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FURTHER STUDIES ON THE DISPOSITION OF DDT IN Squalus acanthias

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We have previously reported on the disposition of ^{3}H-DDT by the spiny dogfish S. acanthias (Bulletin MDIBL 9, 1969) and wish to report here preliminary analysis of our data on the disposition of ^{14}C-DDT in the same species.

In preliminary studies we had investigated the background levels of DDT and its metabolites in this species from specimens captured in Frenchman Bay. This study was repeated in the summer of 1970. DDT was assayed by gas chromatography using procedures and parameters as reported in 1969. Table 1 summarizes the background levels (parts per million) of DDT and metabolites in the organs examined in 1969 and 1970. The drug and its products were found in both

Table 1

PLASMA LEVELS OF ^{14}C-DDT IN THE DOGFISH

Dogfish No.	Sex	Weight	Time	cpm/ml
3	Female	3.8 kg	10 min	277,780
			20 min	208,330
			30 min	-
			1 hr	76,340
			2 hr	32,258
			3 hr	18,248
			4 hr	13,606
			6 hr	9,132
			24 hr	2,056
4	Female	3.9 kg	10 min	250,000
			20 min	169,930
			30 min	123,460
			1 hr	56,500
			2 hr	23,256
			3 hr	14,388
			4 hr	10,416
			6 hr	6,920
			24 hr	2,088

plasma and liver from all four dogfish studied and also in their candles, indicating that exposure to DDT occurs in this species before direct exposure to the food chain that is contaminated with this pesticide. These background levels may be important in disposition studies using tracer doses of the pesticide.

^{14}C-DDT was obtained from the Radiochemical Center Amersham in benzene solution which was evaporated and the DDT taken up in ethanol. The dogfish were injected i.a. with a dose of 0.1

mg/kg ^{14}C-DDT in a minimal volume of ethanol. Plasma and urine were collected at various time intervals and, on sacrificing the fish, various tissues were taken for combustion for determination of ^{14}C. The plasma disappearance of ^{14}C was rapid (Table 2) as previously reported for the ^{3}H-DDT. Less than 1% of the radioactive dose was found in the water (i.e., excreted by

Table 2

DDT AND METABOLITES IN DOGFISH 1969 AND 1970

Sample	Amount found* - PPM					
	DDMU	pp'DDE	op'DDD	op'DDT	pp'DDD	pp'DDT
Liver #1, 1969	0.38	0.94	<0.11	0.33	0.32	2.38
Plasma #1, 1969	<0.007	<0.002	<0.005	0.01	<0.005	0.019
Liver #2, 1969	0.74	1.84	<0.14	0.47	0.55	2.73
Plasma #2, 1969	<0.006	<0.002	<0.004	0.02	<0.004	0.03
Candle #1, 1969	0.21	0.47	<0.039	0.12	0.15	0.60
Liver #1, 1970	<0.08	1.14	<0.08	<0.039	0.73	1.67
Plasma #1, 1970	<0.001	0.006	<0.001	<0.001	0.014	0.024
Liver #2, 1970	<0.08	1.06	<0.077	<0.039	0.82	1.67
Plasma #2, 1970	<0.001	0.008	<0.001	<0.001	0.015	0.027
Candle #2, 1970	<0.006	0.51	<0.006	<0.003	0.42	0.86

*Amount PPM on wet weight basis.

the gills) during the first hour—a time at which the plasma level is highest. DDT was, however, bound to plasma proteins at greater than 95%. The greatest amount of ^{14}C was found in the liver, but the kidneys and red cells contained significant amounts of radioactivity. The bile/plasma ratio at 24 hours was 20-40, indicating concentration of DDT and/or metabolites and excretion via the bile. Samples of urine are currently being examined to determine the metabolites of DDT in this species and further studies on protein binding of DDT are contemplated. In general, we have confirmed our previous studies using the ^{3}H-DDT and find that the ^{14}C-DDT: (1) rapidly disappears from plasma; (2) though extremely lipid soluble is not excreted across the gills; (3) is bound to plasma proteins; (4) is taken up by the liver, and (5) ultimately is excreted by the biliary system.

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RESPIRATION RATES OF INVERTEBRATE TISSUE HOMOGENATES AS A POSSIBLE INDEX OF ENVIRONMENTAL STRESS

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Respiration of tissue homogenates determined with a YSI model oxygen electrode was studied as a possible procedure for evaluating physiological response to environmental change. Two species of hermit crabs, Pagurus acadianus and P. pubescens and one gastropod, Thais lapillus,