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# FOREST INSECT AND DISEASE MANAGEMENT / evaluation report



## Effects of Orthene® on Songbird Brain Cholinesterase in Maine, 1977



U. S. DEPT. OF AGRICULTURE  
NATIONAL FOREST SERVICE

OCT 5 1978

U.S. DEPT. OF AGRICULTURE



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Introduction

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Moosehead Lake in Piscata-  
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rvice with assistance from  
alyses of brain cholinesterase  
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n cholinesterase activity to  
erial applications.

Specific Objectives

1. To deter  
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2. To deter  
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Exposed  
Heads were  
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a freezer at

0, and 35 days after spraying.  
oil, labeled, immersed in li-  
were removed and stored in

Analyses of brain cholinesterase activity was measured according to the methods of Coppage (1971, 1974). Cholinesterase values were expressed as micro-moles of substrate hydrolysed per hour per milligram of brain tissue. Analyses of variance between means of brain cholinesterase activity for each species determined any significant differences between controls and samples collected after spraying. Ludke (1975) reported that storing at -22°C reduced brain cholinesterase activity 25 percent but that activity remained at this level indefinitely. Therefore, it is presumed that values shown in Table 1 are lower than those obtained from analysis of live birds.

Results

There was significant (P<0.025) brain cholinesterase inhibition in evening grosbeaks (maximum 18.1% at 1 day postspray) and magnolia warblers (maximum 22.8% at 10 days postspray) (Table). However redstarts and Canada warblers did not experience significant (P<0.025) brain cholinesterase inhibition. The search of the spray block in conjunction with sampling produced no obviously affected songbirds or other vertebrates. By the final sampling, prespray brain cholinesterase activity levels were approached in all species.

Discussion

We found a larger than expected variation in brain cholinesterase activity. Though the cause of variation in controls is unknown, variations between species ( and among individuals ) or exposed birds may be partially explained by the habits of each species. Snowden et al. (1977) reported that significantly more spray reaches the upper crown and lee-ward side of fir trees receiving aerial applications. This could be a factor in the relative

<sup>1</sup> Use of trade, firm or corporation names in this paper is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture of any product or service to the exclusion of others which may be suitable.

consistency and significant depression in brain cholinesterase activity of evening grosbeaks that spend most of their time in the tops of trees or in open areas on the ground. The warblers and redstarts are found in various locations in the forest canopy, which could lead to variable exposures during aerial spraying operations. It is not known to

Table 1. -- Comparison of unsprayed and postspray cholinesterase activity<sup>a</sup> in brains of birds sprayed with Orthene<sup>®</sup> at 0.5 lbs/acre.

Species	Unexposed Controls	Postspray (days)		
		1	10	35
<i>Evening Grosbeak</i>				
n	10	9	10	10
$\bar{x}$ *	0.502	0.411	0.462	0.472
SE	0.022	0.014	0.015	0.066
Range	(0.405-0.645)	(0.345-0.450)	(0.405-0.540)	(0.360-0.570)
No. 20% dep **	0	3	0	2
<i>Magnolia Warbler</i>				
n	10	14	10	10
$\bar{x}$ *	0.519	0.514	0.396	0.501
SE	0.028	0.036	0.037	0.020
Range	(0.495-0.750)	(0.375-0.930)	(0.225-0.630)	(0.465-0.630)
No. 20% dep **	0	1	6	0
<i>Redstart</i>				
n	11	10	15	6
$\bar{x}$ *	0.498	0.438	0.491	0.573
SE	0.029	0.024	0.022	0.063
Range	(0.390-0.705)	(0.345-0.585)	(0.390-0.675)	(0.345-0.705)
No. 20% dep **	1	3	2	1
<i>Canada Warbler</i>				
n	5	7	7	none collected
$\bar{x}$ *	0.549	0.465	0.420	-----
SE	0.049	0.022	0.034	-----
Range	(0.360-0.645)	(0.405-0.570)	(0.345-0.525)	-----
No. 20% dep **	1	1	2	

<sup>a</sup> Cholinesterase activity expressed as micromoles substrate hydrolysed/hour/milligram brain (wet weight).

\* Significant difference (P 0.025) between means by one way analysis of variance.

\*\* Number of individuals with 20% or more cholinesterase inhibition compared to control means.

what extent feeding on treated insects or stages in mating season—which occurred during times of spraying and sampling—affected brain cholinesterase activity. It is also possible that some of the individual birds received double doses of the spray from overlapping swaths or were not exposed if they were missed by the spray. More frequent sampling intervals could have produced more precise estimates of the time of greatest inhibition, but may also have depleted populations of species studied in the spray block.

Buckner and McLeod (1975) reported Orthene<sup>®</sup>, when applied at 0.5 pounds of active ingredient per acre killed neither juveniles nor adults of 29 species of songbirds that were found in an area they had studied. We found no mortality or evidence of other deleterious effects in populations of songbirds in our study area—which received a similar treatment. Newly fledged warblers were evident in the sprayed area during the later collection periods.

#### Locations

Postspray collections were made in an Orthene<sup>®</sup> treated block of Lily Bay Township, Maine. Control collections were made in several locations well outside the spray block.

#### Methods

A 60,000 acre spruce-fir-hardwood block was sprayed with 0.5 pounds (active ingredient) of Orthene<sup>®</sup> per acre. The spray was applied by helicopter. Songbirds (evening grosbeaks, redstarts, magnolia warblers, and Canada warblers) were collected by several two-man crews with shotguns. Control samples were taken from untreated areas near the spray block. An attempt was made to collect 10 specimens of each species at each of four collection periods. Sufficient samples of evening grosbeaks, redstarts and magnolia warblers were obtained; data on Canada warblers were analyzed, but no 35-day postspray samples were collected for this species.

During the postspray collection period, gross effects of the spray upon birds and other vertebrates were determined. Observers were alerted to report aberrant behavior, loss of mobility or flight capability, and mortality.

#### Pesticide Statement

This publication reports pilot control project results involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or have Federal agencies before they can be recommended.

**CAUTION:** Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife—if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for disposal at surplus pesticides and pesticide containers.





## Acknowledgments

Samples were collected with assistance from Don Mairs and Wesley Smith of the Maine Pesticides Control Board, and Matt Scott, David Courtemanch, and George Lord of the Maine Department of Environmental Protection. Laboratory analyses were done by Ernest Richardson of the Maine Public Health Laboratory, Augusta. Statistical analyses were done by J. Larry Ludke of the U.S. Fish and Wildlife Service, Fish-Pesticide Research Laboratory, Columbia, Missouri.

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