was a great deal of individual variation and the differences before and after antibiotic treatment were not significant ($P > .05$). Thus intestinal bacteria do not appear to play a significant role in the adaptation of urea metabolism to environmental dilution.

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OBSERVATIONS ON THE EFFECT OF DDT IN HERMIT CRABS

W.C. Grant, Jr., Williams College, Williamstown, Massachusetts

Studies by Gaurino *et al.*, 1971 (Bull. MDIBL 11: 29-31) and Kinter *et al.*, 1972 (Environ. Health Perspec. 169-173) have shown that lobsters and selected teleosts concentrate DDT directly from seawater. Similar studies were conducted on hermit crabs in order to judge their possible use as indicator organisms of pesticide contamination. Animals of two species, *P. acadianus* and *P. pubescens* were placed for six hours in 750 ml of aerated seawater at 10-11°C containing 1.0 ppm, 0.5 ppm and 0.1 ppm DDT (Nutritional Biochemicals Corp.) made up in a 0.2 percent solution of ethanol in seawater. The number of animals surviving at six, 12, 36, and 72 hours following initial exposure was recorded. Crabs surviving for 12 hours, which had been previously evicted from their domicile shells, were placed in the center of a water table containing two empty mollusc shells of appropriate size. The time taken for an individual to orient to one of the shells and to effect entry was noted. The results of these experiments are shown in Tables 1 and 2.

TABLE 1

Differential survivorship of hermit crabs exposed to varying levels of DDT contamination in seawater for six hours. *Average crab weight in mgms. per ml. of water.

Species	DDT Concentration	Total number of crabs	*mg/ml	Percent surviving in hours 6	12	36	72
P. acadianus	1.0 ppm	15	9.2	40	0		
	0.5 ppm	15	8.8	87.7	37.3	0	
	0.1 ppm	15	9.0	100	87.7	46.6	46.6
	controls (seawater)	10	8.7	100	93.4	93.4	93.4
P. pubescens	1.0 ppm	10	3.8	0			
	0.5 ppm	10	4.6	80.0	20.0	10.0	10.0
	0.1 ppm	10	3.6	100	80.0	60.0	60.0
	controls (sea water)	10	3.9	100	100	100	100

TABLE 2

Shell orienting and shell entry behavior of hermit crabs surviving twelve hours following exposure to DDT. *Trials in which positive behavior patterns were recorded.

Species	DDT Concentration	No. Trials	No. successful trials	Ave. Time to orient	Ave. Time to entry (hrs.)
P. acadianus	0.5 ppm	5	5	40.3	no entries recorded
	0.1 ppm	9	9	38.8	72.4
	controls	9	9	4.4	23.0
P. pubescens	0.5 ppm	2	1	357.0	no entries recorded
	0.1 ppm	8	2	223.6	239.6
	controls	10	10	213.9	247.8

The results indicate that survival at different levels of DDT is approximately the same for both species even though average crab weight per unit volume in *P. pubescens* is about half of that for *P. acadianus*. Although absolute concentrations of DDT over time in either seawater or crab tissue were not measured, it is suggested that crabs either concentrate the pesticide at rates independent of body size or that *P. pubescens* is a generally more resistant species. The behavior studies are of importance as they indicate differential effects of DDT concentration on individual items of behavior. Although ambulation is much impaired, crabs exposed to 0.5 ppm DDT oriented to shells but were unable to effect entry. In *P. acadianus* animals from 0.1 ppm DDT oriented to and entered shells but at times significantly greater than for controls. At similar concentrations, only two *P. pubescens* demonstrated successful behavior. The comparatively long-time taken by *P. pubescens* controls in displaying behaviors is normal for the species. These investigations indicate that hermit crab behavior may prove to be a reasonably sensitive indicator of DDT contamination in marine waters.

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