

Although the transmission threshold for the *Ae. aegypti* mosquitoes was considerably lower than that of the *A. albimanus* and *A. quadrimaculatus* mosquitoes, with median initial EEE virus titers of 4.9 versus 6.9 and 7.6 respectively, the latter two species were definitely shown to be capable of experimentally transmitting EEE virus with the virus titers of the transmitting mosquitoes being approximately equal for all three species.

SUMMARY. *Anopheles albimanus* and *A. quadrimaculatus* mosquitoes were infected with eastern encephalitis (EEE) virus using the membrane feeding technique. Transmission of EEE virus to baby chicks was obtained with both species of mosquito. The *A. albimanus* were the more susceptible to infection and proportionately more capable of transmitting the infection. The infection thresholds for *A. albimanus* and *A. quadrimaculatus* were equal to or less than 4.7 and 6.0 mouse $1/\log_{10}$ IC LD₅₀ respectively. The transmission thresholds for these mosquitoes were between 6.0 and

6.9 and between 7.0 and 7.6 mouse $1/\log_{10}$ IC LD₅₀ respectively.

References

CHAMBERLAIN, R. W., SIKES, R. K., NELSON, D. B., and SUDIA, W. D. 1954. Studies on the North American arthropod-borne encephalitides. VI. Quantitative determinations of virus-vector relationships. *Amer. J. Hyg.* 60:278-285.

COLLINS, W. E., HARRISON, A. J., and SKINNER, J. C. 1964. The use of a membrane feeding technique to determine infection and transmission thresholds of Semliki Forest virus in *Anopheles quadrimaculatus* and *Anopheles albimanus*. *Mosq. News* 24(1):25-27.

COLLINS, W. E., HARRISON, A. J., and JUMPER, J. R. 1965. The infection and transmission thresholds of eastern encephalitis virus to *Aedes aegypti* as determined by a membrane feeding technique. *Mosq. News* 25(3):293-295.

DAVIS, WILLIAM A. 1940. A study of birds and mosquitoes as hosts for the virus of eastern equine encephalomyelitis. *Amer. J. Hyg.* 32 (Sec. C):45-59.

REED, L. J., and MEUNCH, H. S. 1938. Simple method of determining fifty percent endpoints. *Am. J. Hyg.*, 27:493-497.

TEN BROECK, C., and MERRILL, M. H. 1935. Transmission of equine encephalomyelitis by mosquitoes. *Am. J. Path.* 11:847.

LIST OF MOSQUITO RECORDS FROM ALBERTA

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The following forty-two species of mosquitoes, belonging to eight genera are known to occur in Alberta. The stages of mosquitoes recorded are indicated as larvae (L), adults (♂ ♀), and unspecified (u). These were collected mainly from the following general regions: (Numbers in parentheses refer to the correspondingly numbered references, which contain the original data.) Southern Alberta—McLintock (8), Sheman-chuk (13), and Strickland (14). Central Alberta—Belur (1), Hocking (6), Klassen (7), Pucac (9), Strickland (14), and Wada (16). Northern Alberta—Happold

(5), Hocking (6), and Pucac (9, 10). Twinn (15), Rempel (11, 12), Carpenter and La Casse (3), and Cook (4) refer mainly to Strickland's records.

Aedes (Ochlerotatus) campestris Dyar and Knab L (11, 13, 16); ♂ (7, 13); ♀ (1, 13); u (14, 15). *A. canadensis* Theobald L (9, 11, 16); ♂ (7, 9); u (14, 15). *A. cataphylla* Dyar L (5, 11, 13, 16); ♂ (7); ♀ (1, 5, 7, 9, 12, 13); u (14). *A. cinereus* Meigen L (5, 9, 11, 13, 16); ♂ (7, 9); ♀ (1, 5, 6, 7, 9, 13, 16); u (14, 15). *A. communis* de Geer L (5, 9, 11, 16); ♂ (7, 9); ♀ (5, 6, 7, 9, 16); u (14, 15). *A. diantaeus* Howard, Dyar

and Knab ♀ (5, 10). *A. dorsalis* Meigen L (9, 11, 13, 16); ♂ (13); ♀ (13); u (14, 15). *A. excrucians* Walker L (5, 9, 11, 16); ♂ (7, 9); ♀ (1, 5, 6, 9, 16); u (14, 15). *A. fitchii* Felt and Young L (5, 9, 11, 16); ♀ (5, 6, 7, 9, 16); u (14, 15). *A. flavescens* Muller L (5, 11, 16); ♂ (5, 7, 13); ♀ (1, 5, 7, 9, 13); u (14, 15). *A. hexodontus* Dyar L (9, 10, 16); ♀ (16). *A. idahoensis* Theobald ♀ (8, 10). *A. impiger* Walker L (9, 11); ♀ (6, 9); u (12, 14, 15). *A. implicatus* Vockeroth L (5, 9, 11, 16); ♂ (7); ♀ (5, 7, 9, 16); u (14, 15). *A. increpatus* Dyar L (9, 10, 16); ♀ (7, 16). *A. intrudens* Dyar L (5, 9, 11, 13, 16); ♀ (5, 6, 7, 9, 13, 16); u (14, 15). *A. melanimon* Dyar ♂ (2). *A. nigromaculis* Ludlow L (11, 13); ♂ (13); ♀ (13); u (14, 15). *A. niphadopsis* Dyar and Knab L (16). *A. pionips* Dyar L (5, 9, 11, 16); ♂ (9); ♀ (1, 5, 6, 7, 9), u (14, 15). *A. pullatus* Coquillett L (11, 9); ♀ (9); u (14, 15, 16). *A. punctor* (Kirby) L (5, 9, 11, 16); ♂ (9); ♀ (1, 5, 7, 9, 16); u (14, 15). *A. riparius* Dyar and Knab L (5, 9, 13, 16); ♂ (9, 13); ♀ (1, 5, 6, 7, 9, 13, 16); u (14, 15). *A. spencerii* (Theobald) L (5, 9, 11, 13, 16); ♂ (5, 13); ♀ (1, 5, 9, 13); u (14, 15). *A. sticticus* (Meigen) L (5, 9, 13); ♀ (5, 6, 9, 13); u (15). *A. stimulans* (Walker) L (9, 11); ♀ (1, 7, 9, 16); u (14, 15). *A. trichurus* (Dyar) L (11); ♀ (7, 9); u (14, 15). *A. vexans* (Meigen) L (5, 9, 13, 16); ♂ (13); ♀ (1, 5, 6, 9, 13, 16); u (14, 15). *Anopheles (Anopheles) earlei* Vargas L (5, 6, 9, 11, 16); ♂ (6); ♀ (1, 5, 6, 9, 16); u (14, 15). *Culiseta (Culiseta) alaskaensis* Ludlow L (5, 9, 11, 16); ♀ (1, 5, 7, 9, 13); u (14, 15). *C. impatiens* (Walker) L (5, 9, 11); ♂ (5, 9); u (14, 15). *C. incidens* (Thomson) L (5, 9, 11); u (14, 15). *C. inornata* (Williston) L (1, 5, 9, 11, 13, 16); ♂ (1, 13); ♀ (1, 5, 7, 9, 13, 16); u (12, 14, 15). *Culiseta (Culicella) morsitans* (Theobald) L (5, 9, 16); ♀ (5); u (14, 15). *Culex (Culex) restuans* (Theobald) ♀ (7, 10). *C. tarsalis* (Coquillett) L (9, 13, 16); ♂ (13); ♀ (1, 9, 13); u (11, 14,

15). *Culex (Neoculex) territans* (Walker) L (6, 9, 16); ♀ (1, 6, 9). *Mansonia (Coquillettia) perturbans* (Walker) ♀ (5, 10). *Chaoborus (Chaoborus) americanus* (Johannsen) L (9, 13, 14); ♂ (13); ♀ (13); u (14). *C. flavicans* (Meigen) L, ♂, ♀ (13); u (14). *Eucorethra underwoodi* Underwood L (4, 9); ♀ (4). *Mochlonyx velutinus* (Ruthe) L (4, 9); ♀ (4).

Aedes niphadopsis Dyar and Knab, listed above, is being reported for the first time for Alberta, and as far as I know, for the first time for Canada. Wada (16) collected and identified it, and Hocking confirmed the identification. Wada (16) indicated the following: "A larva of this species was obtained from a collection of small pools in a pasture near a creek, about 20 miles west of Edmonton, on June 7, 1964. Associated mosquitoes were: *Culiseta inornata*, *C. morsitans*, *Aedes dorsalis*, *A. excrucians*, *A. fitchii*, *A. implicatus*, and *A. intrudens*. I reared that larva to an adult, and now I have a female specimen with an associated larval skin."

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References

1. BELUR, N. 1963. A preliminary Report of the Mosquito Survey during July to September 1962. Unpublished Report. Department of Entomology, University of Alberta.
2. BURGESS, L. 1957. Note on *Aedes melanimon* Dyar, a Mosquito New to Canada (Dipt.: Culicidae). *Canad. Ent.* 89:532.
3. CARPENTER, S. J. and LACASSE, W. J. 1955. Mosquitoes of North America. University of California Press, Berkeley.
4. COOK, E. F. 1956. The Nearctic Chaoboridae (Diptera: Culicidae). Technical Bulletin 218. University of Minnesota Agricultural Experiment Station.
5. HAPPOLD, D. H. D. 1963. Studies on the Ecology of Mosquitoes in the Boreal Forest of

Alberta. Doctoral Thesis. Department of Entomology, University of Alberta.

6. HOCKING, B. 1959. Field Notes. Department of Entomology, University of Alberta.

7. KLASSEN, W. 1959. The Influence of the North Saskatchewan River Valley on the Dispersion of *Aedes*. M.Sc. Thesis. Department of Entomology, University of Alberta.

8. McLINTOCK, J. Field Notes. 1950, 1951. Entomology Section, Research Station, Canada Agriculture, Saskatoon, Canada.

9. PUCAT, A. 1965. The Morphology and Function of the Mouthparts of Mosquito Larvae. *Quaestiones Entomologicae* 1(2):41-86; Field Notes.

10. PUCAT, A. 1964. Seven New Records of Mosquitoes in Alberta. *Mosquito News* 24(4):419-421.

11. REMPEL, J. G. 1950. A Guide to the Mosquito Larvae of Western Canada. *Canad. J. Res. D.* 28:207-248.

12. REMPEL, J. G. 1953. The Mosquitoes of Saskatchewan. *Canad. J. Zool.* 31:433-509.

13. SHEMANCHUK, J. A. 1959. Mosquitoes in the Irrigated Areas of Southern Alberta and their Seasonal Changes in Abundance and Distribution. *Canad. J. Zool.* 37:899-912.

14. STRICKLAND, E. H. 1938. An Annotated List of the Diptera (Flies) of Alberta. *Canad. J. Res. D.* 16:175-219.

15. TWINN, C. R. 1949. Mosquitoes and Mosquito Control in Canada. *Mosquito News* 9:35-41.

16. WADA, Y. 1964. Field Notes. Department of Entomology, University of Alberta.

NOTES ON THE MOSQUITOES (CULICINAE) OF NORTHWESTERN NEBRASKA

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Northwestern Nebraska, as considered here, comprises Dawes and Sioux Counties. Ecologically, this is the northern limit of the high plains area of the short grass prairie. Extending across the northern third of Dawes and Sioux Counties in a generally east-west direction is the Pine Ridge, a north-facing escarpment which rises prominently above the surrounding treeless prairie (Fig. 1). North of Pine Ridge, the unglaciated Missouri Plateau of short grass prairie and local badlands extends approximately 60 miles to the Black Hills in extreme southwestern South Dakota. Drainage from the northern slopes of Pine Ridge flows eastward into the headwaters of White River; the southern slopes drain eastward into headwater tributaries of the Niobrara River.

Pound and Clements (1900:83) state:

"The Pine Ridge district is akin topographically and phytogeographically to the Black Hills of South Dakota." With its mature stands of ponderosa pine, and much of its flora and fauna showing affinities with western mountain ranges, the Pine Ridge is an ecological island separated from any other coniferous area by an extensive region of short grass prairie. Such birds as the Pinion Jay, Clark's Nutcracker, Western Tanager, and Pygmy Nuthatch are breeding birds of the area. The caddisfly, *Hesperophylax occidentalis* Banks, a common species of western mountain streams, is found in the streams of Pine Ridge. Several species of the dipterous family Dolichopodidae previously known only from the Wasatch Mountains in north-central Utah have recently been collected in small canyons which dissect the Pine Ridge, and quite likely reach the eastern limits of their distribution in the latter area.

Previous studies on the mosquitoes of Pine Ridge and surrounding areas of

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