

DDT Poisoning in a Cooper's Hawk Collected in 1980

Richard M. Prouty,¹ Oliver H. Pattee,¹ and Sheila K. Schmeling²

¹U.S. Department of the Interior, Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, MD and ²U.S. Department of the Interior, Fish and Wildlife Service, National Wildlife Health Laboratory, Madison, WI

In April 1980, a Cooper's hawk (Accipiter cooperii) was found on the ground in Lakewood, Colorado, unable to fly and in convulsion. The bird died shortly thereafter. The hawk was packed in dry ice and shipped air express to the Fish and Wildlife Service, U. S. Department of the Interior, National Wildlife Health Laboratory, Madison, Wisconsin, for necropsy. Following necropsy, the brain, gastrointestinal tract, and remaining carcass except skin, feet, wings, liver, and kidney were packed in dry ice and shipped air express to the Patuxent Wildlife Research Center, Laurel, Maryland, for chemical residue analysis. Because the bird's behavior before death suggested some form of poisoning, the kidney was assayed for thallium, the liver for lead, and the gastrointestinal tract for strychnine, sodium fluoroacetate, and arsenic. When these assays proved negative, the bird was analyzed for organochlorine pesticides. Necropsy findings and pesticide residue analyses are reported here.

METHODS

The remaining carcass was ground and homogenized in a Hobart food cutter. A 10-g portion of the carcass and the entire brain were mixed separately with anhydrous sodium sulfate in a blender and extracted 7 h with hexane in a Soxhlet apparatus. The extracts were cleaned-up and separated into two fractions on a partially deactivated Florisil column. Fraction 1 was eluted with 1% diethyl ether in hexane and contained polychlorinated biphenyls (PCBs) and all organochlorine pesticides and their metabolites except dieldrin, endrin, and dichlorobenzophenone (DCBP), a DDT metabolite. These remaining three compounds were eluted with 6% diethyl ether in hexane. The pesticides, metabolites, and PCBs in the Florisil fractions were separated as described by CROMARTIE et al. (1975), except that a silica gel column was substituted for the SilicAR column.

All compounds were quantified with a gas chromatograph equipped with an electron-capture detector and a 1.5% SP-2250/1.95% SP-2401 column. Average recoveries of pesticides from fortified carcass tissue of a mallard (Anas platyrhynchos) ranged from 95 to 110% except for HCB which was 77%. Residues were not corrected for recovery values. The lower limit of reportable residues was 0.1 ppm

for pesticides and 0.5 ppm for PCBs. The identities of the residues were confirmed by gas chromatography-mass spectrometry. Operating conditions have been described by KAISER et al. (1980).

RESULTS AND DISCUSSION

The hawk, an adult female weighing 365 g, was in good body condition. Although there were no broken bones or severe bruises, the lungs were hemorrhagic, the thoracic air sacs were blood-tinged, and the lower third of the trachea was filled with clotted blood. The esophageal and stomach mucosa were congested but no food was present. The gall bladder was dilated with bile and some congestion of the kidneys was evident. No lesions were seen in the liver, lower gastrointestinal tract, or reproductive system. The ovary and oviduct were typical of a sexually inactive adult. A brain swab was cultured but there was no significant bacterial growth.

The residue data and percentage extractable lipids are shown below. Based on the high levels of DDT and DDD in the brain (62 ppm, combined), the cause of death was presumed to be DDT poisoning. This conclusion is supported by the work of STICKEL & STICKEL (1970), who found DDT + DDD residues of 30 ppm or higher in the brains of cowbirds (Molothrus ater) killed by dietary dosage of DDT.

Table 1. Pesticide residues (ppm wet weight) and extractable lipids (percent) in Cooper's hawk tissue

| Compound* | Carcass | Brain |
|----------------------|---------|-------|
| p,p'-DDE | 580 | 200 |
| p,p'-DDD | 75 | 16 |
| p,p'-DDT | 130 | 46 |
| Dieldrin | 0.10 | - |
| p,p'-DDMU | 7.0 | 2.5 |
| p,p'-DCBP | 0.78 | - |
| % extractable lipids | 2.7 | 9.3 |

*Other compounds analyzed for and not detected include heptachlor epoxide, oxychlordane, cis-chlordane, cis- and trans-nonachlor, endrin, toxaphene, hexachlorobenzene, mirex, and PCBs.

- = none detected.

The reported incidence of DDT poisoning in raptors is very low. Of 652 bald eagles (Haliaeetus leucocephalus) analyzed by the Patuxent laboratory collected in 1964 thru 1980, only 2 were presumed to have died from poisoning by DDT or its metabolites. Comparable studies of other raptor species are not available.

The source of the DDT is unknown; there has been a moratorium on DDT and DDD usage in the U.S.A. since 1971. An examination of band return records for Cooper's hawks maintained by the U.S. Fish and Wildlife Service reveals that a portion of this species from southwestern U. S. winters along the west coast of central Mexico. Although there are no recovery records for Colorado, Cooper's hawks banded in Arizona and Utah have been recovered in the Mexican states of Jalisco, Michoacan, Sinaloa, and Sonora. Thus, it is possible that the DDT was acquired on the wintering areas outside the U.S.A. and the toxic levels of DDT in the brain occurred when body lipids were mobilized during spring migration. A U.S.A. source of DDT cannot be ruled out since the duck wing and starling monitoring programs for 1976 revealed elevated DDE levels in eastern New Mexico (WHITE 1979a,b).

Acknowledgements. We thank W. Kocal, Special Agent, for the hawk specimen and E. H. Dustman and W. J. Fleming for reviewing this manuscript.

REFERENCES

- CROMARTIE, E., W. L. REICHEL, L. N. LOCKE, A. A. BELISLE, T. E. KAISER, T. G. LAMONT, B. M. MULHERN, R. M. PROUTY, and D. M. SWINEFORD: Pestic. Monit. J. 9, 11 (1975).
- KAISER, T. E., W. L. REICHEL, L. N. LOCKE, E. CROMARTIE, A. J. KRYNITSKY, T. G. LAMONT, B. M. MULHERN, R. M. PROUTY, C. J. STAFFORD, and D. M. SWINEFORD: Pestic. Monit. J. 13, 145 (1980).
- STICKEL, L. F. and W. H. STICKEL: pp. 57-65 in Pesticide Symposia, Halos and Associates, Miami, W. B. Deichmann, ed. (1970).
- WHITE, D. H.: Pestic. Monit. J. 13, 12 (1979a).
- WHITE, D. H.: Pestic. Monit. J. 12, 193 (1979b).