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EFFECTS OF DDE ADMINISTRATION ON HEPATIC MICROSOMAL MIXED-FUNCTION OXIDASE ACTIVITIES IN THE PUFFIN *Fratercula arctica* AND THE WHITE PEKIN DUCK *Anas platyrhynchos*

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It is well known that hepatic microsomal mixed-function oxidases of different bird species respond to DDT or dieldrin administration in various ways (Sell, Davison, Fed. Proc. 32, 2003, 1973), showing either induction, inhibition or no apparent alteration from control enzyme activities. The effect of DDE [1,1-dichloro-2,2-bis(p-chlorophenyl)-ethylene], a metabolite of DDT that occurs as a widespread environmental contaminant, on bird liver xenobiotic-metabolizing enzyme activities is consequently of interest. This report describes the response of puffin and duck hepatic microsomal aniline hydroxylase and benzphetamine demethylase activities, and of duck hepatic microsomal cytochrome P-450 content, to oral dosing with DDE.

Immature puffins (approximately 40 days old) and immature female white Pekin ducks (approximately 4 months of age) were used throughout. Puffins were dosed orally with DDE dissolved in corn oil (experimental) or corn oil alone (controls) for 16 - 21 consecutive days before sacrifice. The amount of DDE fed was selected (based on a daily per bird intake of 120 g of fish) to approximate 50 ppm in the diet. Ducks received 100 ppm DDE mixed in their feed for 10 consecutive days prior to sacrifice. Livers were removed and immediately frozen then assayed for mixed-function oxidase activities and for cytochrome P-450 content within

one week. Microsomes were prepared from liver homogenates and aniline hydroxylase and benzphetamine demethylase activities were determined as described for the little skate (Bull., MDIBL 12, 12,1972) except that incubation was at 37° C for 15 min. with a final protein concentration of 1.5 mg protein/ml. Cytochrome P-450 was quantitated by the procedure of Omura and Sato (J. Biol. Chem. 239, 2370, 1964) in microsomal suspensions containing 2 - 3 mg protein/ml.

TABLE 1

EFFECT OF DDE ADMINISTRATION ON THE HEPATIC MICROSOMAL MIXED-FUNCTION OXIDASE SYSTEM OF THE PUFFIN AND THE WHITE PEKIN DUCK[1]

	PUFFIN		DUCK	
	Control	DDE-fed[2]	Control	DDE-fed[2]
Yield Microsomal Protein (mg/g liver)	22.2±2.2(4)	24.2±1.0(5)	14.0±0.71(5)	16.2±0.95(5)
Aniline Hydroxylase (nmoles/min/mg protein)	0.19±0.05(4)	0.70±0.10(5)	0.72±0.12(5)	1.05±0.09(5)
Benzphetamine demethylase (nmoles/min/mg protein)	1.05±0.19(4)	5.45±0.45(5)	2.75±0.34(5)	4.26±0.19(5)
Cytochrome P-450 content (nmoles/mg protein)	-[3]	-[3]	0.31±0.05(5)	0.41±0.02(5)

[1]Mean ± S.E.M. (n)
[2]Puffins dosed orally with DDE in corn oil for 16 - 21 consecutive days amount selected to approximate 50 ppm in diet). Ducks received 100 ppm DDE in feed for 10 consecutive days
[3]Not measured

As shown in Table 1 hepatic microsomal aniline hydroxylase and benzphetamine demethylase activities in the immature puffin were significantly increased (3.7 and 5.2-fold, respectively) by animal pretreatment with DDE. Although there also tended to be increases in aniline hydroxylase and benzphetamine demethylase activities and in the cytochrome P-450 content of hepatic microsomes from DDE-treated immature ducks, the effects were much less dramatic than with puffins. In neither of these avian species did DDE treatment at our dosage levels cause significant increases in liver weight (data not shown) nor in the yield of microsomal protein on a per gram basis (Table 1).

In conclusion we have demonstrated that the xenobiotic-metabolizing enzyme system of puffin liver is readily induced by DDE treatment. To our knowledge no previous studies of this type have been carried out with this sea bird. In addition the duck hepatic microsomal enzyme system was affected to a much lesser degree by dietary DDE. Until DDE residue values are available (to be reported later), we cannot say whether the apparent relative insensitivity of the duck to DDE stimulated hepatic enzyme induction is a result of species differences or of a shorter dosing period. Miller et al. (Bull. MDIBL, this volume) have found that nasal gland Na,K-ATPase sensitivity to DDE *in vivo* was much greater in the puffin than the duck. Thus, like Sell and Davison (Fed. Proc. 32, 2003, 1973), we have found that the effects of organochlorine feeding on hepatic microsomal enzymes varies from one avian species to the next. (Supported in part by U.S.P.H.S. Grant ES 00920.)