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EFFECTS OF THE DETERGENT COMMANDO ON CHOLESTEROL CONTENT OF THE FRESHWATER FISH *LABEO ROHITA*

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ABSTRACT

Fish *Labeo rohita* were exposed to sublethal concentration of the detergent Commando (20 mg) for 24, 48, 72 and 96 hrs respectively. Biochemical analysis of cholesterol was carried out in liver, kidney, muscles and gills of the fish. The highest percent decrease of 35.1% in kidney, and minimum of 2% in muscles after 96 and 72 hrs exposures were noticed in cholesterol.

INTRODUCTION

Water, the prime requirement for the existence and maintenance of biosphere, has become a scarce resource. The advancement of technology and urban-industrial concentration has burdened the earth in terms of environmental degradation (Mohan 1996).

A survey of the literature reveals that a lot of work has been carried on various aspects of biochemical changes in various fishes due to herbicide and pesticide pollution, but the effect of detergents on the same has been comparatively less investigated. Therefore, an attempt has been made to study the possible impact of detergent, Commando, on some biochemical and histopathological aspects of a freshwater fish *Labeo rohita.*

MATERIALS AND METHODS

Labeo rohita, a commonly occurring freshwater major carp fish, available in the local ponds and rivers was selected for the experimental studies. Bulk of the samples of fish (*Labeo rohita),* ranging in weight from 3-4 g and measuring 3-5 cm in length, were procured from Mettur reservoir. The fish were acclimatized to the laboratory conditions for 2 weeks in large cement tanks (6'× 4'× 3') at 24 ± 3°C. The fish were fed with ad-libitum and minced boiled egg. Fish of about the same size (5-8 g and 7-10 cm), irrespective of the sex, were selected for the experiment.

Technical grade of the detergent Commando was used in this investigation. Batches of 10 healthy fish were exposed to different concentrations of the detergent to calculate the LC_{50} value. One more set of fish was maintained as control in chlorine free tap water. The level of the dissolved oxygen, pH, alkalinity and hardness were monitored and maintained constant. The tanks were continuously aerated with electrically operated aerators. The LC_{50} value was found to be 200mg for 24 hrs using probit analysis method of Finney (1971). From this stock solution, various sublethal concentrations were prepared for the bioassay study.

Four groups of fish were exposed to 20mg ($1/10^{th}$ of 24hrs LC_{50} value) concentration of the detergent for 24, 48, 72 and 96 hrs respectively. Another group was maintained as control. At the end of each exposure period, fish were sacrificed and tissues such as liver, gill, muscles and kidney were dissected and removed. 10mg tissues were homogenized in 80% methanol, centrifuged at 3500rpm for 15 minutes, and the clear supernatant was used for the analysis of different parameters.

Quantitative estimation of cholesterol in tissues was done following the method described by Richmond (1973) using cholesterol esterase, cholesterol oxidase and peroxidase.

RESULTS AND DISCUSSION

The cholesterol content of different tissues, exposed to 20mg concentration of Commando in the fish *Labeo rohita*, is presented in Tables 1, 2, 3 and 4.

The cholesterol contents were recorded as 53.200, 45.467, 50.133, 48.367 and 35.333 mg/dL in liver, 56.433, 40.400, 46.300, 38.333, 36.600 mg/dL in kidney, 43.300, 32.367, 33.200, 42.400, 31.233 mg/dL in muscles, and 52.467, 36.233, 40.533, 46.363 and 42.200 mg/dL in gills with 20 mg of commando in control and after 24, 48, 72, and 96 hrs exposures respectively.

Cholesterol is an important body constituent, used in the structure of cell membranes, synthesis of bile acids and synthesis of steroid hormones. The results of the present study showed significant decrease in cholesterol content in the tissues studied. Similar reduction of lipids in various tissues was studied by various authors. Decrease in lipid content of muscles indicates that lipid hydrolysis

Table 1. Changes in the cholesterol content (mg/dL) in the liver of fish *Labeo rohita* exposed to Commando for different periods.

Exposure periods	Exposure Concentration (20mg)		
	Mean ± SD	SE	%
Control	53.200^{a} ± 1.000	0.5770	-
24hrs	45.467^{d}± 0.8083	0.4667	-14.5
48hrs	50.133^{b} ± 0.9504	0.5487	-5.7
72hrs	48.367^{c} ± 0.3215	0.1856	-9.0
96hrs	35.333^{e} ± 1.2583	0.7265	-33.5

Results are mean (± SD) of three observations; SE: standard error; %: Percentage increase/decrease over control; In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

SED	CD (5%)	CD (1%)
0.7522	1.6760	2.3840

Table 2. Changes in the cholesterol content (mg/dL) in the kidney of fish *Labeo rohita* exposed to Commando for different periods.

Exposure periods	Exposure Concentration (20mg)		
	MEAN ± SD	SE	%
Control	56.433^{a} ± 1.1015	0.6360	-
24hrs	40.400^{c} ± 1.0536	0.6083	-28.4
48hrs	46.300^{b} ± 0.9539	0.5508	-17.9
72hrs	38.333^{d} ± 1.0017	0.5783	-32.0
96hrs	36.600^{d} ± 1.0149	0.5859	-35.1

Results are mean (± SD) of three observations; SE: standard error; %: Percentage increase/decrease over control; In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

SED	CD (5%)	CD (1%)
0.8380	1.8672	2.6559

Table 3. Changes in the cholesterol content (mg/dL) in the muscle of fish *Labeo rohita* exposed to Commando for different periods.

Exposure periods	Exposure Concentration (20 mg)		
	MEAN ± SD	SE	%
Control	43. 300^{a} ± 1.0536	0.6083	-
24hrs	32.367^{bc} ± 1.1060	0.6386	-25.2
48hrs	33.200^{b}± 1.0000	0.5774	-23.3
72hrs	42.400^{a}± 0.9539	0.5508	-2.0
96hrs	31.233^{c}± 0.9018	0.5207	-27.8

Results are mean (± SD) of three observations; SE: standard error; %: Percentage increase/decrease over control; In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

SED	CD (5%)	CD (1%)
0.8211	1.8296	2.6025

Table 4: Changes in the cholesterol content (mg/dL) in the gills of fish *Labeo rohita* exposed to Commando for different periods

Exposure periods	Exposure concentration (20 mg)		
	MEAN ± SD	SE	%
Control	52. 467^{a} ± 0.9047	0.5239	-
24hrs	36.233^{d} ± 1.1015	0.6360	-30.9
48hrs	40.533^{c} ± 0.9609	0.5548	-22.7
72hrs	46. 367^{b} ± 1.1060	0.6386	-11.6
96hrs	42.200^{c}± 1.0000	0.5774	-19.5

Results are mean (± SD) of three observations; SE: standard error; %: Percentage increase/decrease over control; In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

SED	CD (5%)	CD (1%)
0.8313	1.8523	2.6348

might be accelerated to derive the energy to overcome pesticidal stress (Rao et al. 1985). The decreased lipid level in the liver of *Channa punctatus*, exposed to emisan, was observed by Ram & Sathyanesan (1987).

Shariff (1987) have reported the rapid and periodical decline in lipid content of muscle on treatment of *Sarotherodon mossambicus* with synthetic detergents. Lipid level showed a marked decrease in the fish exposed to different concentrations of detergents (Maruthanayagam et al. 2000), and gradual depletion in lipid content of liver and muscles when exposed to malathion (Mishra et al. 2004). All these observations conform to the findings of the present study. In the present investigation the reduction of lipid content can be taken as meaningful biochemical index of Commando toxicity to assess detergent pollution of the aquatic environment.

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