Surveillance and Response to La Crosse Virus (LACV) Cases in Knox County, TN (2024)

1. Executive Summary

In 2024, the Knox County Health Department requested assistance from the University of Tennessee's Medical and Veterinary Entomology laboratory. Specifically, they requested mosquito surveillance at six LACV positive case sites and at two parks where LACV positive cases had previously visited, prior to the onset of illness. The laboratory also conducted surveillance at an additional house and two additional parks.

1) All case sites had the primary and accessory vectors for LACV, indicating each residence may have been the site for transmission. Our next step is to test the mosquitoes for the virus to determine if the virus was found at the residences.
2) The CDC light trap baited with dry ice and the Bg-lure collected all three vectors: Bush mosquito (*Aedes japonicus*), Tree hole mosquito (*Aedes triseriatus*) and Tiger mosquito (*Aedes albopictus*), but more of this last one mentioned mosquito than the other traps.
3) The average number of eastern treehole mosquitoes collected with ovitraps was greater than the other three traps.
4) In order to avoid mosquito bites, homeowners should be advised to remove or drastically reduce standing water in their yards, apply repellent, repair screens and gutters, maintain the yard by removing items that can hold water, and, if necessary, call a professional pest management service company.

2. Findings

Mosquito Surveillance: All three mosquito species of concern were collected at the case sites, but the tiger mosquito was the most abundant. During the study, Case Six had the highest abundance of mosquitoes, while Case Two had the fewest.

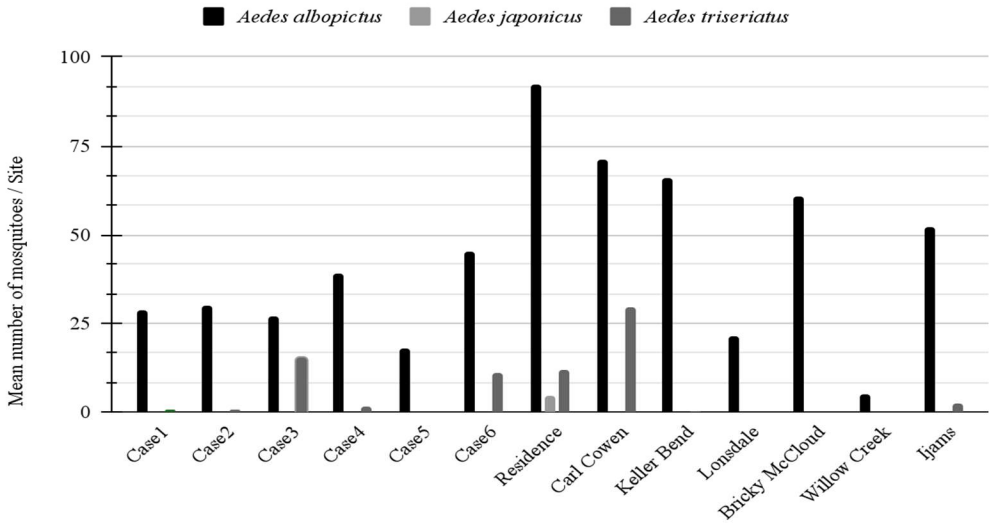

Figure 1. Average of mosquitoes per site with (Case 1-6) and without LACV+ cases (Residence, Carl Cowen Park, Keller Bend, Lonsdale Elementary, Bricky McCloud Elementary, Willow Creek Park and Ijams Quarry).

Mosquito Trapping: All three host-seeking mosquitoes were collected with the CDC traps, but adding the Bg-lure as an additional attractant collected more mosquitoes.

Adult Trap (n = coll/set)	**Average Number of LACV Vectors (Standard Deviation)**			
	Aedes albopictus	***Aedes japonicus***	***Aedes triseriatus***	**Total**
CDC: dry ice (n = 24 / 42)	8.79 (12.137)	0.38 (0.970)	1.75 (4.954)	6.24 (13.543)
CDC: dry ice + BgLure (n = 24 / 42)	12.54 (20.534)	0.88 (3.663)	0.96 (2.941)	8.21 (21.154)
Gravid (n = 17 / 42)	3.06 (4.205)	0 (0)	0.47 (0.874)	1.43 (3.171)
Ovitraps (n = 65 / 72)	3.10 (5.629)	0 (0)	3.56 (9.534)	6.66 (12.405)

Table 1. Median number of LACV vectors (standard deviation) per type trap and mosquito species collected. This table summarizes data of LACV+ sites and Residence from EpiWeeks 35, 36, 38 and 40.

Adult Trap (n = coll/set)	**Median Number of LACV Vectors (Range:Low - High)**			
	Aedes albopictus	***Aedes japonicus***	***Aedes triseriatus***	**Total**
CDC: dry ice (n = 24 / 42)	3 (0-44)	0 (0-4)	0 (0-23)	4 (0-60)
CDC: dry ice + BgLure (n = 24 / 42)	4.5 (0-97)	0 (0-18)	0 (0-14)	4.5 (0-129)
Gravid (n = 17 / 42)	2 (0-14)	0 (0)	0 (0-2)	2 (0-14)

Ovitrapping: All three possible vectors were collected in ovitraps, though more eggs were collected from parks than individual residences, on average.

Ovitrap (n = coll/set)	**Mean Number of LACV Vectors (Standard Deviation)**				
	No. Eggs	***Aedes albopictus***	***Aedes japonicus***	***Aedes triseriatus***	**Total**
6 Case Sites (n = 105 / 108)	113.06 (129.812)	10.60 (24.082)	0 (0)	1.52 (7.775)	12.95 (28.986)
7 Park Sites (n = 96 / 132)	205.04 (267.014)	19.00 (31.655)	0.22 (2.222)	2.90 (12.783)	22.96 (40.986)

Table 2. Median number per site (LACV+ case sites or LACV- park sites) and mosquito collected. This table summarizes data from EpiWeeks 35 - 40.

Ovitrap (n = coll/set)	**Median Number of LACV Vectors (Low range - High Range)**				
	No. Eggs	***Aedes albopictus***	***Aedes japonicus***	***Aedes triseriatus***	**Total**
6 Case Sites (n = 105 / 108)	123 (0-1648)	4 (0-166)	0 (0-22)	0 (0-104)	3.5 (0-221)
7 Park Sites (n = 96 / 132)	64 (0-558)	0 (0-126)	0 (0-0)	0 (0-58)	0 (0-137)

3. Recommendations for the County by the VectorED STN program at UTK

1. Limit mosquito populations by removing standing water. Water should be dumped or drained weekly. Water that cannot be removed should be treated with an appropriate larvicide, covered with a secure lid, and/ or filled with sand/rocks.
2. Encourage necessary repairs to damaged buildings. After storms, check gutters to ensure they do not hold water. During the summer, keep doors closed and repair window screens that may have holes and check the screen attachment to the frame.
3. Continue to use and reapply repellent according to label direction to prevent mosquito bites which reduces the number of the next generation of mosquitoes and prevent transmission to others at the residence. EPA has a list of mosquito repellents that can be used to address the specific needs of individuals in the home (https://www.epa.gov/insect-repellents/find-repellent-right-you).
4. Properly maintain yards within parks. Cover trash cans and/or rain barrels to prevent mosquitoes. Keep parks clean and trimmed, and properly clean and maintain public swimming pools or ponds.
5. If these don't work, consider contacting a local professional pest management service company to spray, or a local program to educate communities on mosquito bite prevention.

4. Methods

Site Selection. A total of 13 sites were monitored for mosquitoes in 2024. Six sites were the residences of children diagnosed with LACV and four sites were public properties that the children visited prior to diagnosis (Ijams Quarry, Willow Creek Park, Lonsdale Elementary School, Brickey McCloud Elementary). The remaining four sites included two additional parks with reported mosquito populations (Keller Bend and Carl Cowan Park) and an additional private residence with mosquito populations, but no reported LACV. This design allowed for a comparison of different case sites and the number of possible vectors for LACV around the county and surrounding areas, further providing possible areas where children could be affected by LACV.

Surveillance. Adult traps operated at each site for ~24-hour period and ovitraps were refreshed weekly from August 29 through October 4, 2024. Due to weather, adult traps did not operate the weeks of September 12 or September 26. Two host-seeking CDC-light traps (light removed) operated at each site to compare baits for LACV vectors; (1) dry ice vs (2) dry ice and Bg-lure. The dry ice sublimates and emits as carbon dioxide and the Bg-lure releases compounds that mimic mammal skin odors. A gravid trap was placed at each site to collect adult mosquitoes ready to lay eggs (oviposit), and three ovitraps were placed at each site to collect the eggs of ovipositing container mosquitoes. These traps were baited with water infused with bovine liver powder. All eggs were counted then reared to adults using standard operating procedures, and those adults (along with the adults collected in the field) were identified to species and sex using dichotomous keys.

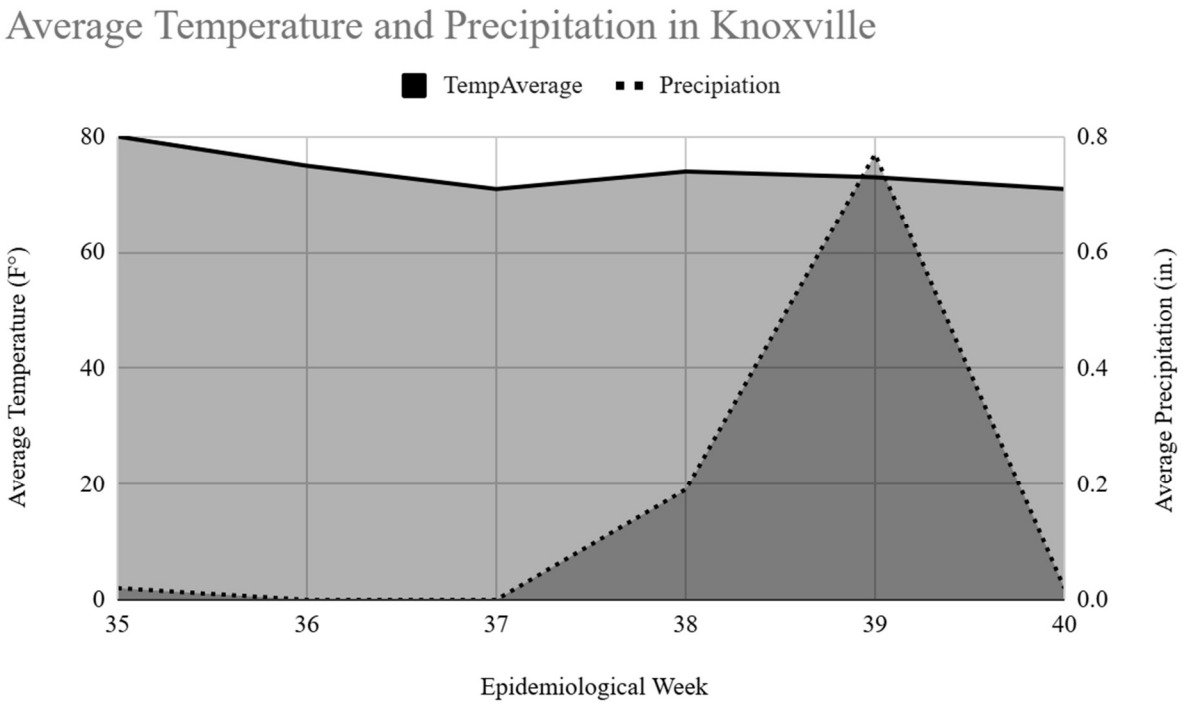

Figure 4. Average temperature (Fº) and average precipitation (in.) during each epi-week during the collection period.