

Epidemiology and Control of St. Louis Encephalitis In Birmingham, Alabama, 1975

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In 1974, 56 (78 per cent) of the United States cases of St. Louis encephalitis (SLE) occurred in Alabama, Mississippi, and Tennessee.¹ As a result, the Jefferson County (Alabama) Health Department implemented a comprehensive SLE surveillance program the following year. Jefferson County is located in northcentral Alabama and contains 34 incorporated municipalities, including Birmingham, the state's largest city (pop. 300,910).

Methods

In April 1975, local physicians and designated staff members in each of Jefferson County's 15 hospitals were asked to report suspected cases of SLE to the County Health Department. All suspects or immediate family members were questioned as to clinical, immunization and travel histories, and the approximate level and sources of recent mosquito exposure. A series of three blood samples was obtained from each: an initial sample and two convalescent samples, 10 and 21 days later.* Serologic testing was carried

out using antigens of SLE and yellow fever, group A antigens of Eastern, Western, Venezuelan equine encephalitis, and that of La Crosse virus. Neutralization tests for SLE antibodies utilized a plaque reduction technique in primary duck embryo cell cultures.

Mosquito larvae were collected and counted during door-to-door premise surveys, and existing or potential breeding sites on public property were indicated on detailed maps. Adult mosquitos were collected from 20 daytime resting sites using battery-operated aspirators.

Larviciding of standing water was performed at five- to seven-day intervals using diesel fuel with an added surfactant. Adult mosquito control was achieved with a single, aerial ultra-low volume (ULV) application of 95 per cent Malathion over Birmingham at a rate of 225 ml per hectare. Spraying effectiveness was evaluated with randomly-placed cages of live mosquitos, and insecticide droplet size and distribution were closely monitored.

Continuing coverage of SLE program activities was provided by the local media. In addition, SLE pamphlets were widely distributed and a slide presentation prepared for citizen groups illustrating the various types of locations where the vector species (*Culex pipiens quinquefasciatus*) breeds.

Results

Thirty-two confirmed and four presumptive cases of SLE were identified in Jefferson County during 1975. Of these, 28 confirmed and two presumptive cases were Birmingham residents while the other four confirmed cases lived less than two kilometers from the city limits. The majority of the cases (25 confirmed, three presumptive) had clinical onsets between August 23 and September 27; the peak of the outbreak occurred during the week of August 31 when ten confirmed cases became ill (Figure 1).

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* Cases were serologically classified as follows: *Confirmed*—a four-fold rise or fall of hemagglutination-inhibition (HI), complement-fixation (CF), or neutralizing antibody; *Presumptive*—a less than four-fold change in antibody titer with at least one specimen showing an HI titer ≥ 80 or a CF titer ≥ 16 ; *Inconclusive*—a measurable HI titer < 80 or a CF < 16 ; and *Negative*—no measurable titers in appropriately timed samples.

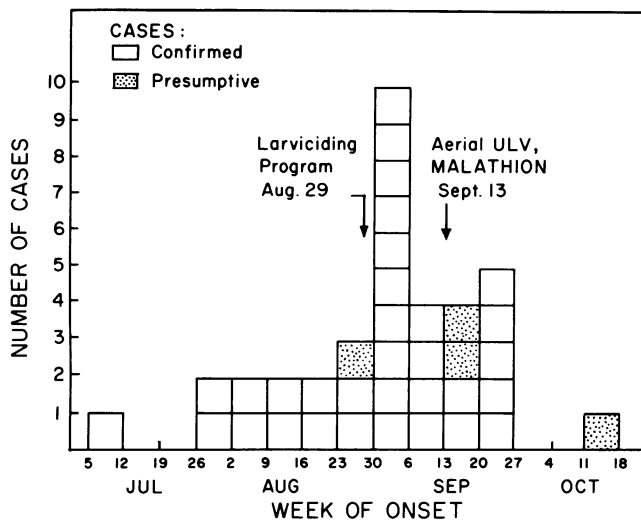


FIGURE 1—Confirmed and Presumptive Cases of St. Louis Encephalitis by Week of Onset, Jefferson County, Alabama, 1975.

A total of 178 suspect cases were ultimately investigated. Of the 109 cases clinically diagnosed as aseptic meningitis, only eight (7.3 per cent) were subsequently confirmed as SLE. In contrast, 20 (44.4 per cent) of the 45 cases diagnosed as encephalitis were serologically confirmed. Sixteen of the 20 encephalitic cases were at least 55 years of age, while only two of those initially diagnosed as aseptic meningitis were in this age group.

The attack rate in Birmingham was 9.3/100,000, with the highest age-specific attack rate (48.3/100,000) in the 65–74 year old group. The age-adjusted attack rate in blacks was significantly higher than in whites ($p < .02$) (Table 1). Only three of the 32 confirmed cases in the county were less than 33 years of age, and both sexes were equally affected (15 males, 17 females).

Birmingham cases were geographically scattered (Figure 2). Attack rates were higher in lower-middle and lower socioeconomic census tracts than in upper-middle and upper tracts, a difference that was significantly different ($p < .01$) when the two upper and two lower categories were combined and compared² (Table 2).

Three confirmed cases died, although two of them developed medical complications which may have contributed to their demise. Attributing the three deaths to SLE, the case fatality ratio was 9.4 per cent.

Vector Control

Because of abundant vector breeding sites, larviciding was begun on August 29, with larger areas being treated as new cases were reported. Although the emergence of adult mosquitos was undoubtedly reduced by these efforts, the aerial ULV application was deemed necessary on September 13 to eliminate those mosquitos already infected. Adult mosquito collections made in 15–20 minute periods yielded 10–65 per site prior to the spraying, but dropped to near zero afterward and remained low into October.

Discussion

The high attack rate and increased clinical severity of SLE in the older age groups noted in Birmingham have been two of the most common findings in previous epidemics.^{3–5} An association between risk of infection and either race or socioeconomic class has been described but data are inconsistent. Frequent exposure to large numbers of vector mosquitos seems to be the crucial predisposing factor. The absence of confirmed cases in the valley bordering Birmingham to the west cannot be readily explained although two pre-

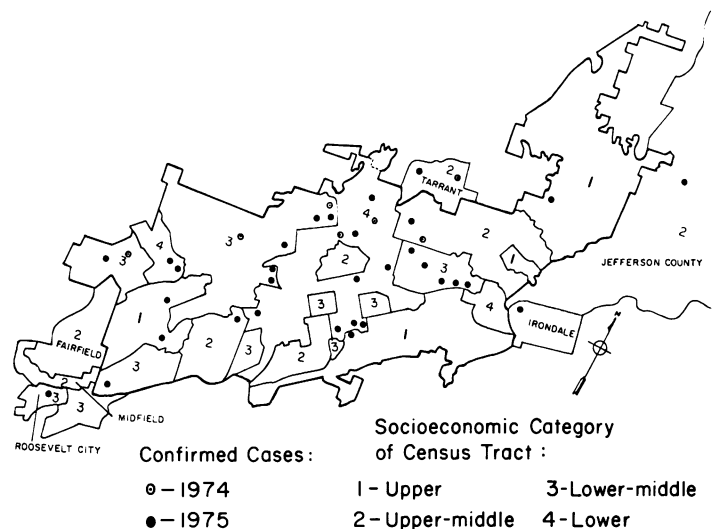


FIGURE 2—St. Louis Encephalitis, Birmingham, Alabama, 1974 and 1975.

TABLE 1—St. Louis Encephalitis, Birmingham, Alabama 1975: Attack Rate by Race

| Race | Population* | Cases (Confirmed) | Crude Attack Rate/100,000 | Age Adjusted** Attack Rate/100,000 |
|-------|-------------|-------------------|---------------------------|------------------------------------|
| White | 173,926 | 9 | 5.2 | 4.8 |
| Black | 126,465 | 19 | 15.0 | 13.1 |
| TOTAL | 300,391 | 28 | 9.3 | |

* Population data—U.S. Census, 1970.

** Age adjustments based on the age distributions shown in the 1970 census of Birmingham.

TABLE 2—St. Louis Encephalitis, Birmingham, Alabama 1975: Attack Rate by Socioeconomic Status of Area of Residence

| Socioeconomic Status* | Population** | Cases (Confirmed) | Attack Rate/100,000 | |
|-----------------------|--------------|-------------------|---------------------|--------------|
| | | | Crude | Age Adjusted |
| Upper | 83,048 | 4 | 4.8 | 5.5 |
| Upper-middle | 55,634 | 2 | 3.6 | 1.6 |
| Lower-middle | 83,272 | 12 | 14.4 | 13.3 |
| Lower | 77,939 | 10 | 12.8 | 11.4 |
| TOTAL | 299,893 | 28 | 9.3 | |

* Socioeconomic status of area of residence calculated by Serfling-Sherman technique.

** Population data—U.S. Census, 1970.

sumptive cases did reside there. The area shows comparable demographic and socioeconomic characteristics.

Without ongoing mosquito control programs, local governmental officials must base decisions regarding such action not only on medical and scientific information, but also on logistical, political, and economic factors. Once human cases are detected it can generally be assumed that a significant level of virus is present in wild birds and arthropod vectors, and that many more inapparent cases exist. A reasonable approach to such a situation would be a combination of larviciding and adulticiding if feasible. Aerial spraying is generally a last resort consideration because of the expense. Since the months of peak SLE occurrence are August and September, the aerial spraying of Birmingham was carried out rather late, thus limiting conclusions as to its effectiveness.

Because of the widespread occurrence of SLE during the previous two years, surveillance programs were again

initiated in Jefferson County in 1976. Approximately 5 per cent of the juvenile sparrows bled were antibody positive early in the summer, but the percentage diminished to near zero by the first week of July. Only two confirmed and two presumptive cases were ultimately disclosed that year. An early decision by Birmingham city officials to implement a ground ULV mosquito control program may have averted a more serious problem, although the total number of case reports from elsewhere in the nation was also relatively low⁶.

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Evidence for the Existence of Q Fever in Northwest Texas

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Q fever, caused by *Coxiella burnetii*, was described in 1937.¹ The host range at present is known to include many species of ectoparasites, birds, and mammals, including man.^{2,3} Q fever in animals is generally believed to be an inapparent disease, although recently two independent reports

have related the disease to abortions in sheep and goats, and experimentally infected cows.^{4,5} Many infected animals are known to shed the organism in feces, milk, nasal discharges, placental tissues, and birth fluids.⁶ The resistance of *Coxiella burnetii* to heat, drying, and chemical agents allows the organisms to remain viable for extended periods of time outside of the host. Thus, the inhalation of contaminated dust is generally reported as the means of transmission of the disease.⁷ Other modes of transmission include bites from infected ectoparasites, direct contact with the organism, and possibly by ingestion of contaminated milk; a recent report presented evidence of *in utero* infections in humans.⁸

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