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A REVIEW OF MOSQUITO-BORNE ENCEPHALITIS ACTIVITY IN THE U.S. DURING 1983 WITH SPECIAL REFERENCE TO CONDITIONS IN OHIO

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Four major mosquito-borne encephalitis viruses which cause human illness are known to be endemic in the United States: Eastern equine encephalitis (EEE), Western equine encephalitis (WEE), St. Louis encephalitis (SLE), and LaCrosse encephalitis (LAC). All of these viruses are maintained in natural cycles involving mosquito vectors and vertebrate reservoir hosts. The reservoir hosts of EEE, WEE, and SLE are numerous species of wild avians, while woodland mammals, primarily members of the squirrel family, serve as hosts for LAC virus. Considering the nature of this conference, the remainder of this paper will be devoted to the former three viruses.

As their names imply, EEE occurs primarily in the eastern U.S., while WEE is most common west of the Mississippi River. Both viruses cause illness in horses, as well as humans. In 1983, 101 horses in 19 western and plains states were documented as having WEE (Figure 1). Seven human cases were reported in the U.S., four in North Dakota and one each in Minnesota, South Dakota and Texas (Centers for Disease Control, 1983). Six cases (one fatal) were confirmed in southern Manitoba, Canada, just north of the U.S. border. An extensive mosquito control effort directed against the principal vector, *Culex tarsalis*, probably prevented a full-scale epidemic in Minnesota. Extremely high vector populations, coupled with steadily increasing rates of WEE virus isolation from mosquitoes and seroconversions of sentinel chicken flocks, prompted the Minnesota Department of Health to take immediate action to reduce *Cx. tarsalis* populations. In a cooperative effort, two private corporations and the 907 Tactical Airlift Group/Aerial Spray Branch (USAF Reserve) aerially sprayed approximately 1.2 million acres with malathion (3 oz/acre) to bring *Cx. tarsalis* under control and break the virus transmission cycle (Minnesota Department of Health, 1983). The entire operation was completed in less than two weeks.

Eastern encephalitis virus was active along much of the eastern and gulf coasts from Massachusetts to Louisiana, as well as in several inland foci, most notably in upstate New York and southern Michigan-northern Indiana. Twelve human cases of EEE, involving three fatalities, were documented during 1983 (Centers for Disease Control, 1983c). Those states reporting human EEE were: Massachusetts (five), Florida (three), Rhode Island (two), Georgia (one), and New York (one) (Figure 1). The cases from Rhode Island represent the first ever reported from that state. Fourteen states recorded EEE in horses, for a total of 120 cases. Nearly half (55/108) of the equine cases occurred in Florida, where virus activity was at high levels in Polk County (central Florida), and along the St. John River in northeast Florida. Virus transmission was also detected for the third consecutive year along the southern Michigan (Cass and Lenawee counties) and northern Indiana (St. Joseph and Elkhart counties) border.

St. Louis encephalitis virus activity was present at low levels across the U.S., especially in the central states, where only one case was reported from Indiana. In Ohio,

SLE cases were not detected for the second consecutive year (single cases occurred in 1980 and 1981). The last major epidemic to impact Ohio and the north-central states occurred in 1975, when 416 cases, 29 of which were fatal, were diagnosed. Much of the Ohio-Mississippi River basin was also involved in this epidemic, which resulted in 1815 cases nationwide. Following the epidemic, the Ohio Department of Health instituted a statewide SLE surveillance program in 1976 to monitor SLE virus activity and provide a means to predict outbreaks before the onset of human cases. The main thrust of the program involves blood sampling avians for detection of antibodies to SLE. House sparrows (*Passer domesticus*) are the most commonly sampled species in the program. They have been implicated as significant reservoirs of SLE virus during numerous SLE outbreaks (McLean et al., 1983) and are found in virtually every urban and rural area in the state. Summer field personnel of the Ohio Department of Health use Japanese mist nets to collect house sparrows in selected locations across the state. Sampling locations are determined primarily on the basis of previous SLE activity. A 0.4cc blood sample is drawn from each bird, which is then banded and released. Serum from these samples is later examined for the presence of SLE antibody by neutralization testing at the Ohio Department of Health Laboratory.

Weather patterns during the winter and spring of 1983 closely resembled those of previous epidemic years, resulting in a great deal of concern early in the mosquito season that SLE might again resurface in widespread outbreaks (Centers for Disease Control, 1983b). In late July and early August, it appeared that an SLE outbreak in Ohio was a real possibility based on avian surveillance data (Figure 2). In Cincinnati, Dayton, and Columbus, seropositive juvenile birds were being detected at the same sites on consecutive weeks and infection rates at several collection sites ranged from 2.5 to 4.0%. Seropositive rates from 0 to 3% can be attributed to normal enzootic SLE activity, while above this level there is cause for concern about virus transmission to the human population (Bowen et al., 1980). SLE activity in the three cities dropped off abruptly in the last week of August, however, and no human cases were reported.

In 1983, 13,641 avian sera were tested for SLE antibodies, with 31 positives (0.22%). Twelve counties were sampled on a weekly basis and three additional counties were sampled intermittently by local health departments. Seropositive juvenile birds (indicating recent SLE virus transmission) were detected in six counties: Cuyahoga (two), Franklin (seven), Hamilton (six), Montgomery (two), Pickaway (two), and Warren (one) (Figure 3). The avian seropositive rate of 0.22% in 1983 closely parallels other recent years when SLE cases were not reported.

No seropositive hatching-year birds were detected in a sample of almost 4,000 in Indiana, although the state recorded the only confirmed SLE case in the central U.S. Illinois, which has also conducted avian surveillance since 1976, reported only six positive juvenile birds (three in June, one in July, and two in August) (Figure 2). This low level endemic SLE virus activity appears to be normal throughout the central United States.

Elsewhere in the country, confirmed SLE cases were reported in California (eight) and Arizona (one) (Centers for Disease Control, 1983a). All of these cases were associated with extensive flooding of the Colorado River along the border between the two states. Populations of the vector in the western U.S. (*Culex tarsalis*) were found to be ten times above normal levels in mid-July and despite emergency control measures, virus infection rates in *Cx. tarsalis* were sufficient to result in disease transmission to humans (Centers for Disease Control, 1983c).

LITERATURE CITED

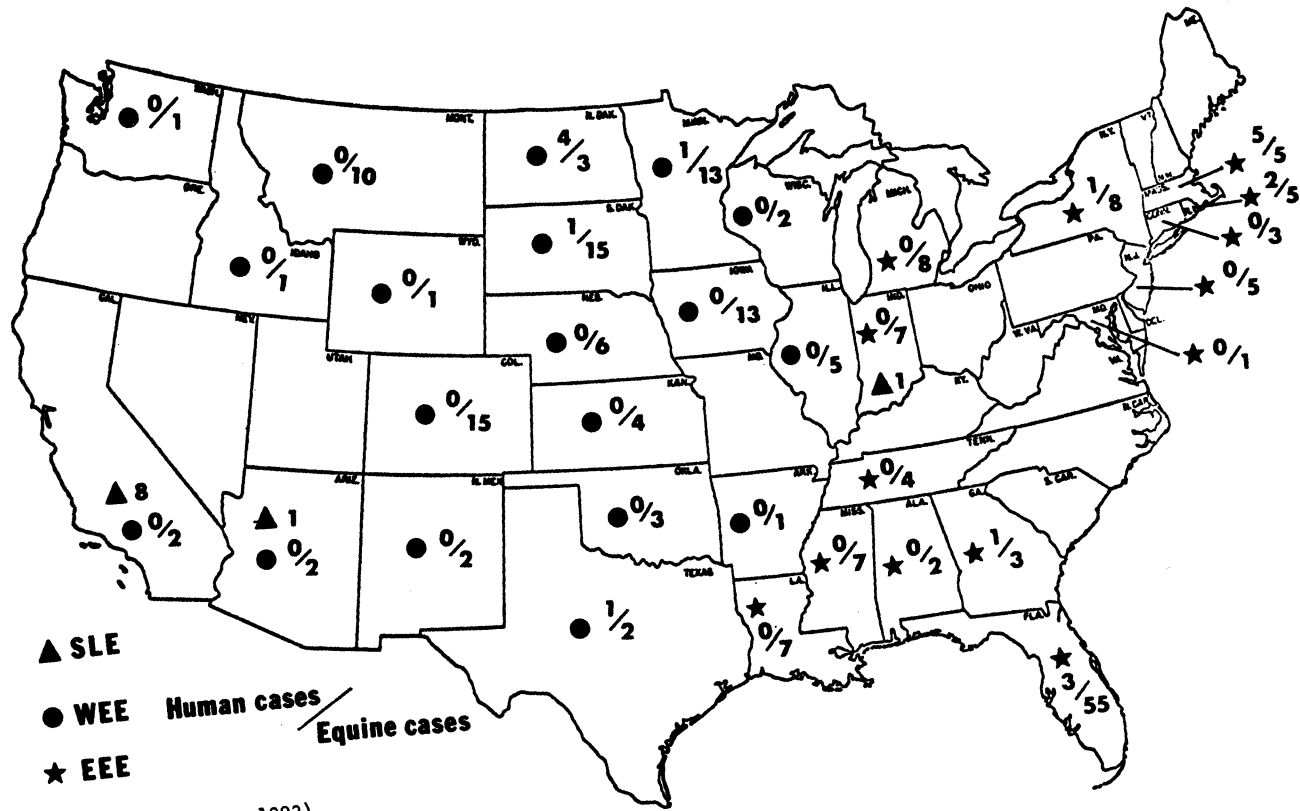
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(As of 4 November, 1983)

FIGURE 1. Arboviral Encephalitis in the U.S., 1983

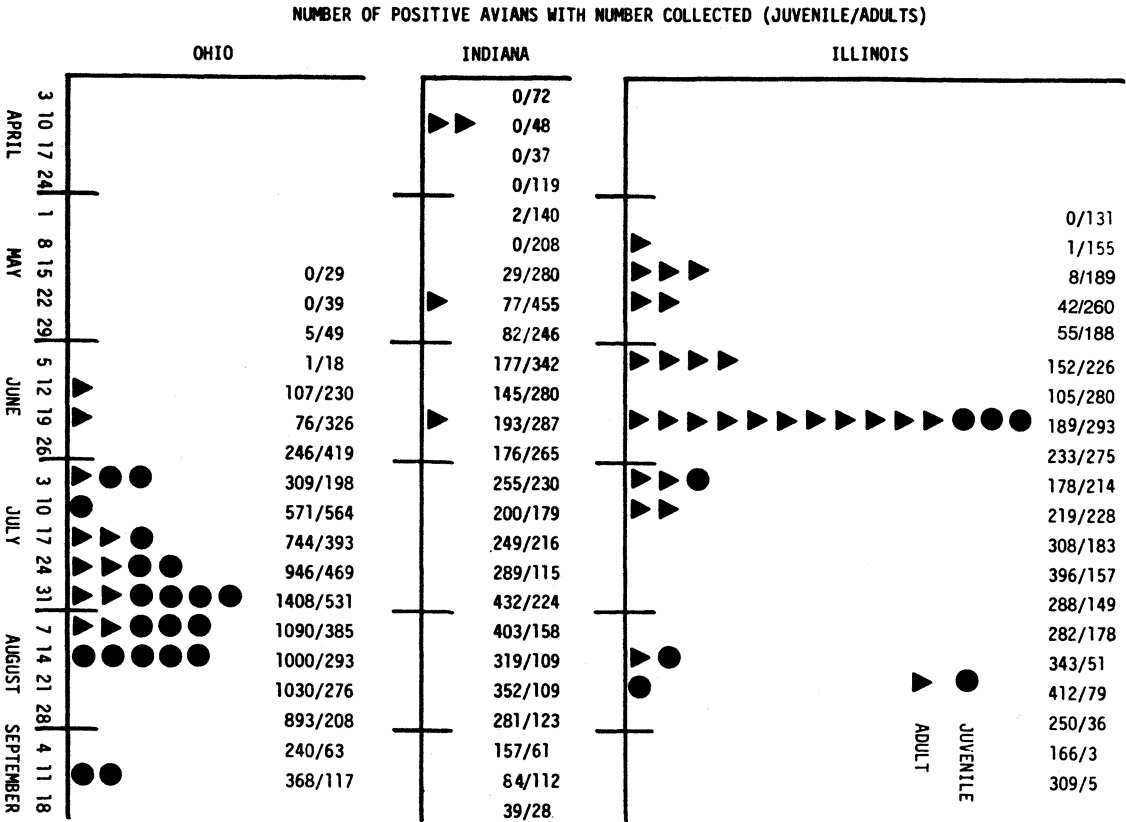


FIGURE 2. Temporal distribution of avians positive for antibodies to SLE virus in Illinois, Indiana and Ohio, 1983.

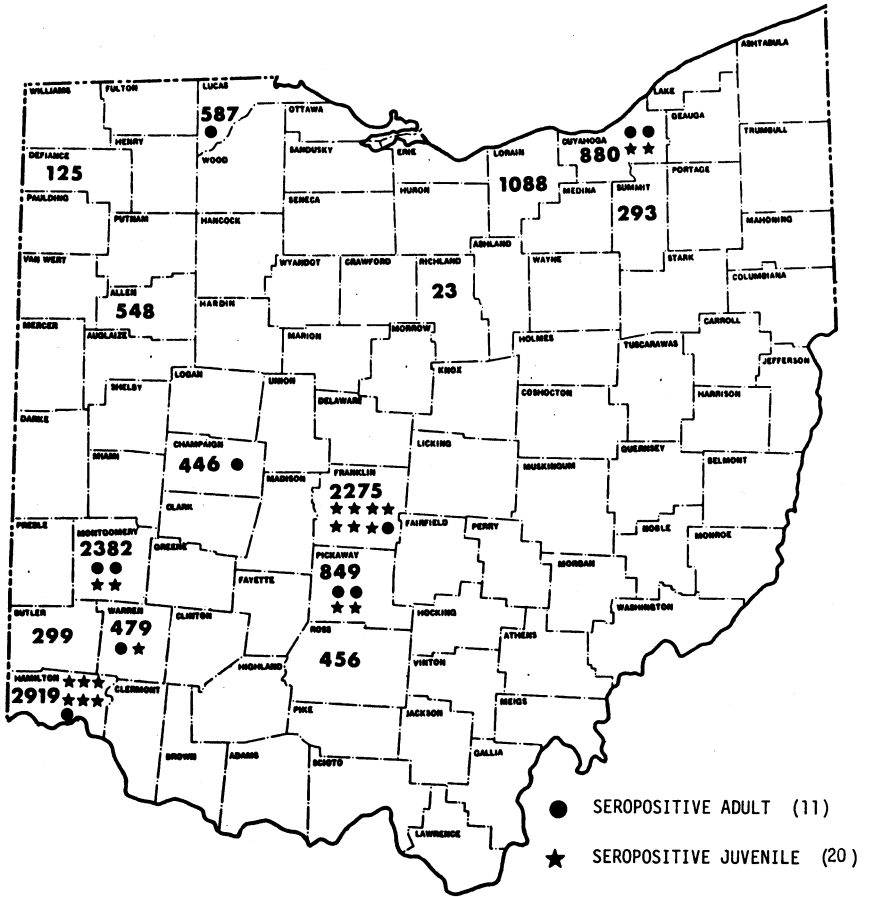


FIGURE 3. Ohio Department of Health. 1983 Arbovirus Surveillance. Avian Serology.