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PARATHION POISONING OF WILD GEESE IN TEXAS

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On the mornings of 24 and 25 February 1981, 60 Canada geese (*Branta canadensis*), six snow geese (*Chen caerulescens*), four white-fronted geese (*Anser albifrons*), and two Ross' geese (*Chen rossii*) were found dead on the south shore of Lake Texoma within the boundaries of the Hagerman National Wildlife Refuge near Sherman, Texas. All the specimens were fresh. The birds were not observed in the area on the afternoon of 23 February, therefore they were assumed to have died during the next two days. Six specimens (four Canada geese, one snow goose, and one white-fronted goose) were sent on wet ice to the National Wildlife Health Laboratory (NWHL), Madison, Wisconsin, for necropsy and pathological examination. Additionally, six specimens (four Canada geese, one snow goose, and one white-fronted goose) were kept frozen until brain assays for cholinesterase activities and chemical analyses of proventricular contents could be performed. Nine apparently healthy specimens (five Canada geese, two snow geese, and two white-fronted geese) collected in January and April 1981 near Hereford, Texas, and Lake Charles, Louisiana, served as controls in the analyses.

On several days, just before discovery of the dead birds, winter wheat fields in the surrounding countryside were sprayed with parathion (O, O-Diethyl-O-p-nitrophenyl phosphorothioate), an or-

ganophosphate insecticide, for the control of greenbugs (*Schizaphis graminum*).

A modification (Hill and Fleming, 1982, Environ. Toxicol. Chem., in press) of the Ellman et al. (1961, Biochem. Pharmacol. 7: 80-95) technique was used to determine brain cholinesterase (ChE) activities of birds found dead and of controls. Brain ChE activity was greatly inhibited in birds found dead compared to that in controls (Table 1) and was sufficient to account for death (Ludke et al., 1975, Arch. Environ. Contam. Toxicol. 3: 1-21) in the six geese analyzed. The proventriculi of birds found dead were packed with winter wheat foliage; the six boluses were removed and analyzed separately for organophosphate insecticide residues following the methods described by White et al. (1982, J. Field Ornithol. 53: 22-27). Parathion was present in proventricular contents of the six geese found dead, ranging from 6 to 20 ppm on a wet weight basis; residues in one specimen were confirmed by mass spectrometry (White et al., 1979, Bull. Environ. Contam. Toxicol. 23: 281-284). Parathion was not detected in proventricular contents of control birds, nor was there any evidence of infectious disease or significant histopathology in the geese examined at the NWHL. In toxicological studies, parathion has been found to be extremely toxic to mallard ducks (*Anas platyrhynchos*), having an LD₅₀ of about 2 mg/kg (Tucker and

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TABLE 1. Brain cholinesterase (ChE) activities of wild geese found dead and of controls.

Species	N	ChE Activity ^a	% Inhibition
Canada Goose			
Controls	5	8.2 (6.0-9.8) ^b	0
Died	4	1.8 (1.6-1.9)	78
Snow Goose			
Controls	2	9.3 (9.1-9.4)	0
Died	1	1.4	85
White-fronted Goose			
Controls	2	8.4 (7.9-8.8)	0
Died	1	1.4	83

^aChE activity expressed as micromoles acetylthiocholine hydrolyzed per min per g brain tissue. Mean values are given for groups with more than one individual.

^bExtreme values.

Crabtree, 1970, U.S. Fish and Wildl. Serv., Resource Publ. No. 84, 131pp).

We conclude that parathion applied to winter wheat fields near Sherman, Texas, was responsible for the deaths of 72 wild geese, mostly Canada geese, found at the Hagerman NWR on 24 and 25 February 1981. Wheat fields near the Refuge received parathion applications on 18 February, and, contrary to Refuge policy and without the manager's consent, a field on the Refuge was sprayed with parathion by a tenant farmer on 23 February. Since greenbug infestations supposedly were widespread in Texas, other fields in the area also probably were sprayed with parathion. The exact locality where the birds were poisoned is unknown, since birds were not observed feeding in fields where spraying was documented.

Since 1956, parathion has been implicated in wild goose die-offs in the wheat growing areas of Texas and Oklahoma (White et al., 1982, op. cit.); it also has been responsible for adverse effects in other birds, for example laughing gulls (*Larus atricilla*) (White et al., 1979, Bull. Environ. Contam. Toxicol.

23: 281-284) and ring-necked pheasants (*Phasianus colchicus*) (Wolfe et al., 1971, Neb. Agric. Exper. Sta. 18: 4-6). The Texas A & M Agricultural Extension Service (TAMAES) (Pamphlet B-1251, 15pp) recommends five organophosphate insecticides for greenbug control on winter wheat. Parathion, the second most toxic of these to waterfowl (Tucker and Crabtree, 1970, U.S. Fish and Wildl. Serv., Resource Publ. No. 84, 131pp) is the one used most extensively on winter wheat in Texas (White et al., 1982, op. cit.). Even when used on wheat at recommended rates, parathion is extremely toxic to wild geese (White et al., 1982, op. cit.), probably because they ingest such large quantities of the treated vegetation. Other less conspicuous components of the fauna also may be adversely affected from parathion use. Since malathion is of very low toxicity to waterfowl (Hill et al., 1975, U.S. Fish and Wildl. Serv., Spec. Sci. Rep., Wildl. No. 191, 61pp) and is one of the chemicals recommended by TAMAES for use on winter wheat, farmers should be urged to use this compound, especially when geese are in the vicinity of treatment.

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