that…**
  - A physician who attends a person bitten by an animal known to be a potential carrier of rabies shall report the incident within 24 hours to the local health director.
  - When an animal required to be vaccinated under this Part bites a person, the animal shall be immediately confined for 10 days in a place designated by the local health director.
- **That seems to be a narrower definition of exposure. What if a stray dog or cat licks an open wound?**
  - Bites have long been recognized as the most significant exposure, but are not the only type of exposure

# Type of exposing animal

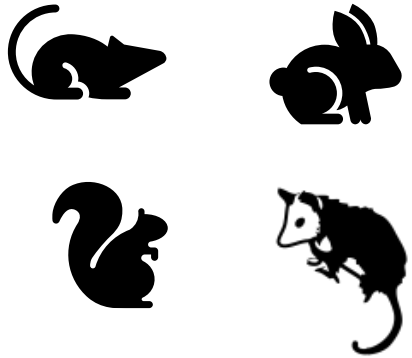
**High-risk wild mammals**



Capture, euthanize, and submit for testing without delay

Bats require some special considerations

**Low-risk wild mammals**

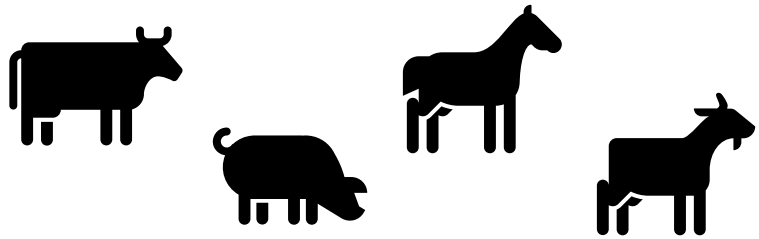


Requires risk assessment. Testing must be approved based on animal behavior, health, circumstances of the exposure

**Domestic animals (pets)**

Confine and observe for 10 days (regardless of vaccination status)

**Domestic animals (livestock)**

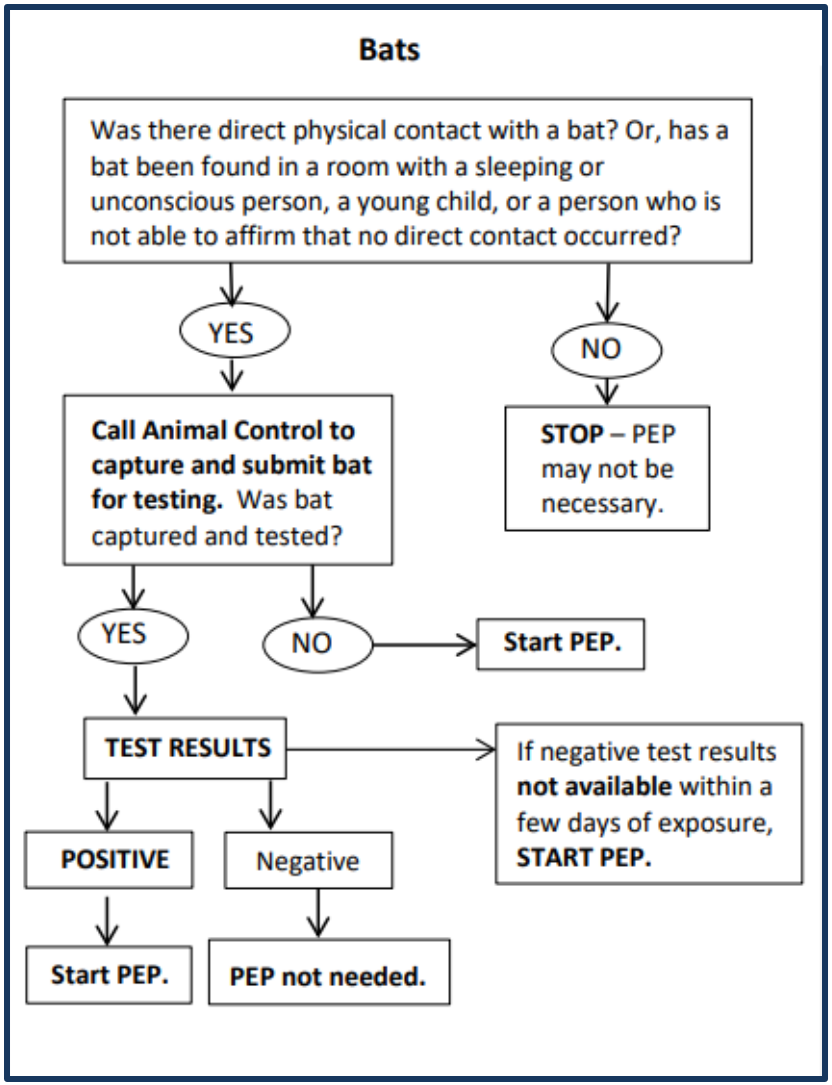


Confine and observe for 15 days (regardless of vaccination status)

# What about bats?

# One bat, One person, One exposure of concern

- Any direct contact between a person and a bat where a bite or scratch can't be definitively ruled out
- Bats found in a room with someone who might not be aware of bat contact
  - –A person has been sleeping or is intoxicated
  - –A young unattended child
  - –Any person who can't reliably communicate



# What is a Mass Bat Exposure?

- Current ACIP guidance (2008) addresses bat exposure in the context of an individual person and/or bat
- These guidelines do not address PEP in the setting of multiple persons exposed to a bat or a bat colony, otherwise known as mass bat exposure (MBE) events.
- https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/rabies.html

# Bat Infestations Require Special Consideration

- Bat infestations are common, complex, and require a multi – agency response
  - Property owner
  - Animal Control
  - Wildlife Control Agent
  - Communicable Disease staff
  - Environmental Health Staff
  - Exposed person(s)

# Bat Infestations Require…

- A public health assessment of potentially exposed persons

  Rabies PEP may or may not be required

- A structural assessment of the infested building

  This may require a recommendation that residents / tenants move while the problem is resolved

# Bats in an Attic, Dormitory, Hospital, etc.

**Determine if the bats are present in the living / working space of the structure**

**If bats are restricted to an area of the structure where people are not present the risk of rabies exposure is essentially zero**

Property owner can work with Wildlife Control Agent to exclude bats from structure

Exclusion is NOT permitted from 1 May → 1 August

If excluded during this time adults cannot return to juveniles resulting in their death

**If bats have access to the living / working space rabies risk assessments should be conducted**

# Bats in Attic Gain Access to Living Space

There may be a risk to the resident: rabies risk assessment by CD nurse required

It is permissible to block access to living space

- Identify portal of entry → Seal it
  - Example: gap between drywall and ceiling light fixture or HVAC register

However, cannot exclude bats from attic

- Again, If restricted to attic there is no immediate health risk

# Rabies exposure FAQs

- **I administered a vaccine to a feral cat then accidentally stuck myself with the needle. Do I need rabies PEP?**
  - This would be considered low risk for rabies exposure, but if possible, confine and observe the cat for 10 days.

- **My dog was playing with a bat, then licked me. The bat tested positive for rabies. Do I need PEP?**
  - If the dog licked you immediately after biting the bat, and if there were any open wounds or mucous membranes exposed, consider PEP. Otherwise PEP not indicated.

# Questions?

# Vectorborne Disease Investigation

# Tips for all Vectorborne investigations

**Determine what is required to meet the case definition**

- Lab criteria
  - May be different based on the disease
- Clinical criteria
  - May be different based on the disease
  - Date of illness onset
- Risk/Travel History
  - optimal but not required for all endemic diseases

**Enter needed information in NCEDSS**

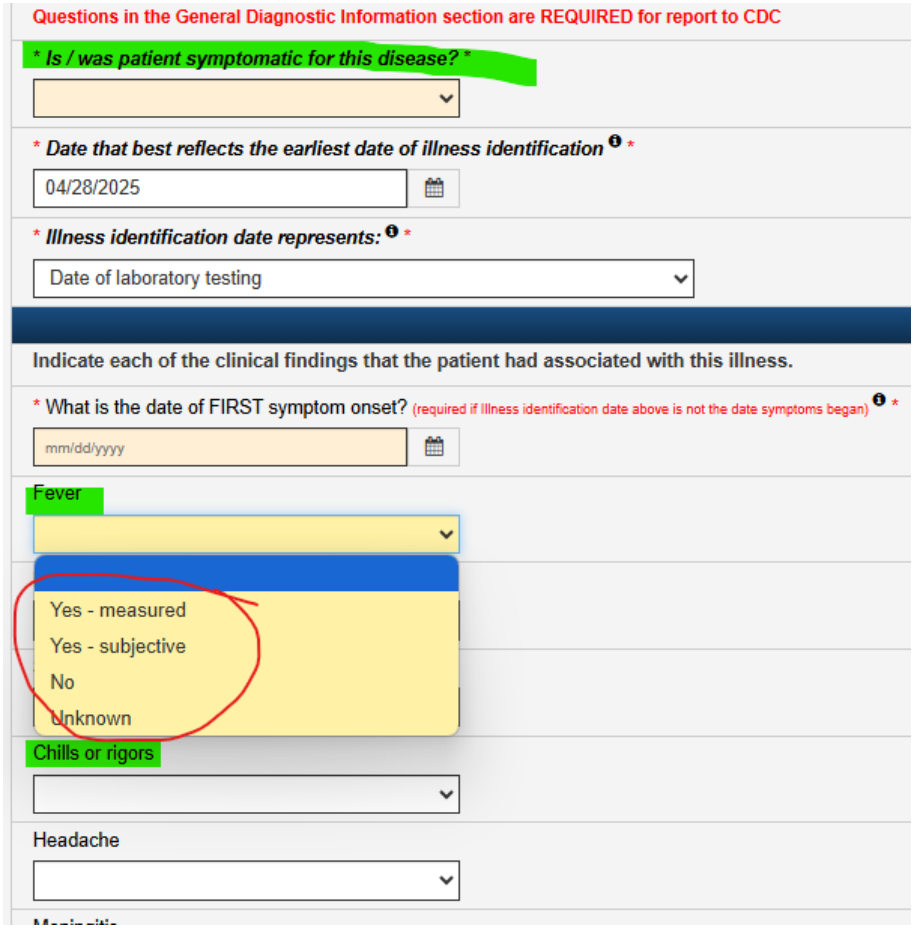
- State staff review every NCEDSS event
  - Information from LHD investigation that allows for determination of the case classification is necessary for state review

# NCEDSS Tips

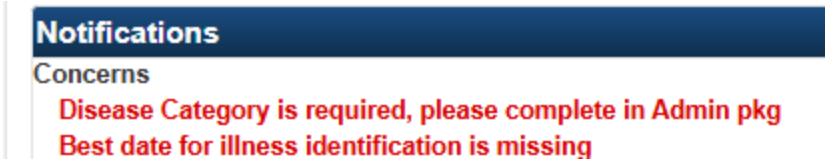
## Clinical criteria

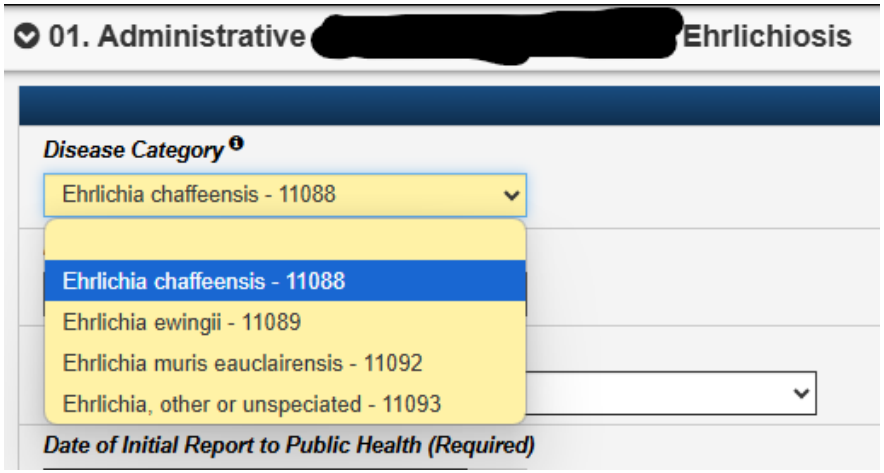
- No s/s of disease illness?
  - Select ‘No’ to “Is/was the patient symptomatic for this disease?
- Don’t have the s/s required per the case definition?
  - Select ‘No’ in the dropdown menu

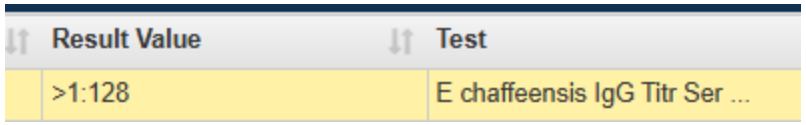
## How to enter in NCEDSS



# Ehrlichiosis




**Disease Category is required for Ehrlichiosis**

- **Look at the lab to determine the species**
  - **>90% will be E. chaffeensis**
  - **Please call or leave this blank if you are unsure**

# Ehrlichiosis/Anaplasmosis

- Fever, Chills, Rigors or Sweats
  - Lack of fever does not completely rule out Ehrlichiosis or Anaplasmosis
  - Presence of chills, rigors or sweats may be substituted for fever
    - Depending on the lab these (without fever) will require either one objective or 2 subjective additional qualifying s/s.
- Be sure to document in NCEDSS,
  - do not send events back with only fever marked 'no', we need to know you assessed for reported chills, rigors or sweats

- Notes
  - Spotted Fever Rickettsiosis (SFR) case definition still requires fever.
  - IgG $\leq$ 1:64 or IgM only titers do not meet lab criteria for Ehrlichiosis, Anaplasmosis and SFR

# LYME DISEASE

# Lyme Signs and Symptoms

- Appear days to months after the tick bite
  - EM rash
    - Typically begins as a red macule or papule and expands over a period of days to weeks
    - Primary lesion must reach size of > 5CM (~2 inches)
  - Nervous System
    - Facial palsy (loss of muscle tone on one or both sides of the face)
    - Severe headaches, stiffness of the neck due to inflammation of the spinal cord (meningitis)
  - Musculoskeletal system
    - Recurrent, brief attacks (weeks or months) of **objective joint swelling in one or a few joints**
      - *Objective joint swelling may sometimes be followed by chronic arthritis in one or a few joints.*
    - Radiculopathy
      - Range of symptoms including pain that radiates along sensory nerves, numbness and tingling in the arms and legs
  - Cardiovascular System
    - Acute onset of high-grade (2nd-degree or 3rd-degree) atrioventricular conduction defects that resolve in days to weeks.
      - *Dizziness, fainting or heart palpitations*
- Surveillance definition clinical criteria includes an illness characterized by at least one of the above when reported by a health care provider and *in the absence of another know etiology.*

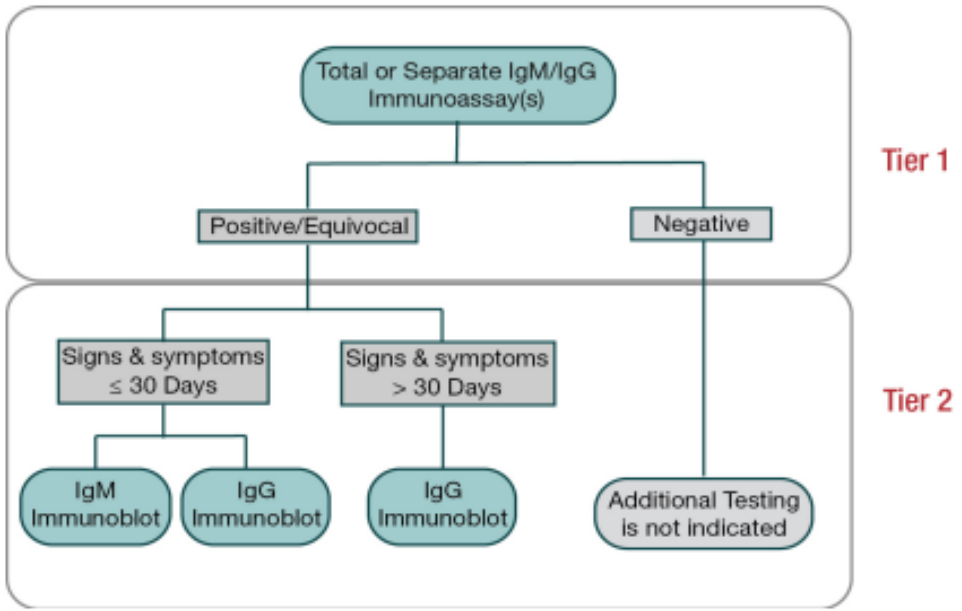
# Lyme Disease Stages of Illness

| LD generalized clinical overview | Presentation | Localized | Early disseminated | Late disseminated |
|---|---|---|---|---|
| | General timeline | Within 1 month | 1 to 3 months | Over 3 months |
| | Clinical features | EM Rash: may not always occur, difficult to visualize on people with darker skin tones | - Multiple EM rashes<br>- Bells Palsy<br>- Meningitis<br>- Heart block | Arthritis<br>For surveillance case definition, must be preceded by brief attacks of **objective joint swelling** |
| | Also called… | Dermatologic | Neurologic, Encephalitic, Cardiac | Musculoskeletal |

# Lyme Lab Tests

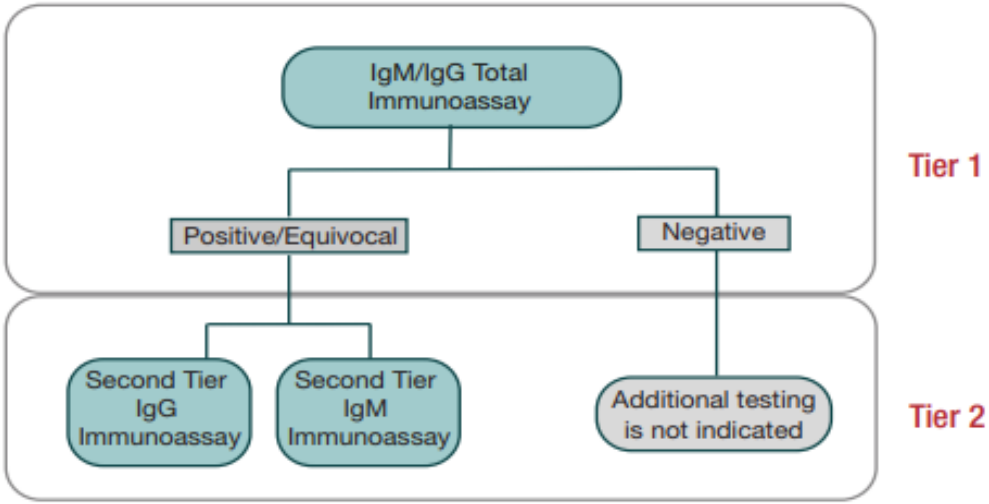
## Standard Two-Tier Test (STTT)

**Figure 1.** Standard Two-Tiered Testing




## Modified Two Tier-Test (MTTT)

Figure 3: MTTT Algorithm 2 – Separate IgM and IgG Second Tier Immunoassays




If you do not have a 2-tier test

- IgM with no initial immunoassay does not meet laboratory criteria
- IgG with no initial immunoassay meets presumptive laboratory criteria

For both MTTT and STTT IgM positive with IgG negative must have s/s onset ≤ 30 days prior to lab collection date

https://www.aphl.org/aboutAPHL/publications/Documents/ID-2024-Lyme-Disease-Serologic-Testing-Reporting.pdf

# Arboviral

## Arthropod-borne-virus

Arbovirus is a viral disease that is transmitted by an infected arthropod including mosquitoes and ticks

# Arboviral Diseases Reportable in NC

## Endemic Arboviral (Neuroinvasive)

- Eastern Equine Encephalitis (EEE)
- La Crosse (LAC)
- West Nile Virus
- 'Other' arboviral encephalitis
  - Jamestown Canyon
  - Saint Louis Encephalitis
  - Powassan, Heartland, Bourbon Viruses*

## Travel Related/Non-endemic (Neuroinvasive and Non-Neuroinvasive)

- Chikungunya
- Dengue
- Yellow Fever
- Zika
- Oropouche (new)

*transmitted by ticks

# NC Endemic Arboviral Diseases (Neuroinvasive)

- **Transmitted** by infected mosquitos (Aedes spp, Culex spp)
- **Clinical presentation**
  - Aseptic or viral meningitis or encephalitis

    Fever, headache, stiff neck, confusion, personality changes, altered mental status, paralysis, seizures, coma, death
- **Treatment**: no specific treatment is available, clinical management is supportive care
- **Laboratory diagnosis** is generally by virus specific immunoassays for IgM in serum or CSF
- **Prevention is key**: mosquito repellents, wearing long sleeves and long pants, limiting outdoor exposure from dawn to dusk, use air conditioning, installing window and door screens and reducing mosquito breeding sites around home

# Include other reported clinical signs that may indicate neuroinvasive disease

- Headache
- Myalgia
- Stiff neck
- Altered mental status
- Seizures/convulsions
- Paresis (muscle weakness)
- Gait disturbances, dyscoordination
- Involuntary muscle movements
- Paralysis
- Pleocytosis (^number of WBC in CSF)
- Photophobia
- Nausea/vomiting

# Mosquito-borne Diseases Lab Tip

IgG positive alone is not enough to meet surveillance case definition

If IgM is present

INVESTIGATE for signs/symptoms of neuroinvasive disease

# Travel Related Mosquito-borne Disease

- Review the NC CD Manual Case Definition
  - Ensure the reported laboratory result meets case definition
  - Review medical record for any qualifying clinical information
    - Neuroinvasive and non-neuroinvasive cases of travel diseases are reportable
- Obtain travel destination(s)
- Obtain dates of travel

# Travel Related Mosquito-borne Diseases

| Disease | Exposure | Diagnosis |
|---|---|---|
| **Chikungunya** | Within 12 (2-4) days prior to symptom onset | Within 1 week of illness onset: Virus isolation and RT-PCR<br>After first week of illness: **IgM** and IgG antibodies, ELISA |
| **Dengue** | Within 14 (4-10) days prior to symptom onset | ≤ 5 days of symptom onset: Virus isolation, RT-PCR, antigen detection via ELISA<br>≥ 5 days of symptom onset: **IgM** ELISA, **IgM** rapid test, IgG ELISA |
| **Malaria** | Within 40 (7-30) days prior to symptom onset | Blood smear microscopy, RDT |

# Working with Environmental Health/Local Vector Control

# Vector-borne Investigation Principles

Reponses to suspected* cases require quick intervention by local vector control staff, including:

- Collecting mosquitoes at possible infection locations (i.e., homes, parks, outdoor restaurants, fishing docks, etc.)
- Testing mosquitoes for WNV, EEE, LAC, etc. at the state lab
- Barrier spraying vegetation for infected mosquitoes at some or all locations
- Truck spraying suspected transmission areas (sq. miles)
- In extreme cases, aerial spraying for adult mosquitoes (e.g., wide-area WNV or EEE outbreak)

Therefore, good communication between CD Nurses and local vector control is important

*A **positive IgM** indicates local transmission is occurring in the location they were infected. Therefore, reduction of infected adults may be necessary to prevent additional cases

# Pre-Case Vector-borne Investigation Tips

1. Determine which group covers mosquito control in your county.

Options include:

a) General County Env. Health Staff
b) Dedicated County Vector/Mosquito Control Staff
c) County staff in another Department (e.g., Brunswick Public Works)
d) City or Town Staff (e.g., City of Rocky Mount covers parts of Nash and Edgecombe Counties)

# Pre-case Vector-borne Investigation Tips

## 2. Determine if the Vector Control staff are HIPAA-trained

**If Yes:**

- Check with County legal if you can share patient information needed for mosquito investigations (usually, only addresses of potential infection is necessary)

**If No:**

- Check with County legal if the Health Department has a "Memorandum of Understanding" or other legal agreement to allow sharing of patient's home address (if transmission is suspected there) outside of the HD.

**If No:**

- Check with County legal if the Health Department can share public locations where patient may have been infected (e.g., parks, outdoor restaurants, etc.)

**At minimum, share the closest location legally possible – such as nearest intersection, city block, etc. **

# Defining "Travel"

1. In-County Travel
   - Areas the patient spent time outdoors in previous 1-2 weeks. They DO NOT need to remember mosquitoes biting
2. Out-of-County Travel
   - Outdoor areas spent outside their county of residence; including outdoor time at hotels and restaurants
3. Out-of-State Travel
   - Same, but out of State
   - Consider areas with open-air housing (e.g., Key West, parts of California)
4. Out-of-Country Travel
   - Same as out-of-state travel
   - Consider airports, hotels and restaurants with no A/C
   - Many tropical mosquitoes will breed and live inside of homes

# Case Investigation Tips

1. Positive IgM
   - IgM denotes recent infection, so should be shared with vector control regardless if symptoms meet case definition
2. Travel History:
   - Enter in NCEDSS where patient spent time outdoors in 1-2 weeks before onset…
     1. Within the County
     2. Outside the County
     3. Outside the State
     4. Outside the continental U.S.
   - Examples include: Pt. Home, relative's homes, local park, greenways, outdoor restaurants, etc.
3. Communication with Vector Control:
     1. Within the County – contact county or city vector control staff
     2. Outside the County – Consider contacting CD nurse in that county
     3. Outside the State – Consider contacting state staff (Entomologist)
     4. Outside the U.S. – Log in NCEDSS only

# Communication Tips

1. CD Role
   - Information beyond address(es) of suspected infection is rarely needed by vector control staff
   - If patient address cannot be shared due to HIPAA concerns, consider sharing the block, nearest intersections, or close landmarks
2. Vector Control Role
   - If home address is shared, Vector Control should NOT pinpoint the home of interest. Instead:
     - Many houses and public areas in the neighborhood should be visited
     - County trucks should be parked at random locations on the street, not at the case driveway
     - Mosquito trapping and/or applications should occur at many homes in the vicinity
   - Staff communication with neighbors should be limited to true but general statements to protect the patient (e.g., “Mosquito season has started, and we are helping the city/county check for mosquitoes”)

# Questions?