



FAIRFAX COUNTY HEALTH DEPARTMENT

When Two Mosquito-Borne Viruses Collide: An Unprecedented West Nile and La Crosse Coinfection in a Non-Traveling Adult in the Fairfax Health District, 2025



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Learning Objectives

1. To define the epidemiological, laboratory, and surveillance thresholds necessary to classify La Crosse virus as locally endemic in a jurisdiction that has not previously confirmed local transmission.
2. To analyze how case investigations, confirmatory testing, and vector surveillance data are synthesized to differentiate between isolated or anomalous detections and evidence of sustained local transmission.
3. To translate these determinations into public health actions, including decisions regarding surveillance intensification, ecological and wildlife assessments, and clinician outreach.





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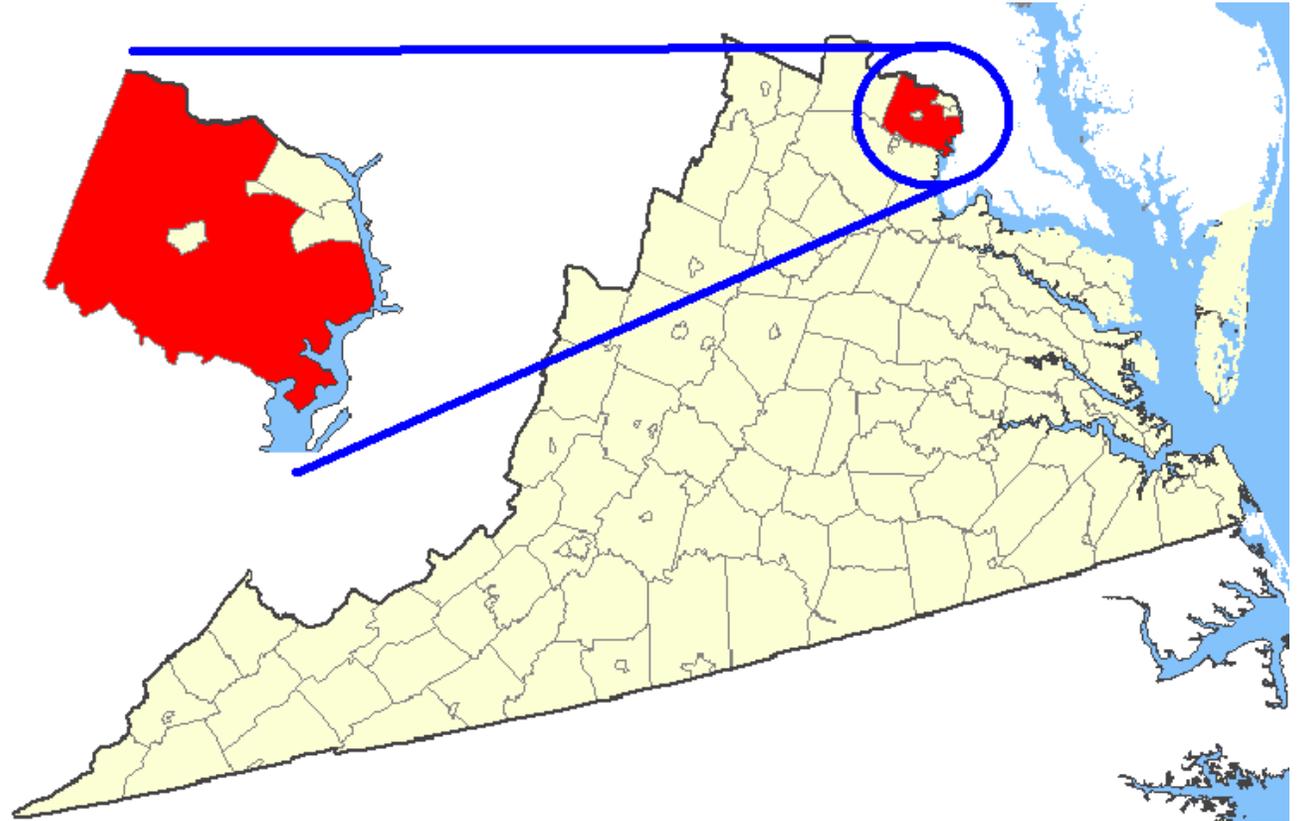
Background



Background Cont.

- Fairfax County:

- 1.2 million people
- Span of 395 square miles
- Approximately 140 square miles of wooded and open land.
- Dense suburban communities adjacent to natural habitats
- Warm, humid summers ideal for mosquito breeding
- These environmental and demographic factors increase exposure risk to mosquito-borne illnesses



The Surveillance Threshold Problem

- One laboratory-confirmed WNV-LACV coinfection
- No travel outside of FHD
- No environmental detection

SIGNAL or NOISE?

At what threshold does: A single case, with strong laboratory evidence, but weak environmental support justify declaring local transmission?



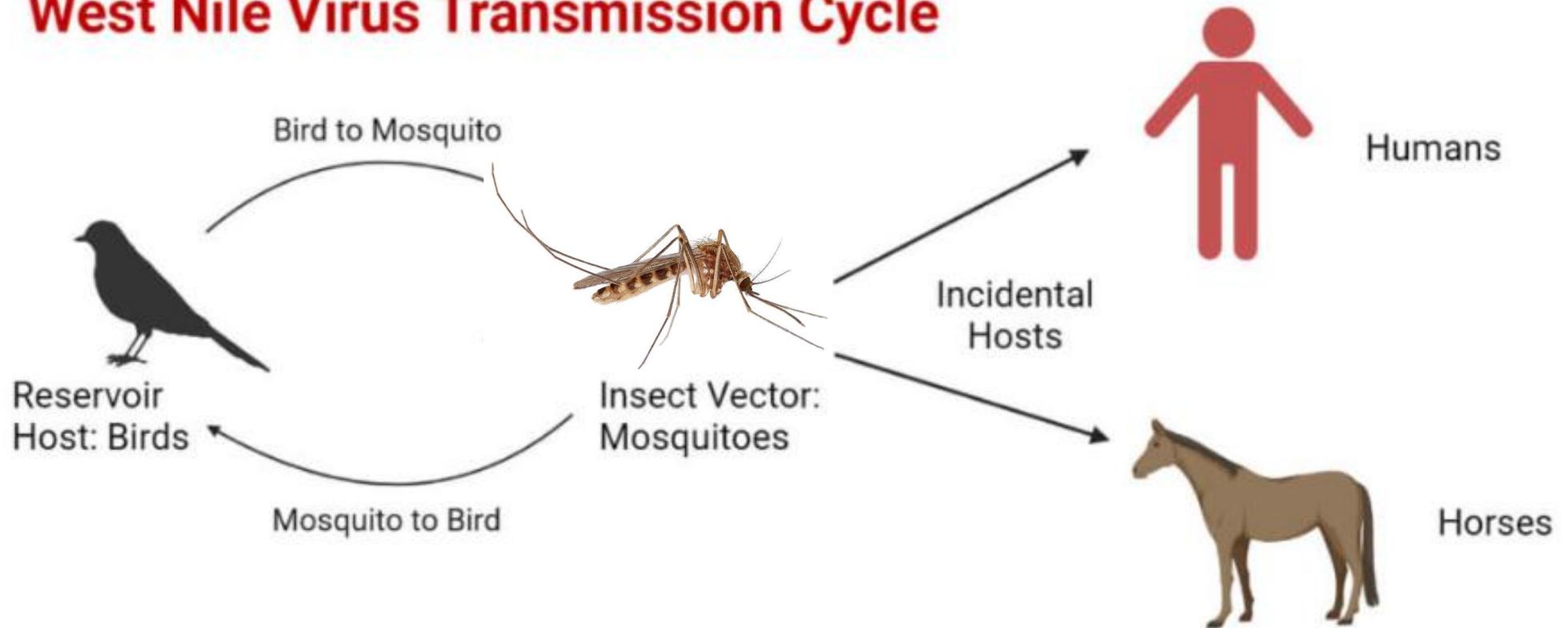
Background Context – West Nile Virus

- West Nile Virus (WNV) is a mosquito-borne virus, transmitted by the Northern House Mosquito (*Culex pipiens*), but can also spread through blood transfusion and organ transplantation. WNV belongs to the family Flavivirus, which includes other viruses like Zika and Dengue.
- WNV primarily infects birds, but can also cause illness in humans and horses, ranging from mild flu-like symptoms to severe neurological disease.
- Most people (80%) infected with WNV remain asymptomatic.
- WNV is the most common mosquito-borne disease in Virginia.
 - 264 VA cases (1999-2024)
 - 68 in FHD



Background Context - Northern House Mosquito (*Culex pipiens*)

West Nile Virus Transmission Cycle



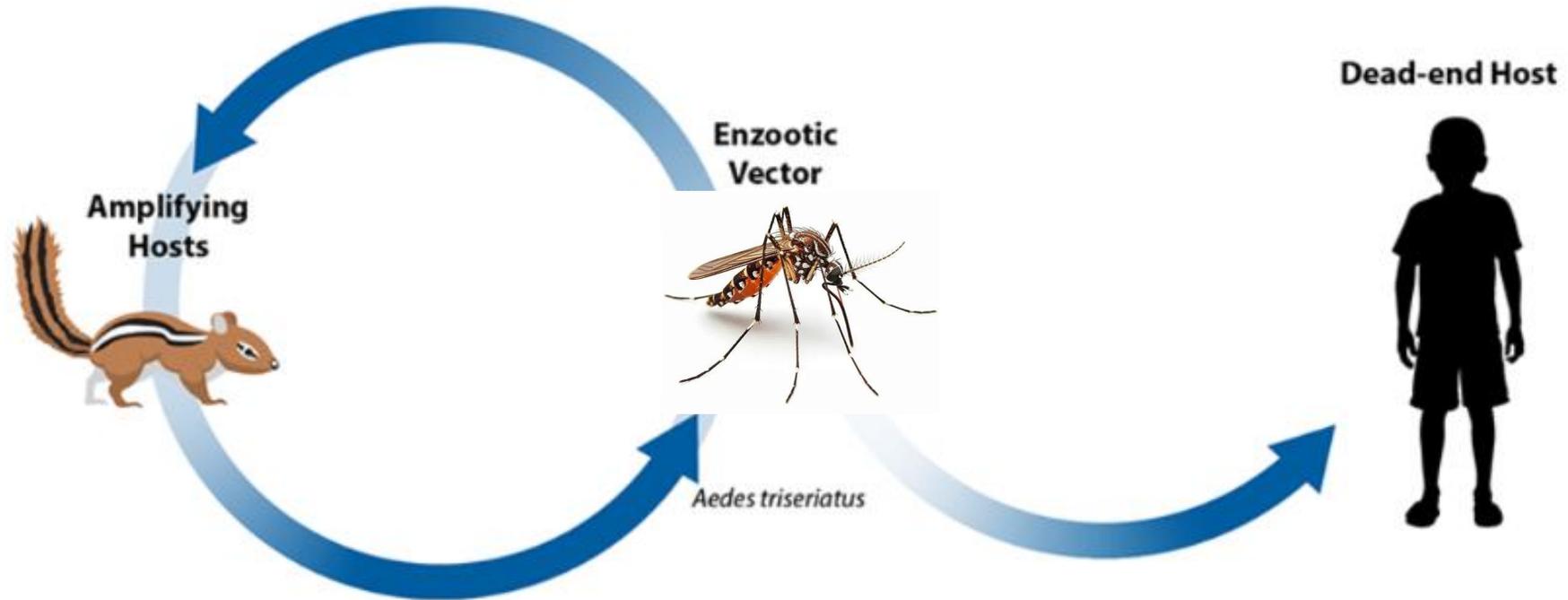
Background Context – La Crosse Encephalitis

- LACV is a mosquito-borne virus that primarily detected in children and can lead to severe neurological symptoms including encephalitis.
- On average, about 30 to 90 neuroinvasive cases of LACV disease are reported each year in the US.
- Though endemic in parts of the Midwest and Appalachia, it is rarely reported in Virginia adults and has never been identified as locally acquired in the FHD, where only two travel-associated cases have been documented.



Background Context - Eastern Tree Hole Mosquito (*Aedes triseriatus*)

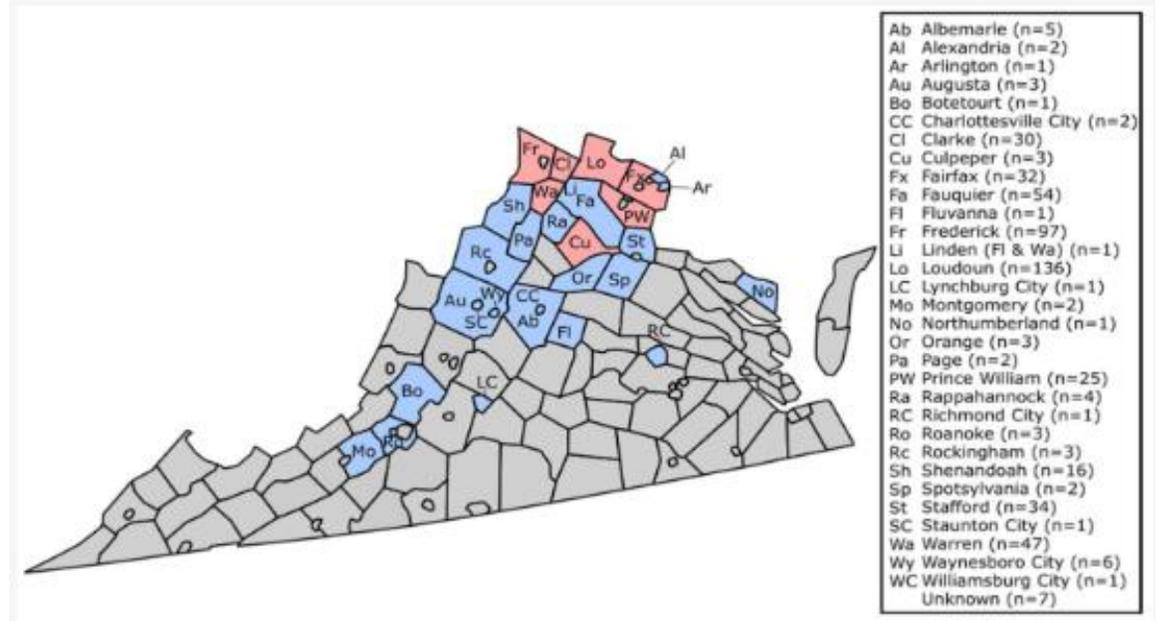
La Crosse Virus Transmission Cycle



La Crosse Virus in Wildlife

- Evidence suggests that LACV has been circulating in Virginia wildlife, particularly outside Appalachian counties.
- A study conducted between October 2019 and December 2022 found an overall LACV seroprevalence of 1.90% among wild mammals in Virginia, indicating exposure in several species not typically associated with LACV, such as cottontails and red foxes.

Figure 1. Geographic distribution of study samples. Red counties represent counties yielding LACV-seropositive individuals. Blue counties represent counties where samples originated but where no evidence of LACV was determined.



Faw LR, Riley J, Eastwood G. La Crosse Virus Circulation in Virginia, Assessed via Serosurveillance in Wildlife Species. *Infectious Disease Reports*. 2023; 15(4):360-369. <https://doi.org/10.3390/idr15040036>

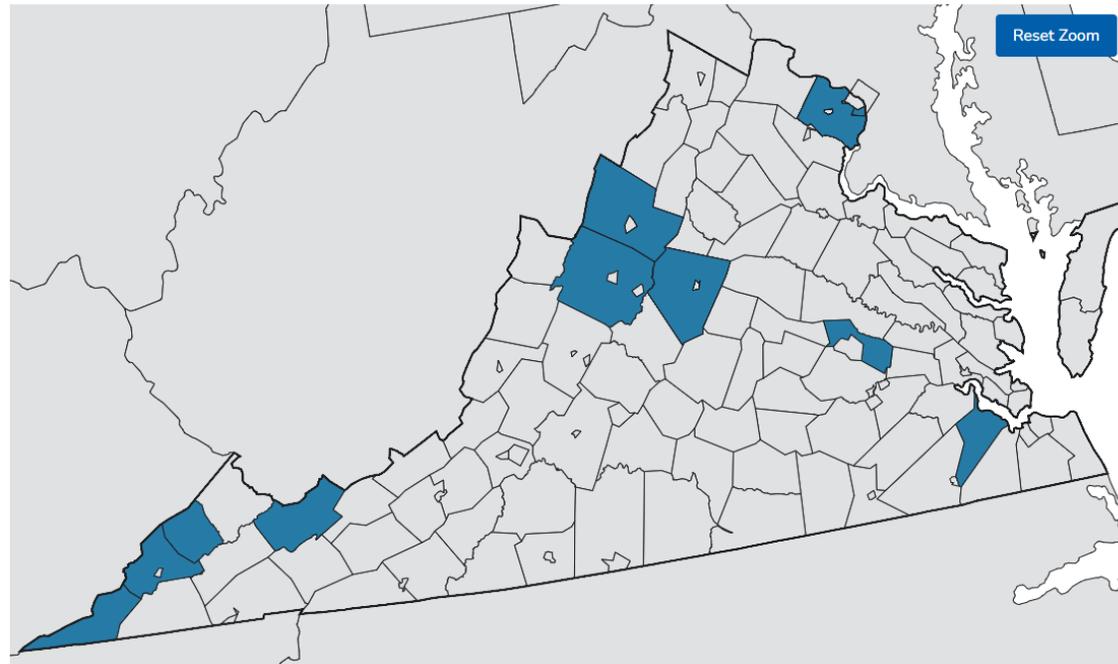


La Crosse Virus in Humans in Virginia

La Crosse virus human and non-human activity by area of residence for year(s) selected below*

Year

2003-2024



*25 human cases reported in VA from 2003-2024 and 2 reported in FHD (travel-associated)

- Non-human activity
- Human disease cases and non-human activity
- Human disease cases
- Data unavailable



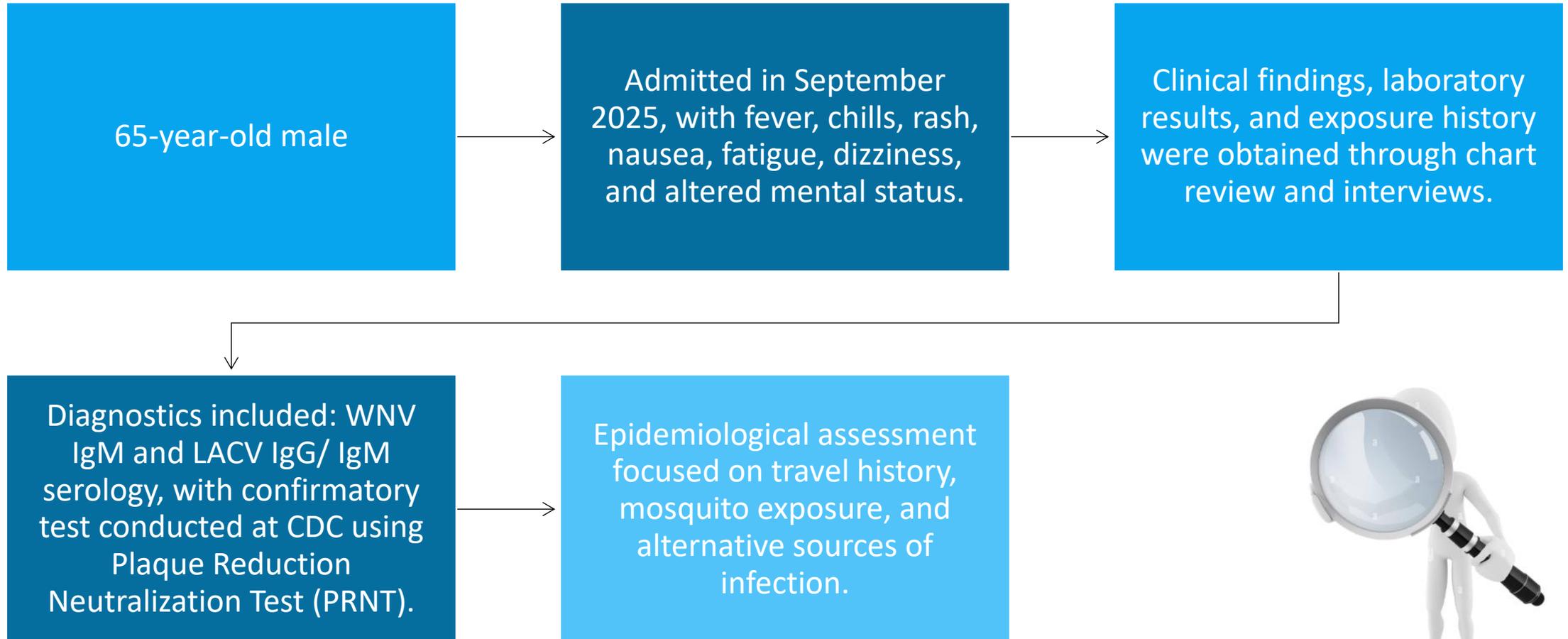


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Methods

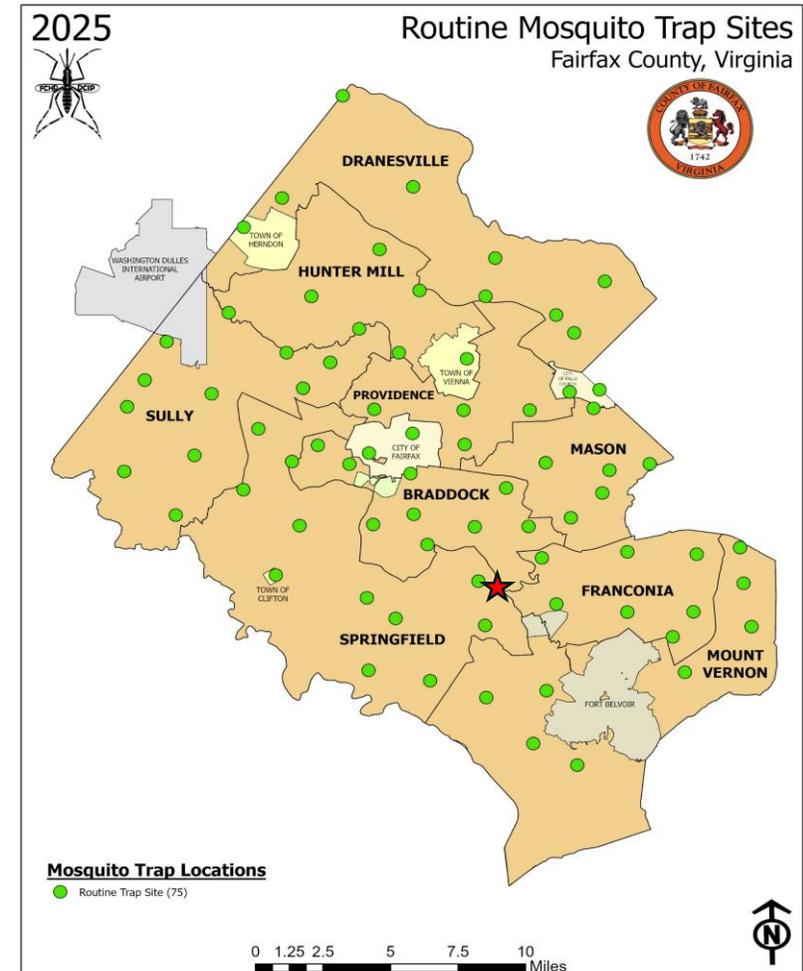


Case Overview



Case Overview

FHD Division of Environmental Health tested 338 local mosquito pools specifically for *Aedes triseriatus*.





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Results



Findings

- The patient met clinical and lab criteria for both neuroinvasive WNV and LACV
- Initial Serology:
 - WNV: IgM – positive
 - LACV: IgM and IgG – positive
- CDC confirmatory PRNT verified infection for both WNV and LACV
 - WNV: 1:80
 - LACV: 1:640



Findings Cont.

- The patient reported no travel outside the FHD and reported heavy mosquito activity near his residence.
- No blood transfusion and organ transplantation.
- No alternative exposures were identified.
- All 338 mosquito pools tested negative for LACV.
- Confirmatory case investigations of WNV and LACV were submitted separately and accepted as surveillance cases by CDC.





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Conclusion



Defining Local Transmission: Epidemiologic Criteria



Clinical & Laboratory Evidence

Confirm infection

Timing of IgM/IgG consistent with acute infection

Verify clinical criteria is compatible with virus



Epidemiologic Linkage

No travel during incubation period

Exposure window aligns with mosquito season

No alternative exposure sources identified



Environmental Confirmation

Presence of competent vector

Virus detected in mosquito pools or wildlife

Ecological conditions support transmission



Evidence Assessment: Does This Meet Local Transmission Criteria?

Evidence	WNV	LACV
Confirmatory PRNT	1:80	1:640
Compatible Clinical Syndrome	Neuroinvasive	Neuroinvasive (less typical in adults)
No Travel During Incubation	Yes	Yes
Additional Local Cases	Known endemic	X None
Positive Mosquito Pools	Historically detected	X 338 pools negative
Known Local Endemicity	Established	X Not established in FHD



Risk-based Public Health Response

Because sustained LACV transmission is unproven but cannot be excluded:

- Expand mosquito surveillance geographically and temporally
- Include LACV in broader arboviral testing panels
- Enhance species identification of *Aedes triseriatus*
- Strengthen wildlife/ ecological monitoring

Because laboratory confirmation alone does not confirm local establishment:

- Avoid premature declaration of local LACV transmission
- Maintain enhanced surveillance posture
- Based on this information, we decided not to do a public press release

Because clinicians may only consider WNV diagnosis:

- Conduct targeted educational outreach emphasizing the need for arboviral panel testing during mosquito season to rule out other arboviruses



Key Lessons for Arboviral Surveillance

First suspected WNV-LACV coinfection in FHD

- Rare multi-species arboviral exposure

Confirmed serology does not equal confirmed local transmission

- PRNT confirms infection, not geography of acquisition

Environmental data matters

- 338 negative mosquito pools weigh heavily against established LACV circulation

Arboviral local transmission requires multidisciplinary synthesis

- Clinical evidence
- Laboratory evidence
- Vector ecology
- Field epidemiology

Surveillance systems must be robust enough to detect rare events without over-interpreting them



The Real Lesson

- This case was not just about WNV or LACV.
- It was about how we interpret rare events in a changing ecological landscape and how we decide when evidence justifies reclassification.
- Arboviral emergence sits at the intersection of:
 - Epidemiological thresholds – How we define “local transmission”
 - Clinical vigilance – How we respond to unusual cases
 - Environmental context – Vector distribution, wildlife reservoirs, climate variability, and human-mosquito interface patterns

In an era of shifting ecology and expanding vector ranges, rare events warrant investigation – but classification must remain evidence-based.



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Questions?



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