

## ARTICLES

EVIDENCE AGAINST WINTER CARRYOVER OF WESTERN EQUINE ENCEPHALOMYELITIS VIRUS BY *CULEX TARSALIS*

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When the role of *Culex tarsalis* as an important vector of western equine encephalomyelitis (WEE) was first established by the work of Hammon *et al.* (1942), they discussed the possibility that hibernating *C. tarsalis* may carry the virus through the winter and re-establish it in vertebrate hosts the following spring. The evidence for this hypothesis is contradictory. Bennington *et al.* (1958) have shown that blood feeding by *C. tarsalis* becomes reduced during fall and late summer, and that a majority of the hibernating mosquito population probably has not had an opportunity to become infected. On the other hand, Bellamy *et al.* (1958) and workers at the Rocky Mountain Laboratory (unpublished) have shown that, under experimental conditions, the mosquito can support virus for a period equivalent in duration to a northern winter. Furthermore, Blackmore and Winn (1956) isolated WEE virus from *C. tarsalis* collected in Colorado in December.

In any case, to be accepted, the hypothesis of winter carryover by *C. tarsalis* must be supported by additional isolations from winter-collected mosquitoes. The purpose of the present communication is to report results of a summer-winter-summer sequence of attempts to isolate WEE virus from mosquitoes collected in eastern Oregon. The number of winter-collected specimens is the largest ever reported to have been so tested in a northern region.

**METHODS.** The study was carried out near Vale, Oregon, with the cooperation

of the State Health Department and the Malheur County Health Department. The area is described elsewhere (Rush, 1962). Summer collections were made by light traps and by aspirator in chicken houses. Winter collections were made by manually moving rocks among which mosquitoes were resting and collecting mosquitoes by aspirator. Overwintered mosquitoes were captured in early spring in chicken-baited traps which were placed adjacent to hibernation sites. Antibody determinations (neutralization in 21-day-old mice, inoculated intracerebrally) were made on the bait chickens before and after exposure to the mosquitoes. Virus isolation was attempted by inoculating suckling mice intraperitoneally with suspensions of mosquitoes.

**RESULTS.** Ten isolations of WEE virus were made from 1025 *C. tarsalis* collected during July, 1960, and tested in 23 pools of 50 or less mosquitoes. During the following winter and early spring, before appearance of the first spring brood of adults, 2471 *C. tarsalis* were collected. Virus was not detected in these mosquitoes and the bait chickens which had been exposed to the emerging hibernators did not develop antibodies. During July and August, 1961, 2059 *C. tarsalis* were collected and tested in 62 pools, 18 of which contained virus. Thus, at least 28 (approximately 1%) of the 3084 mosquitoes collected during the two summers contained virus while no virus was found in 2471 mosquitoes collected during the intervening winter.

**DISCUSSION.** If *C. tarsalis* were in-

volved in winter maintenance of WEE virus, virus should be present in the mosquito population during a winter like that of 1960-61, which came between two summers of high virus incidence in mosquitoes. The negative findings during such a winter suggest the unlikelihood of consistent yearly carryover. Moreover, even if an occasional infected *C. tarsalis* does survive through winter, it is doubtful that it can re-establish a cycle during early spring, since at that time conditions are unfavorable for virus maintenance by mosquitoes (Rush *et al.*, 1963).

#### References

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## THE USE OF A MODIFIED HOSKINS-CALDWELL SPRAY CHAMBER FOR MOSQUITO INSECTICIDE RESISTANCE STUDIES<sup>1</sup>

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With the advent of insecticide-resistant mosquito populations, the question of whether a population is resistant to a given insecticide is of prime importance in planning and executing any chemical control program. Techniques for detecting insecticide resistance in larvae and adults are now available, and have been used extensively throughout the world (Fay *et al.*, 1953; Mathis *et al.*, 1959; Anon., 1960).

Recent laboratory studies on insecticide resistance in *Aedes aegypti* (L.) required (a) a critical measurement of the proportion of insecticide-resistant indi-

viduals in given populations of several strains, and (b) selection of both sexes at 90 percent or greater mortality levels to produce homozygous resistant strains for genetic tests. As large numbers of mosquitoes were required for both types of studies, the standard techniques used for field detection of resistance were not considered adequate. In addition, the direct application of the toxicant to the insect minimized the influence that behavioral characteristics (e.g., resting habits on residues) might exert on the results of a test. These factors prompted the consideration of a modified Hoskins-Caldwell spray chamber (Perry, in manuscript). Aside from fulfilling the previously mentioned purposes, it was hoped that the device would enable the detection of relatively small variations in the insecticide susceptibility of various nonresistant strains of *A. aegypti*.

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