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ARBOVIRUS SURVEILLANCE IN OHIO -- 1979 UPDATE

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The Ohio Department of Health (ODH) has maintained an arbovirus surveillance program since 1964, when the Vector-borne Disease Unit was formed to survey and study California encephalitis epidemiology in Ohio. Since 1975, a major part of the surveillance program has been devoted to St. Louis encephalitis.

Both of these diseases have viruses as the causative agent of illness. Both have specific mosquito vectors, and both are classified as zoonotic diseases in that they are primarily diseases of wild vertebrates, transmissible to man -- in this case, only by the bite of an infected mosquito.

The vertebrate reservoirs of California encephalitis are members of the squirrel family, which includes, besides the familiar fox, red, and grey squirrels, chipmunks, flying squirrels, and woodchucks (or ground hogs). The vertebrate reservoirs of St. Louis encephalitis have not been as neatly identified, but they are definitely birds and possibly, also bats. My remarks hereafter will deal primarily with St. Louis encephalitis and its bird reservoir, which are of major concern to the Ohio arbovirus surveillance program.

The natural cycle of St. Louis encephalitis (SLE) virus, as we understand it at present, involves birds, the mosquito species *Culex pipiens*, and SLE virus. Normally, this virus is transmitted from bird to bird by *Culex pipiens*, which prefers to feed on birds and needs a blood meal in order to produce eggs. During the latter part of the summer, however, its feeding preference changes, or its preferred host availability is changed, resulting in a higher percentage of blood meals being taken from mammals, including man. It is this change in host-feeding pattern which sets the stage for transmission of SLE virus to man.

During 1975, environmental conditions were such that an epidemic of SLE was taking place in bird populations throughout the Great Lakes states. There were 416 human cases of SLE diagnosed by the ODH Laboratories during that year, with over 1100 additional suspect cases (Figure 1).

In subsequent years the ODH arbovirus surveillance program emphasized the collection and testing of *Culex* mosquitoes and bird bloodsamples (primarily House Sparrow and pigeon) for evidence of SLE infection. The goal of this program is to detect significant activity due to SLE early enough that mosquito vector control activities can be stepped up and another epidemic averted.

Since 1975, the numbers of human cases of SLE have dropped off sharply, but each year evidence of continued activity has been found, indicating that SLE is still present and may be endemic in Ohio (Table 2).

In 1978, five SLE cases were diagnosed in the following counties: Champaign (2), Cuyahoga (1), Franklin (1), and Ross (1). It has generally been held that such sporadic activity is beyond the capability of a surveillance program to detect and control. Follow-up surveys done in the above counties found little evidence of SLE in Franklin and Cuyahoga Counties, but surveys in Champaign and Ross Counties showed infection

rates in birds to be greater than 5% near the case residences (Table 1). Furthermore, the evidence clearly showed that these outbreaks were highly focal, with infection rates dropping off rapidly with increasing distance from the focus of the outbreak.

As a result of these findings, the surveillance program was expanded in 1979 to include a wider geographic coverage and a greatly increased number of communities being sampled (Figure 2). There were 228 localities in 78 counties included in the 1979 surveillance program (Figure 3). On the average, samples were taken from the 78 counties three times during the summer months. A total of 16,965 bird sera were collected, or 218 sera per county (Figure 4).

The results of this survey showed 31 birds with antibody to SLE virus, including 24 adult and 7 juvenile birds from 21 counties (Figure 5). In addition, there were 17 birds found with antibody to Western encephalitis, including 7 adult and 10 juvenile birds (Figure 6). Western encephalitis (WE) has been known for several years to occur in Ohio. The infection rate of WE in birds in 1979 is roughly twice that found during 1978. The significance of this finding is not clear at present; but further investigation of it is underway, and we will be watchful for further evidence of WE virus in the future.

To date in 1979, there have been no SLE cases reported in Ohio. Our surveillance program predicted this, although it is possible that sporadic cases may yet be diagnosed. There has been a demonstrated trend of decreasing SLE activity ever since 1975. This low level of activity is probably the norm. Yet we have also demonstrated continuous SLE activity ever since 1975, which leads us to believe that the virus is endemic in Ohio. Under the proper environmental conditions, it has the capability of becoming epidemic once again. The Ohio arbovirus surveillance program will be continued, so that we may have an early warning and be in a position to control the vector mosquitoes before an epidemic occurs.

SUMMARY

The Ohio Department of Health has engaged in a statewide mosquito-borne arbovirus surveillance program since 1964. After an epidemic of St. Louis encephalitis (SLE) in 1975, which caused 416 laboratory diagnosed and over 1100 suspect cases, the primary emphasis of the program has been on SLE. St. Louis encephalitis is normally transmitted from bird to bird by *Culex* mosquitoes, but humans may also be infected. The goal of the surveillance program is the early detection of significant SLE activity, so that steps may be taken, in time, to avert another epidemic. Data from 1978 showed that minor outbreaks may take place in small to medium sized communities. Thus, the 1979 surveillance program was expanded to include a greater geographic area and a greater number of communities in Ohio. Results of testing mosquitoes and bird blood samples in Ohio showed a very low level of SLE activity during 1979, with the predicted expectation that no outbreaks or epidemics would take place. To date, no human cases of SLE have been diagnosed in Ohio this year. Each year since 1975, the surveillance program has shown that SLE virus was active in Ohio at a low level. These data support the hypothesis that SLE is endemic in Ohio and that, given the proper environmental circumstances, an epidemic can occur again. The Ohio arbovirus surveillance program will be continued and improved to provide early warning of potentially epidemic SLE activity.

TABLE 1. Avian serum samples tested for hemagglutination-inhibition antibodies to St. Louis encephalitis virus★ 10/1978-12/1978.

Site	km from Urbana/ Chillicothe	Number Tested	Percent Positive	HI 1:20-1:80	Titers 1:120-1:320
Champaign County:					
Urbana	---	401	8.2%	22	11
Dallas Rd. Farm	7.1S	283	2.5%	6	1
Westville	6.9W	51	2.0%	1	
Mingo	14.5NE	33	0		
Mechanicsburg	16.0SE	111	0.9%	1	
Ross County					
Chillicothe	---	196	5.6%	7	4
Ross Co. Fairgrounds	8.1N	77	0		
Kingston	16.0NE	52	0		
Frankfort	17.5NE	193	0.5%	1	

★All specimens were negative for HI antibodies to Eastern and Western Equine encephalitis viruses.

TABLE 2
SLE SURVEILLANCE IN OHIO
AVIAN SEROLOGY 1975-1979

YEAR	HUMAN CASES	AVIAN SERA TESTED	SLE★ SEROPOSITIVES	% POSITIVE
'975	416	663	225	36.16
1976	10	2525	25	0.99
'977	4	5376	30	0.55
'978A	0	6061	16	0.26
'978B	5	1437	55	3.82
'979	0	'6,536	31	0.18

★HI 1:20
A 6/78-9/78
B 10/78-12/78

FIGURE 1

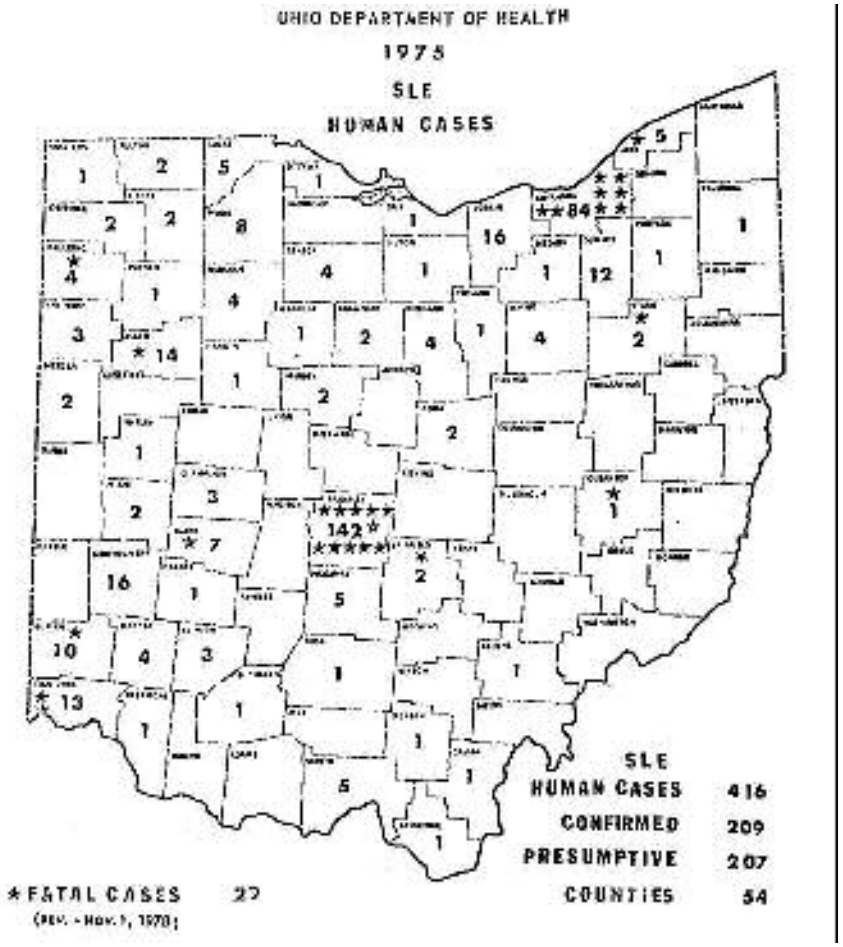

OHIO DEPARTMENT OF HEALTH
1975
SLE
HUMAN CASES
SLE
HUMAN CASES 416
CONFIRMED 209
PRESUMPTIVE 207
COUNTIES 54
* FATAL CASES 22
(REV. - Nov. 1, 1976)

FIGURE 2

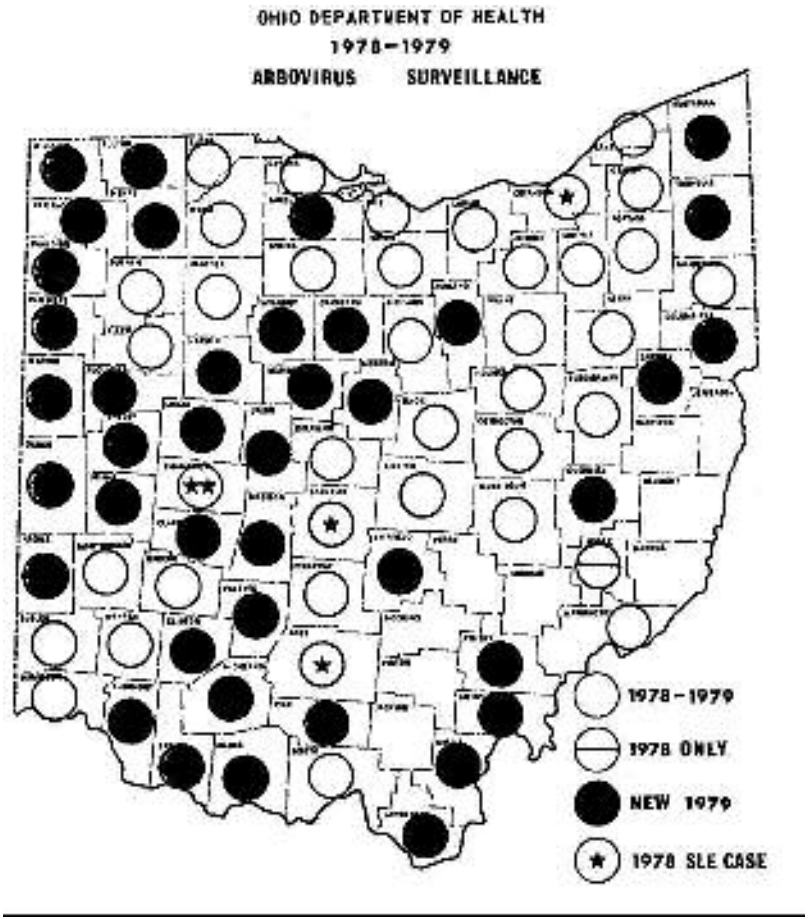

OHIO DEPARTMENT OF HEALTH
1978–1979
ARBOVIRUS SURVEILLANCE
1978–1979
1978 ONLY
NEW 1979
1978 SLE CASE

FIGURE 3

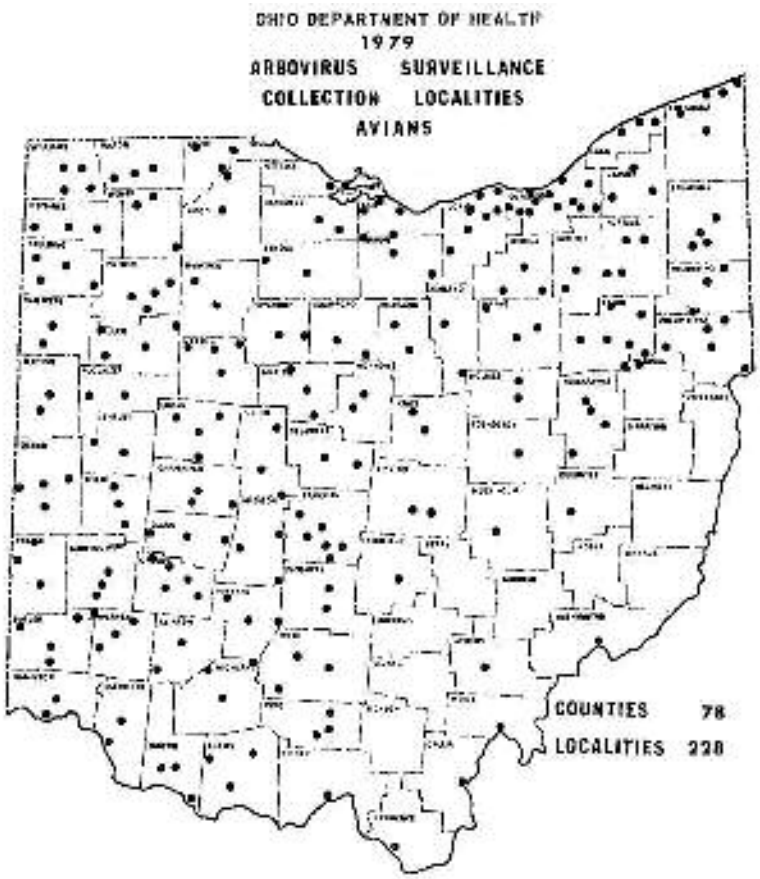

OHIO DEPARTMENT OF HEALTH
1979
ARBOVIRUS SURVEILLANCE
COLLECTION LOCALITIES
AVIANS
COUNTIES 78
LOCALITIES 228

FIGURE 4

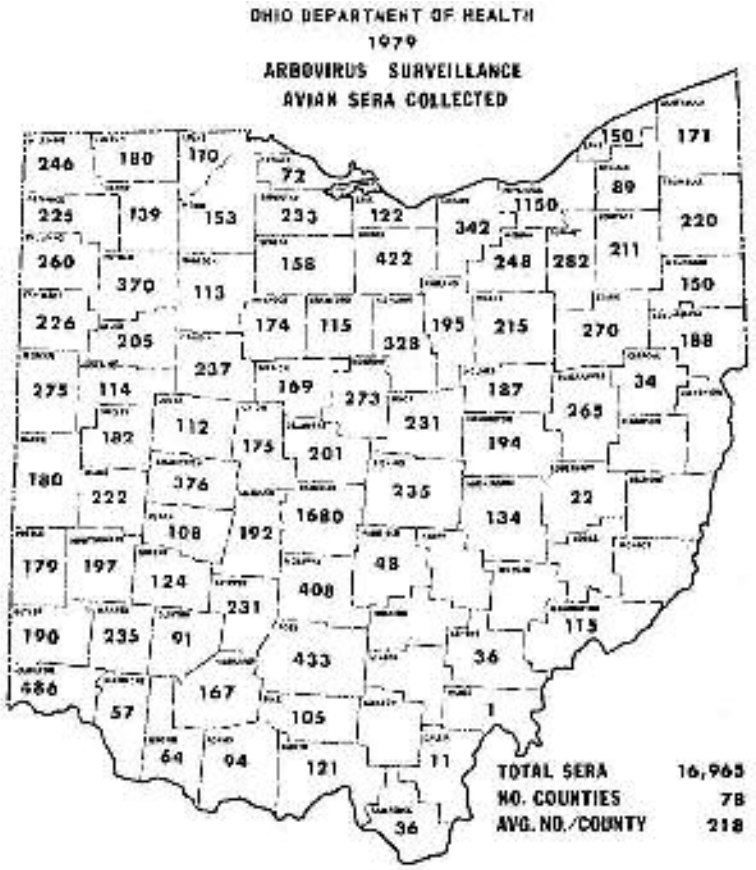

OHIO DEPARTMENT OF HEALTH
1979
ARBOVIRUS SURVEILLANCE
AVIAN SERA COLLECTED
246
180
170
72
150
171
225
139
153
233
122
1150
342
89
220
260
370
113
158
422
248
282
211
150
226
205
174
115
328
195
215
270
188
275
114
237
169
273
187
34
182
112
175
201
231
194
265
180
222
376
1680
235
134
22
179
197
124
408
48
231
190
235
91
433
36
175
486
57
167
105
1
64
94
121
11
36
TOTAL SERA 16,965
NO. COUNTIES 78
AVG. NO./COUNTY 218

FIGURE 5

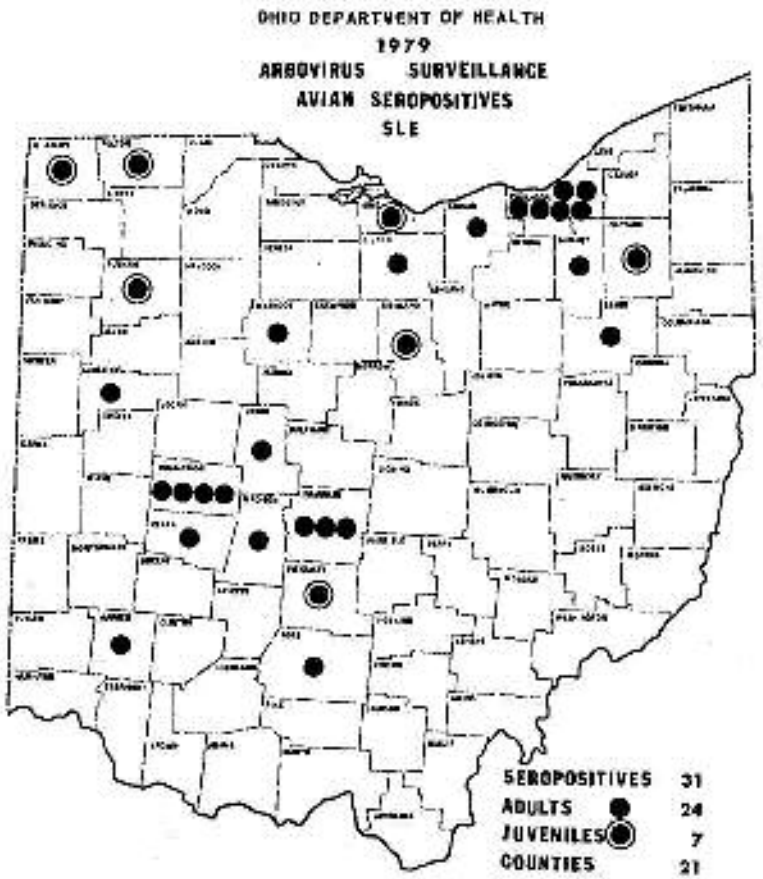
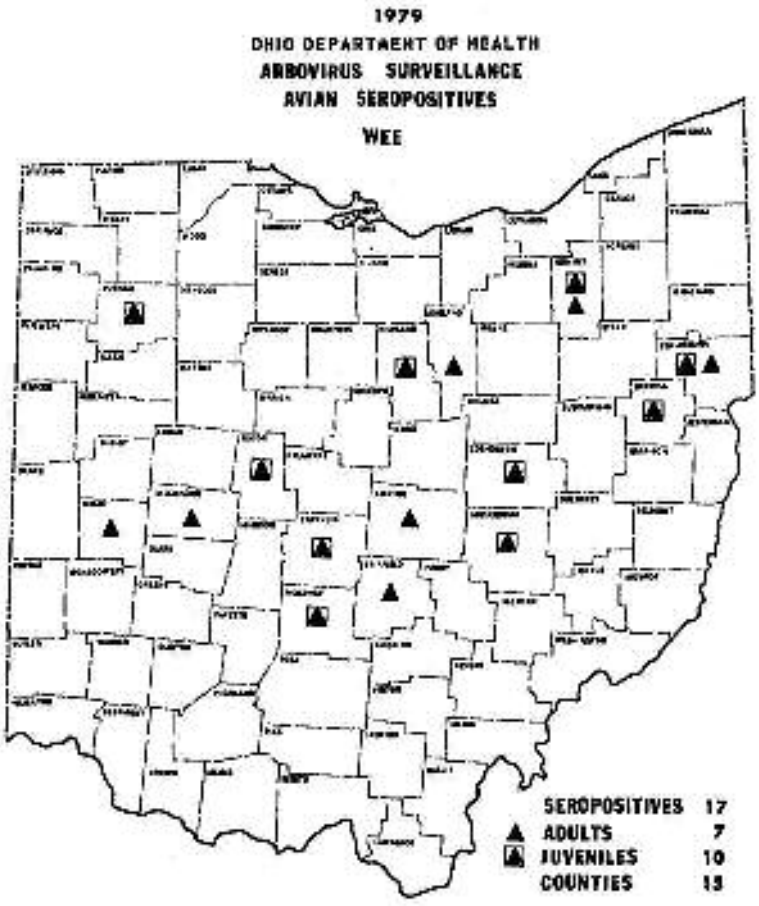

OHIO DEPARTMENT OF HEALTH
1979
ARBOVIRUS SURVEILLANCE
AVIAN SEROPOSITIVES
SLE
SEROPOSITIVES 31
ADULTS 24
JUVENILES 7
COUNTIES 21

FIGURE 6


1979
OHIO DEPARTMENT OF HEALTH
ARBOVIRUS SURVEILLANCE
AVIAN SEROPOSITIVES
WEE
SEROPOSITIVES 17
ADULTS 7
JUVENILES 10
COUNTIES 13