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THE TOXICITY OF 120 SUBSTANCES TO MARINE ORGANISMS

by

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FISHERIES LABORATORY, BURNHAM-ON-CROUCH, ESSEX

No. 19

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One of the activities of the Fisheries Laboratory, Burnham-on-Crouch is to obtain information on the probable effects on marine organisms of a variety of chemicals which are found in effluents from chemical factories and town sewers. Since the majority of the literature at present available on the toxicity of chemicals deals primarily with freshwater species it is necessary to test these chemicals against marine species of both plants and animals. This work has now been in progress since 1966 and the present leaflet provides a summary of the results obtained using animals up to the end of July 1970. It is intended that the leaflet should be up-dated periodically.

Toxicity tests are also being made using marine plants (flagellates and diatoms) but these will be reported separately.

All the toxicity tests described here were carried out in the manner previously described by Portmann (1968) and Portmann and Connor (1968). Briefly the experimental procedure consists of exposure, for a set period, of eight to twenty-five of the test animals (depending on species and size) to several dilutions in sea water of the chemical under test. The sea water was static but aerated and all dilutions were tested in duplicate with a total solution volume of 10 litres per test tank. Where solvents were used to dissolve solids, e.g. DDT, the maximum volume of solvent used in adding the chemical was also added to the controls. All the experiments were conducted at 15°C and were of 48 hours duration except those with oysters, Ostrea edulis, which lasted 5 days.

The results of the toxicity tests given in the following tables express in parts per million (ppm) the concentration which kills 50 per cent of the test organisms, i.e. the lethal concentration to half the animals, or the LC_{50}. Where the chemical is a solid, e.g. DDT, this is on a weight to volume basis, and where the material is a liquid, e.g. the solvent emulsifiers, it is on a volume to volume basis.

Where a second figure is given in brackets this indicates that the experiment was repeated on another occasion with a different result. Where a figure is underlined, e.g. 100-330, it indicates that the LC_{50}, although within that range, was very close to the underlined value - in this case 330 ppm.

REFERENCES

Portmann, J. E., 1968. Progress report on the programme of insecticide analysis and toxicity testing in relation to the marine environment. Helgoländer wiss. Meeresuntersuch., 17, 247-255.

Portmann, J. E. and Connor, P. M., 1968. The toxicity of several oil-spill removers to some species of fish and shellfish. Mar. Biol., 1 (2), 322-329.

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Solvent emulsifiers	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
Exxsol OSR	12.5	8.8	15.8				20.4	15-50
Cyclosol	8.5	15.7	70				23.2	
Exxsol	12.1	114.5	12.7				> 300 (15)	≈ 100
Shell 1002	5.8	5.8	81		10-33 (L)		10-25	50-100
Isanosol	32	44	19.2				102	
Isolvene	8.6	9.6	63				15-20	50-100
Exxsol D	11.5	9.6	38.8					
Exxsol CW	14.6		69.5					
Shell 1961	87.2	120	48.5				> 150	
Nickgone 1	5.2	6.6	32.4				35.0	
Nickgone 2	4.5	3.5	30.5				21.3	
Exxsol RJ885	1-3.3	3.3-10						
Arrow Solvent M		33-100						
BS 4545		≈ 1000						
BS 4545 in Pink Paraffin		330-1000						
BS 4545 in IPA		3300-10000	330-1000					
BS 4545 in IBA		330-1000						
Aquaclene		100-330	33-100					

Solvent emulsifiers (continued)	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
10% Lubrol in APNS 90% Perchloroethylene		10-33	33-100					
10% Lissapol NX 90% Pink Paraffin		330-1000						
Esso Solvent FG155		10-33						
15% Lissapol NX 85% IPA		1000-3300						
Banner DG01		10-15						
Banner DG02		8-12						
Banner DG03		10-15						
Banner DG04		15-20						
Basol AD6		10-15						
Cuprinol 106		4-8						
Penetone X		20-30						
Polycomplex A		100-200	33-100		33-100 (L)			
Craine OSR		500-750						
Correxit 7664		7500-10000	3300-10000		1000-3300 (L)			
Mobilsol		10-33						

Solvent emulsifiers (continued)	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
Houghtosolve		10-33						
Raynap Sol B		3.3-10						
Foilzoil		330-1000	33-100					
BP 1100		> 3300	1000-3300	1000-3300				
Ridzlik		330-1000						
Dermol	148	156	148					
Corexit 8666		> 3300						
New Dispersol OS (Dispersol SD)		3300-10000		100-330				
New BP 1100 A		> 3300						
New BP 1100 B		> 3300						
Finasol ESK		100-330						
Finasol SC		33-100						
Hoe SC 1708		330-1000						
Snowdrift SC 98		330-1000						
Neptune Marine Cleaner		33-100						
Finasol OSR		3300						
BP 1100 A		3300-10000						
Sefoil		1000-3300		1000-3300				

Detergents	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
Octyl Phenol 11 Ethylene Oxide.	10.8	> 100 (63)	19.6		33-100 (F)		> 100	
Nonyl Phenol 12 Ethylene Oxide	19.3	89.5	92.5				> 100	
Dobs JN	> 100	> 100	> 100				> 100	
Dobs 055	> 100	> 100	34.3		10-33 (F)		> 100	
Lauryl Ether Sulphate 3 Ethylene Oxide	> 100	> 100	24.0				> 100	
Coco monoethanolamide		> 100	> 100					
Coco monoethanolamide 4.5 Ethylene oxide 4/5 Ethoxy monoethanolamide		> 100	> 100				> 100	
Compass		> 100	> 100				> 100	
Gloquat C		100-300						
Lissapol NX		1000-3300						

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Pesticides	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
"Cassoron" (Dichlobenil)		6.2	> 100				10.4	
L[illegible]at		> 10	> 10					
Paraquat		> 10	> 10					
Parathion		0.0033-0.01	3.3-10		0.03-0.1 (P)			
Malathion		0.33-1.0	3.3-10					
DDT		0.0033-0.01	> 10		0.3-1 (P)			
BHC		0.001-0.0033	> 10					
Dieldrin		0.01-0.033	> 10	> 3.3			0.01-0.033	
Azinphos-methyl	0.0003-0.001	0.0003-0.001	> 10		0.01-0.03 (L)		0.033-0.1	
Dimethoate	> 0.033	0.0003-0.001	> 3.3				> 3.3	
F[illegible]osulfan		0.01	> 10	0.033-0.1				
Ethyl parathion		0.0033-0.01	3.3-10					
Morphothion		1-3.3	> 10					
Tetradifon		> 10	> 10					
Toxion	0.98	6.6	27.4				163	
Simazine		> 100	> 100				> 100	
Atrazine		10-33	> 100				> 100	

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Pesticides (continued)	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
Carbyne		3.3-10	100	3.3-10		3.3-10 100 within 1 hour		
Phenoxylene		> 10						
Phortox		> 10						
Phordene		> 10						
Fentin Acetate		> 33						
Maneb		3.3-10	100-330	0.33-1		33-100		
Gesapex		33-100				> 100 serious effect at 33 after 24 hours		
Dalapon		> 100	> 100		> 100 (F)			
Weedazol T-L		1000-3300						
Arochlor 1260		> 10	> 10	> 10				
Arochlor 1254		3-10	> 10	> 10				
Aroclor 1262		> 10	> 10	> 10				
Aroclor 1248		0.3-1.0	> 10	> 10				

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Pesticides (continued)	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
Aroclor 1242		0.3-3.0 ≈ 1.0		> 10				
Clophen A60		> 10	> 10	> 10				
Clophen A30		0.3-1	3	> 10				
Clophen A40		1-3.3						
Clophen A50		3.3-10						

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Pure organic and inorganic chemicals	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus macnas	Ostrea edulis
Copper as $CuSO_4$	0.14	29.5 (19)	1.0		1-3.3 (F)		109	100
Zinc as $ZnSO_4$	9.5	110	257.5				14.5	116.5
Lead as $PbNO_3$	≈ 375		> 500					
Mercury as $HgCl_2$	0.075	5.7	9.0		3.3 (F)		1.2	≈ 4.2
Nickel as $NiSO_4$	13.9	125	> 500				255	100-150
Chromium as $CrCO_3$		100	100-330	33-100		33-100		
Cyanide as KCN	≈ 0.25		> 25				> 5	
Thiocyanate as NaCNS	> 6.2	> 500	> 500				> 500	
Phenol C_6H_5OH	17.5	23.5	> 500		33-100 (F)		56	
Iron as $FeCl_3$	39	56	190				90-100	
Sulphuric Acid	42.5	80-90	200-500	80-90	100-330 (F)		90	
Hydrochloric Acid		100-330	330-1000	100-330		100-330		
Nitric Acid			330-1000	100-330		100-330		
Sodium Hydroxide		33-100	330-1000	33-100		33-100		
Sodium Chloride dilutions of 300 ppt solution with sea water		10-20x	< 5x	10-15x		20-30x		
Cresol		10-100	> 100	10-33	10-33 (P)			
D.M.F.		> 100						

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Pure organic and inorganic chemicals (continued)	Pandalus montagui	Crangon crangon	Cardium edule	Agonus cataphractus	Pleuronectes limanda (L) or platessa (P) or flesus (F)	Asterias rubens	Carcinus maenas	Ostrea edulis
Ethanediol		> 100						
[illegible]yl Alcohol		1-10	> 100			> 33		
Triethanolamine		> 100						
Acetaldehyde		> 100						
Ethanolamine		> 100						
Dimethylamine		> 100						
Vinyl Acetate		10-100			> 100 (F)	330-1000		
Acetic Acid		100-330						
Sodium Fluoride		> 300						
Doxcide (ClO_2)	> 500	> 500	> 500				500	
[illegible] Dichloropropane		> 100						
Acrylonitrile		24 hours 10-33						
Formaldehyde		330-1000			100-330 (F)			
Cadmium as $CdCl_2$		3-10						

x = times > = more than < = less than ≈ = approximately equal to