

A Study on the Effect of Detergent Tide on the Biochemical Constituents of the Fresh Water Fish, *Cirrhinus Mrigala*

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Abstract: To get an idea about the nature of the toxic effect of detergent **Tide** on the biochemical characteristics like total protein, carbohydrate, cholesterol of aquatic organisms. Fishes belonging to the species *Cirrhinus mrigala* were exposed to sublethal concentration of 3.6mg for 24, 48 and 72 hrs respectively. The results of the present study showed a significant decrease in protein, carbohydrate, cholesterol content in the tissues studied. The kidney showed the highest percent decrease (77.27%) in carbohydrate, (76.42%) in protein, (80.03%) in cholesterol content.

Keywords: Carbohydrate, Cholesterol, *Cirrhinus mrigala*, Detergent, Protein.

I. Introduction

The increase in population and rapid phase of industrialization in India has created problems of disposal of waste products. Domestic wastes and industrial effluents are being indiscriminately discharged into nearby rivers, lakes and ponds, even on the adjoining fields without any proper treatment. The presence of detergent in water accelerates the corrosive action, impedes the filtering, sedimentation and coagulation processes, increases the saturation of water with oxygen and also deteriorates the taste properties of water ([1]). Environment stress invokes compensatory metabolic changes in the organs of an animal through modification of the quality and quantity of protein ([2]).

Glycogen is a major fuel for aerobic metabolism and it plays an important role in osmoregulation, through the glucose and lactic acid. Cholesterol is known to control cell permeability, hormone regulation and protection against injuries and diseases ([3]). Effects of the detergent commando on cholesterol content of the freshwater fish *Labeo rohita* has been studied by ([4]). The extensive use of the detergents (the mixture of surface active substance, mineral and organic elements) have polluted the whole of the aquatic system ([5]), ([6]), ([7]), ([8]), ([9]).

II. Materials And Methods

Cirrhinus mrigala is the fresh water carp mainly found in Northern India, Punjab, West Bengal and Orissa. Major food consists of sand, mud, algae and decaying vegetations. Breeding takes place in flooded river in monsoon month (July – September). Growth is recorded 25cm in a year. The fingerlings of the freshwater fish, *Cirrhinus mrigala* ranging in weight from 3g to 8g and measuring 4cm to 8cm in length) were procured from “Tamil Nadu Fisheries, Department corporation” Mettur, Salem District. The procured bulk samples of *Cirrhinus mrigala* were transported to the laboratory in well aerated polythene bag and acclimatized to the laboratory conditions under natural photoperiod for one week in large plastic containers at (26 ± 5 °C). During this period the fish were fed with mixture of oilcake and rice bran.

Appropriate narrow range of concentration 10-50 mg was used to find the median lethal concentration, using a minimum of 6 fishes, for each concentration and the mortality was recorded for every 24 hrs upto 72 hrs. It was found as 36mg for 48 hrs, using probit analysis method ([10]). Three groups of fishes were exposed to 3.6mg (1/10th of 48hrs Lc50 value) concentration of the detergent ‘**Tide**’ for 24, 48 and 72 hrs respectively. Another group was maintained as control. At the end of each exposure period, fishes were sacrificed and tissues such as liver, gill, muscle and kidney were dissected and removed. The tissues (10mg) were homogenized in 80% methanol, centrifuged at 3500 rpm for 15 minutes and the clear supernatant was used for the analysis of different parameters.

Total protein concentration was estimated by the method of ([11]). Quantitative estimation of carbohydrate in the tissues was done following the method described by ([12]). Cholesterol was estimated based on enzymatic method using cholesterol esterase, cholesterol oxidase and peroxidase ([13]).

III. Results And Discussion

In the present investigation, the effect of a detergent **Tide** on biochemical nature of carbohydrate, protein, cholesterol in Blood and different tissues (liver, muscle, kidney, gills, brain) of the freshwater fish, *Cirrhinus mrigala* have been studied and presented as figures (1-6). The results were statistically analysed.

IV. FIGURES

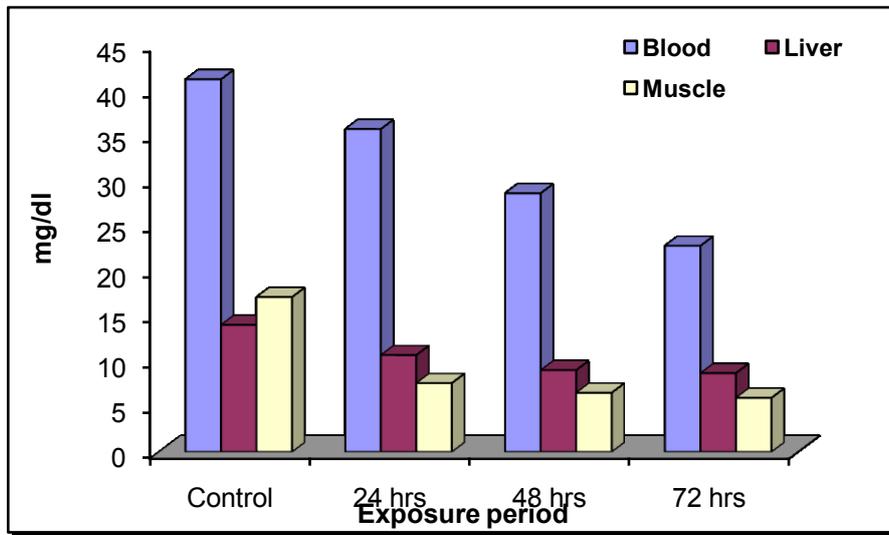


Figure 1: Levels of carbohydrate (mg/dl) in different tissues (Blood, liver & muscle) of the fish *Cirrhinus mrigala* on exposed to the detergent Tide (3.6 mg/L)

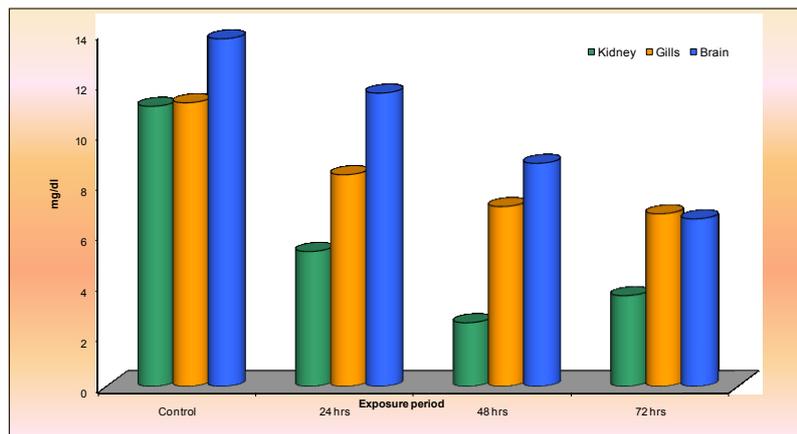


Figure 2: Levels of carbohydrate (mg/dl) in different tissues (Kidney, Gills, Brain) of the fish *Cirrhinus mrigala* on exposed to the detergent Tide (3.6 mg/L)

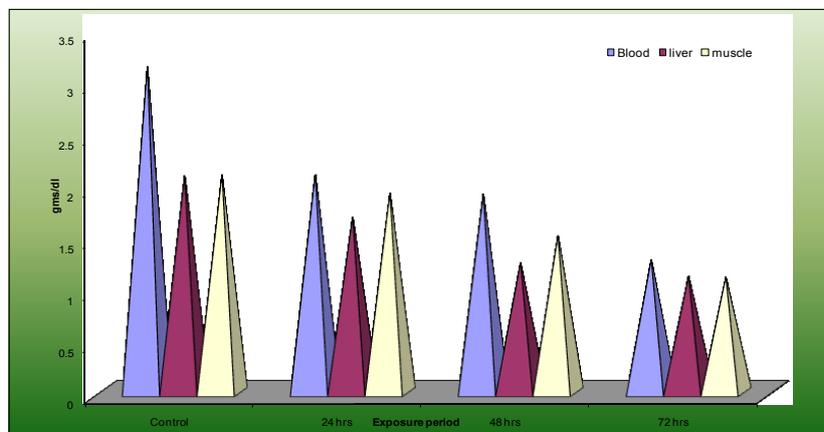


Figure 3: Levels of protein (gms/dl) in different tissues (Blood, liver & muscle) of the fish *Cirrhinus mrigala* on exposed to the detergent Tide (3.6 mg/L)

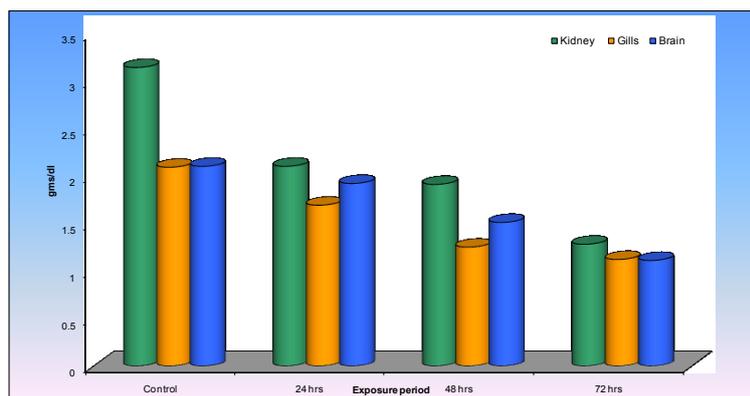


Figure 4: Levels of protein (gms/dl) in different tissues (Kidney, Gills, Brain) of the fish *Cirrhinus mrigala* on exposed to the detergent Tide (3.6 mg/L)

The control value of carbohydrate in Blood,liver,muscle,kidney,gills and brain was found to be 41.20mg/dl,14.05mg/dl,17.12mg/dl,11.09mg/dl,11.23mg/dl and 13.76mg/dl in 36mg concentration of **Tide** respectively.The carbohydrate level was found to be 35.70, 28.60 and 22.79mg/dl in 24,48 and 72 hours respectively in Blood,10.71, 9.04 and 8.71mg/dl in 24,48 and 72 hours respectively in liver,7.61,6.54and5.98mg/dl in 24,48 and 72 hours respectively in muscle,5.34, 2.52 and 3.59mg/dl in 24,48 and 72 hours respectively in kidney,8.38, 7.12 and 6.83mg/dl respectively in 24,48 and 72 hours in Gills,11.61, 8.83 and 6.63mg/dl in 24,48 and 72 hours respectively in Brain.("Fig"1&2).The decrease in the glycogen content might have been due to the possible onset of glycogenolysis forming free glucose in the exposed tissue ([14]).Decreased glycogen synthesis is also attributed to the inhibition of the enzyme glycogen synthatase which mediates glycogen synthesis([15]).

The control value of protein in Blood,liver,muscle,kidney,gills and brain was found to 3.14mg/dl, 2.09mg/dl, 2.10mg/dl, 1.40mg/dl, 1.09mg/dl and1.91mg/dl in 36mg concentration of **Tide** respectively.The protein level was found to be 2.10, 1.91 and 1.28mg/dl in 24,48 and 72 hours respectively in Blood,1.69, 1.25 and 1.12mg/dl in 24,48 and 72 hours respectively in liver,1.92,1.51and1.11mg/dl in 24,48 and 72 hours respectively in muscle,0.83,0.33 and 0.38mg/dl in 24,48 and 72 hours respectively in kidney,0.47,0.41 and 0.65mg/dl respectively in 24,48 and 72 hours in Gills,1.28,1.03 and 0.55mg/dl in 24,48 and 72 hours respectively in Brain.("Fig"3&4).The decrease in the total protein observed is due to proteolysis that results in the production of free amino acids. Proteins are also used in TCA cycle for energy production in stress condition ([16]).The decreased trend of the protein content in most of the tissues may be due to metabolic utilization of the ketoacids to gluconeogenesis pathway for the synthesis of glucose([15]).

The control value of cholesterol in Blood,liver,muscle,kidney,gills and brain was found to 51.50mg/dl, 12.02mg/dl, 16.21mg/dl, 10.12mg/dl, 9.16mg/dl and15.21mg/dl in 36mg concentration of **Tide** respectively. The protein level was found to be 39.61mg/dl, 30.23mg/dl and 26.35mg/dl in 24,48 and 72 hours respectively in Blood,10.02mg/dl,9.19mg/dl and 8.16mg/dl in 24,48 and 72 hours respectively in liver,9.15mg/dl,8.37mg/dland 5.22mg/dl in 24,48 and 72 hours respectively in muscle,5.01mg/dl,4.05mg/dl and 2.02mg/dl in 24,48 and 72 hours respectively in kidney,7.72mg/dl,5.22mg/dl and 4.23mg/dl respectively in 24,48 and 72 hours in Gills,12.46mg/dl,10.20mg/dl and 9.66mg/dl in 24,48 and 72 hours respectively in Brain.("Fig"5&6).The decrease in total lipid level may be due to utilization of lipid for energy demand under the conditions of stress ([17]). The alterations in cholesterol content may be due to its utilization in corticosteroidogenesis and also impairment in the synthesis of cholesterol.Lipids may be mobilized to meet the energy requirement of fish either through oxidation or a process of gradual instauration of lipid molecules([18])

V. Conclusion

Based on the result obtained in the present study,it was concluded that the biochemical alterations in different tissues may lead to fish morbidity and mortality.

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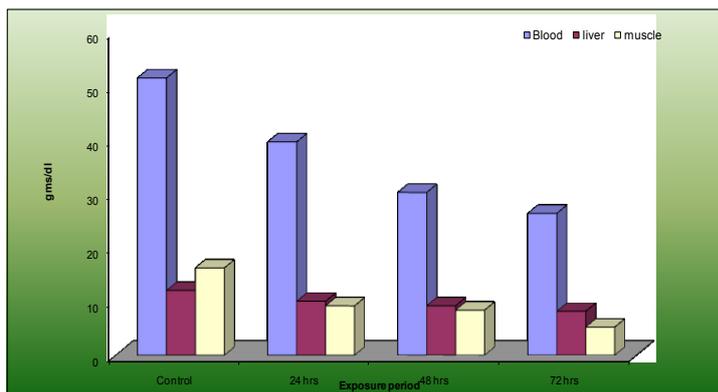


Figure 5: Levels of cholesterol (mg/dl) in different tissues (Blood, liver & muscle) of the fish *Cirrhinus mrigala* on exposed to the detergent Tide (3.6 mg/L)

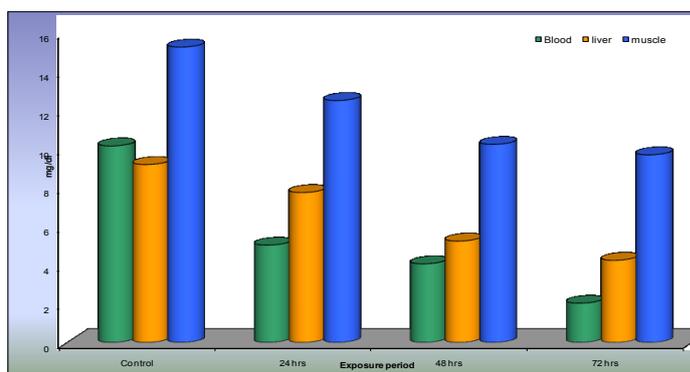


Figure 6: Levels of cholesterol (mg/dl) in different tissues (Kidney, Gills, Brain) of the fish *Cirrhinus mrigala* on exposed to the detergent Tide (3.6 mg/L)

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