ARBOVIRUS VECTOR SURVEILLANCE FOLLOWING THE 1962 ST. LOUIS ENCEPHALITIS EPIDEMIC IN THE TAMPA BAY AREA [1]

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Following the St. Louis encephalitis (SLE) epidemic in the Tampa Bay area of Florida in 1962 (Lewis, *et al.,* 1964; Dow *et al.,* 1964; Chamberlain *et al.,* 1964; Bond *et al.,* 1965), a surveillance program was established by the Florida State Board of Health, Encephalitis Research Center, to monitor any subsequent return of SLE virus. This report presents the numbers and types of arboviruses encountered in mosquitoes of the area over the 4-year period, 1963 through 1966. No evidence of current SLE activity was detected in humans, animals or arthropod vectors, but five other arboviruses were isolated from various species of mosquitoes: eastern encephalitis (EE), western encephalitis (WE), Tensaw (Bunyamwera group), a Hart Park-like (HPL) virus, and at least two strains of the California encephalitis group (CE).

METHODS. In October 1962, 12 mosquito trapping stations were established in the counties of Pinellas, Hillsborough, Manatee and Sarasota in the Tampa Bay area. In each county SLE human cases and SLE mosquito isolations occurred during the epidemic of 1962. Collection sites were increased to 28 during 1963, then reduced to 14 during 1964, and 10 during 1965 and 1966. Reductions were made to allow more intensive study at selected stations.

A lard can bait trap similar to that designed by Bellamy and Reeves (1952), with a 2- to 4-week old chick was used each year. A screened cage prevented the mosquitoes from engorging on the chick. During 1964, 1965 and 1966, the CDC miniature light trap designed by Sudia and Chamberlain (1962) was used along with the bait trap. During 1965 and 1966 both traps were supplemented by adding dry ice to the trap, considerably increasing the numbers of mosquitoes collected. Also a few collections were selected from truck-mounted funnel traps (Bidlingmayer 1961) for virus isolation attempts in 1963.

During the 4-year period, mosquitoes were collected alive in all the types of traps, and transported to the Encephalitis Research Center in Tampa in as good condition as possible. The mosquito control districts of Pinellas, Hillsborough and Manatee counties cooperated very effectively in making these collections and delivering them to the Research Center. At the Center, the mosquitoes were chloroformed, identified by species and location, pooled in glass screw-capped vials and stored at —70° F. in a Revco mechanical freezer until processed for virus isolation attempts in suckling mice. Identification of isolates was performed by standard immunoserologic techniques. Most initial isolates were sent for confirmation to either the arbovirus laboratory of CDC, Atlanta, Georgia, or the University of Pittsburgh Department of Epidemiology and Microbiology.

RESULTS. During the 1962 epidemic, *Culex nigripalpus* was the species most frequently infected with the SLE virus. One isolation was obtained from each of three other species: *Culex (Melanoconion)* species, *Anopheles crucians,* and *Aedes taeniorhynchus,* (Chamberlain *et al.,* 1964; Dow *et al.,* 1964; Hodapp *et al.,* 1966). Therefore special efforts were made to collect and examine *Culex nigripalpus* in the subsequent surveillance program. *Culex nigripalpus* comprised approximately 50 percent of the total number of mosquitoes

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TABLE 1.—*Culex nigripalpus* females tested for arbovirus isolation compared with all species tested, 1963 through 1966, Tampa Bay area, Florida.

	Culex nigripalpus				Total (all species)			
Year	Mosquitoes Tested	No. of Pools	Viruses Isolated	Positive Pools	Mosquitoes Tested	No. of Pools	Viruses Isolated	Positive Pools
1963	40,334	1284	Hart Park-like	1	67,583	3074	California Enceph. Tensaw Hart Park-like	8 1 1 10
1964	125,717	1903	Eastern Enceph. Tensaw Hart Park-like	5 1 1	223,716	4149	California Enceph. Eastern Enceph. Tensaw Hart Park-like Western Enceph.	33 18* 13 6 7* 76
1965	152,365	1913	Hart Park-like Eastern Enceph.	2 3	221,509	3165	California Enceph. Eastern Enceph. Tensaw Hart Park-like Western Enceph.	24 8 16 5 1 54
1966	127,847	1426	Hart Park-like	2	269,454	3269	California Enceph. Eastern Enceph. Tensaw Hart Park-like Western Enceph.	76 6 17 14 1 114
Total	446,263	6526	Eastern Enceph. Tensaw Hart Park-like	8 1 6	782,262	13,657	....	254

* 2 isolations in 1 pool.

tested each year. The numbers processed for virus during the 4 years by the Encephalitis Research Center are presented in Table 1. A total of 446,263 were tested in 6526 pools. No SLE isolates were obtained; however 8 EE, 1 Tensaw, and 6 Hart Park-like virus isolations were made. The ratios of positive pools to total mosquitoes tested demonstrate the rarity of the three viruses, EE, Tensaw and HPL, in *Culex nigripalpus*. *Culex quinquefasciatus,* the principal vector of SLE in Texas (Beadle 1966) also occurs in Florida and 35,271, collected in all months of the year, were tested in 832 pools with no SLE isolation during the 4 years.

By 1965 it was apparent the SLE virus was not providing an opportunity for detailed study. Therefore our primary investigation was shifted to California encephalitis (CE), one of the prevalent arboviruses. A new serotype, Keystone, was isolated from *Aedes atlanticus* collected in a stable trap using a donkey as bait in 1964 at Fox's Corner in Hillsborough county, (Bond *et al.,* 1966). This local strain and the trivittatus-like strain were isolated frequently from *Aedes atlanticus, Aedes infirmatus,* and occasionally *Aedes taeniorhynchus* in the Tampa Bay area.

A total of 11 mosquito species yielded one or more of five arboviruses in the Tampa Bay area. Table 2 gives the distribution of all 254 isolations by the mosquito species from which they were obtained. The largest number came from *Aedes atlanticus* and *Aedes infirmatus,* reflecting the concentrated effort on these two species during 1964, 1965 and 1966, using the CDC miniature light trap. California encephalitis and Tensaw were the two most commonly isolated viruses. CE virus has been incriminated in Florida as the causative agent for at least one human case of acute central nervous system infection disease in the state. Three other cases in Tampa Bay area residents were detected in Florida but originated elsewhere. Tests on one other patient suggested laboratory evidence of acute infection with the local Tensaw strain, a member of the Bunyamwera group. (Gates *et al.,* 1967.)

SUMMARY. During the 4-year period 1963 through 1966 a mosquito vector surveillance was maintained for St. Louis encephalitis in the Tampa Bay area in Florida. This work was initiated following an epidemic of SLE in 1962. Mosquitoes were collected from stations distributed over four counties. Several different types of traps were used: lard-can chick-baited trap (with and without dry ice), CDC

TABLE 2.—Total Arbovirus Isolations from Mosquitoes, 1963—1966 Encephalitis Research Center, Tampa Bay Area, Florida.

Species	Pools Tested	Number of Isolations						
		Calif.	EE	Tensaw	HPL	WE	SLE	Total
An. crucians	503	1	1	38	..	..	..	40
Ae. infirmatus	1036	38	2	3	..	2	..	45
Ae. atlanticus	319	95	..	..	..	1	..	96
Ae. taeniorhynchus	450	4	..	2	..	..	..	6
Ae. spp.	39	3	..	..	..	..	..	3
Cu. nigripalpus	6526	..	8	1	6	..	..	15
Cu. salinarius	1631	..	1	..	5	..	..	6
Cu. quinquefasciatus	832	..	1	..	..	..	..	1
Cu. (*Mel.*) spp.	744	..	1	..	..	..	..	1
Cs. melanura	456	..	17*	..	15	6*	..	37*
Mn. perturbans	368	..	1	..	..	..	..	1
Ps. confinnis	101	..	..	2	..	..	..	2
(Mixture)	4	..	..	1	..	..	..	1
Other spp.	648	..	..	..	..	..	..	..
Total	13,657	141	32	47	26	9	0	254

* One pool had EE & WE.

miniature light trap (with and without dry ice), and a truck-mounted funnel trap. During the epidemic, *Culex nigripalpus* was established as the vector of SLE. In the subsequent 4 years over 782,000 mosquitoes were tested for arbovirus; 446,000 of these were *Culex nigripalpus*. Arboviruses isolated were: 141 California encephalitis (Keystone and trivittatus); 32 eastern encephalitis; 47 Tensaw (Bunyamwera); 26 Hart Park-like, and 9 western encephalitis. SLE virus was not detected in any species including *Culex nigripalpus*. From 6526 *Culex nigripalpus* pools there were, however, 8 EE, 6 Hart Park-like and 1 Tensaw virus isolation.

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