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## AN INCIDENT OF FENTHION MOSQUITO CONTROL AND SUBSEQUENT AVIAN MORTALITY

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*Abstract:* Mass mortality among migratory birds at Grand Forks, North Dakota, was attributed to a mosquito control operation employing the insecticide fenthion. The factors involved may have included the toxicity of the pesticide for birds, the method of application and coincidence with the peak of the spring warbler migration.

### INTRODUCTION

A contract mosquito control operation was conducted for the City of Grand Forks, North Dakota, Friday, 23 May 1969, between 0730 and 1130 hours, on approximately 600 hectares of residential and park areas and adjacent Red River of the North and English Coulee. A helicopter equipped with an 5.5 m boom fitted with six T-jet size 815 nozzles was employed for the aerial spraying. Undiluted fenthion (*O, O*-dimethyl *O*-4-(methylthio)-*m*-tolyl phosphorothioate)  $\square$  was reportedly applied at the recommended rate of 95.0 ml/ha (1.3 oz/acre), and a pressure of 0.84 kg/cm<sup>2</sup> (12 psi) from the aircraft flying at 72 km/h just above tree height which varied from 15-23 m.

The same afternoon and on the next 2 days, local residents observed dead and moribund birds. On Monday, 26 May, dead birds which had been collected over the weekend were received by the Biology Department at The University of North Dakota, and a public appeal for additional specimens was issued. A total of 453 birds representing 37 species was received. Found in greatest numbers were warblers and thrushes, especially Tennessee, *Vermivora peregrina*, (196), yellow, *Dendroica petechia*, (88), and blackpoll, *D. striata*, (50) warblers, robins, *Turdus migratorius*, (17), and Swainson's thrushes, *Hylocichla ustulata*, (26). Most of the

birds (422) were found in areas adjacent to the Red River; 31 others were collected near the English Coulee and elsewhere in the city. It was impossible to ascertain the exact magnitude of the mortality; however, based on an extrapolation of mortalities occurring on areas of known size to the total area treated, it appears that probably 5,000-25,000 birds died.

### MATERIALS AND METHODS

Nineteen warblers and a Swainson's thrush which had been found dead early in the morning of 24 May and frozen immediately were selected for cholinesterase determinations. The birds had been held in home freezers from the time of collection until 28 May and then at -10 C until 3 June. At that time the brains were removed in a frozen state and sent in dry ice to Crowell Henderson, Division of Fisheries Services, Colorado State University, Fort Collins, for cholinesterase assay<sup>1</sup> which was performed on 7 and 8 June.

### RESULTS

The 20 brains showed very little cholinesterase activity (Table 1), a typical finding in cases of fenthion poisoning in birds.<sup>2,3</sup> Reported average values for several species of passerines, shorebirds

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$\square$  BAYTEX Liquid Concentrate, Chemagro Corporation, Kansas City, Missouri, U.S.A.

and mourning doves not exposed to fenthion were approximately equivalent to 1.0-1.2  $\mu$ M acetylcholine bromide hydrolyzed by 2 mg of brain tissue.<sup>2</sup> The levels of cholinesterase activity observed in this

incident are considerably lower than these reported normal values and are comparable to values which Elder and Henderson<sup>2</sup> found in fenthion poisoning in other species of birds.

TABLE 1. Cholinesterase activity in brain tissue from dead birds, City of Grand Forks, May 1969.

Species	Number	Mean*	Range*
Swainson's Thrush	1	0.09	
Yellow Warbler	6	0.08	0.00 - 0.36
Tennessee Warbler	7	0.22	0.00 - 0.68
Blackpoll Warbler	6	0.35	0.00 - 0.56
TOTAL	20		

\* $\mu$ M acetylcholine bromide hydrolyzed by 2 mg brain tissue in 30 minutes at 25 C.

#### DISCUSSION

Fenthion is known to be highly toxic to birds, as indicated by its alternative name "Quelatox"<sup>5</sup> (African weaverbirds are of the genus *Quelea*), and bird mortalities have been associated with its application for mosquito control at the ultra-low volume rates of 117 - 234 ml/ha.<sup>3,4,6</sup> Additional factors in the Grand Forks incident may have included variations in spray droplet size, a cumulative effect of overlapping applications, or areas of high application developing as a result of improper calibration of the spray apparatus or placement of nozzles on the boom. If a pretest of the spray pattern had been conducted, it might have given an indication of calibration errors. There is also the possibility of an uneven application resulting from the use of a highly maneuverable helicopter which could readily vary its air speed or overlap previously

treated areas. Furthermore, the spraying was conducted during the peak of the warbler migration, therefore exposing a greater number of species and individual birds than at other times of the spring or summer.

We know of few reported incidents of significant avian mortality resulting from the ultra-low volume application of fenthion. Although the evidence is circumstantial, all indications are that the use of this insecticide, the timing of the operation, and possibly the method of application caused the sudden and widespread mortality. As a result of this mortality and bird losses associated with other similar applications, it was recommended that the registration for ultra-low volume aerial application of fenthion be withdrawn.<sup>6</sup> We understand this has been accomplished, though low volume and conventional aerial applications are still approved.

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