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EFFECT OF DETERGENT TIDE ON THE HAEMATOLOGICAL PARAMETERS OF THE FRESHWATER FISH, *LABEO ROHITA*

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ABSTRACT

Water pollution may be defined as any impairment in its native characteristics by addition of anthropogenic contaminants to the extent that it either cannot serve humans for drinking purposes or to support the biotic communities. A change in the quality of water by the presence of contaminants makes it potentially harmful to life forms, instead of sustaining them. The entry of toxicants into aquatic media may affect the water quality parameters which in turn leads to changes in the haematological variables of fish and other aquatic lives due to close association with the external environment. The blood parameters were analysed in the fish, *Labeo rohita* theLC_{50} value was determined when the fish was exposed to detergent tide. The parameters like RBC, Hb, MCV,MCH and PCV were decreased and WBC have been increased in the fish.

KEYWORDS: Detergent Tide, *Labeo rohita,* Haematology.

INTRODUCTION

The major source of water pollution is domestic sewage and includes household water which passes through municipal sewage system. It includes food wastes, modern synthetic detergents used for washing clothes and cleaning toilets, human excreta and water based paints. Although detergents are not highly toxic for fishes, they cause damage to gills and remove protective mucus from gills, skin and intestine. Increased use of detergents in industry as well as household purposes is making it as an ecotoxicant in natural aquatic

systems. Detergents alter the physicochemical parameters of the water bodies and are known to cause disorders in aquatic animals (Shansavani, 2004).

Cleanliness has been an important concern for human beings from time immemorial thus initially, soap making and gradually production of synthetic detergents came into being. Subsequently with time and upsurge of industrial revolution, other uses of detergents were realized. The present detergent industry is not solely concerned with household needs but is also catering to the needs of industry and other areas where detergents are now widely used. Among different classes of detergents available, only few types of detergents are currently used in large quantities in the market. Excluding soap, which is definitely the most widely used anionic detergent, the market is dominated by Linear Alkylbenzene Sulfonate (LAS), and alcohol derivatives like Alcohol Sulfates (AS), Alcohol Ether Sulfates (AES) and Alcohol Ethoxylates (AE).

Contamination of natural water by detergents has become a matter of concern in recent years because of their large scale use in home and industrial applications, such as, washing powders, dye fasteners, formulation of shampoos, industrial and household cleansing agents, toothpaste, tooth powder, in dispersing oil spills etc (Ogundiran *et al.*, 2010). Available reports indicate that entry of detergents into aquatic system build up in the food-chain and are responsible for many hazardous effects and even death of the aquatic organisms, including fishes (Summarwar and Lall, 2013).

Haematology provides an index of physiological status of fish and the use of blood picture of fish is an effective tool for detection of alterations in functional state of organism. Behavioural changes in animal are indicative of internal disturbances in the body functions, such as disturbances in metabolic pathways and ionic imbalance in blood serum (Shah, 2002).

MATERIALS AND METHODS

Rohu is a eurythermal species and does not thrive at temperatures below 14 °C. It is a fast growing species and attains about 35-45 cm total length and 700-800 g in one year under normal culture conditions. Appropriate narrow range of concentration 10-50 mg was used to find the median lethal concentration using a minimum of 10 fishes for each concentration and the mortality was recorded for every 24 hours up to 96 hours. It was found as 27mg for 96 hours, using Probit Analysis method (Finney 1971). Four groups of fishes were exposed to

2.7mg ($1/10^{th}$of 96 hours LC_{50} value) concentration of the detergent 'Tide' for 24, 48, 72, and 96 hours respectively.10 fishes were exposed in each experiment and blood was collected from gills and caudal regions. The blood sample was tested for haematological parameters.

RESULTS AND DISCUSSION

The evaluation of haematological characteristics in fish has become an important means of understanding normal and pathological processes and toxicological impacts (Borges *et al.*, 2007). Red blood cells are the most numerous formed elements in blood. The count of red blood cells is quite a stable index and the fish body tries to maintain this count within the limits of certain physiological standards using various physiological mechanisms of compensation.

The RBC count in the blood of fishes to detergent short term exposure concentration (2.7 mg) showed significant decrease ($P<0.05$) over control. The percentage decrease of RBC count in fish exposed to short term exposure of the detergent were 12.81%, 24.91%, 32.38% and 51.95% for 24, 48, 72 and 96 hours respectively. The percentage increase of WBC count of fish treated with short term exposure of the detergent over control at 24, 48, 72 and 92 hours were -18.75%, -37.50%, -50.00%, -59.37% for 24, 48, 72, and 96 hours respectively.The percentage Hb content of fish treated with short term exposure of the detergent over control at 24, 48, 72 and 96 hours were 12.50%, 35.93%, 39.06%, and 59.37% respectively. The percentage decrease of MCV of fish treated with short term exposure of the detergent over control at 24, 48, 72 and 96 hours were 19.43%, 32.48%, 74.16% and 76.72% respectively. The percentage decrease of MCH of fish treated with short term exposure of the detergent were 16.77%, 21.11%, 28.57% and 37.26% for 24, 48, 72, 96 hours respectively. The percentage decrease of PCV in fish treated with short term exposure of the detergent were 6.21%, 18.63%, 29.19% and 53.41% for 24, 48, 72 and 96 hours respectively.

The decrease in RBC and Hb values may be due to the exaggerated disturbances that occurred in both metabolic and haematopoetic activities of fish exposed to sub-lethal concentration of pollutants.The high WBC count recorded could be due to attempt by the fishes to fight against theantigens (pollutants) and this led to the production of more antibodies (WBC) to improve thehealth status of the organism. The increase in WBC during acute exposure.The decreased haemoglobin concentration observed in this study is an indication of impaired oxygen delivery to the tissues. The general reduction in haemoglobin concentration, erythrocyte count and PCV in the fish treated with Diethyl Phthalate was an

indication of anaemia (Obiezue *et al.*, 2014).The statistically significant decrease in MCV coupled with low haemoglobin content indicate that the red blood cells have shrunk, either due to hypoxia or microcytic anemia. A significant decrease in MCV value observed in fish is in agreement with that reported in *Heteropneustes fossilis* exposed to toxicants (Kumar *et al.*, 1999). The fluctuation in the MCH values clearly indicates that the concentration of haemoglobin in the red blood cells were much lower in the fish, thus indicating an anaemic condition.Annune and Ahuma, 1998 reported PCV values always decrease when a fish loses appetite or becomes diseased or stressed.

Table 1: Changes in the Haematological Parameters of *Labeo rohita* exposed to Sublethal Concentration of Detergent (Tide).

Blood Parameters	Exposure periods				
	Control	24 Hours	48 Hours	72 Hours	96 Hours
RBC(Millions/cu.mm)	2.81±0.03	2.45±0.05	2.11±0.11	1.9±0.15	1.35±0.7
't' value	16.22**	10.69**	10.63**	10.30**	3.60**
% change		-12.81	-24.91	-32.38	-51.95
WBC(Cells/mm³)	3.2±0.05	3.8±0.2	4.4±0.075	4.8±0.27	5.1±0.35
't' value	11.08**	5.04**	23.05**	10.09**	9.30**
% change		18.75	37.5	50	59.37
Hb(gms/dI)	6.4±0.95	5.6±0.65	4.1±0.59	3.9±0.83	2.6±0.1
't' value	11.66**	1.20**	3.56**	3.43**	6.89**
% change		-12.5	-35.93	-39.06	-59.37
MCV(Cu-µ)	39.1±0.34	31.5±0.79	26.4±0.17	10.1±0.52	9.1±0.23
't' value	19.91**	15.30**	57.86**	80.84**	12.65**
% change		-19.43	-32.48	-74.16	-76.72
MCH(pg)	16.1±0.47	13.4±0.69	12.7±0.96	11.5±0.74	10.1±0.83
't' value	59.33**	5.60**	5.50**	9.08**	10.89**
% change		-16.77	-21.11	-28.57	-37.26
PCV(%)	16.1±0.12	15.1±0.36	13.1±0.42	11.4±0.22	7.5±0.57
't' value	23.23**	4.56**	11.89**	32.48**	25.57**
% change		-6.21	-18.63	-29.19	-53.41

Values are mean ±SD, n=5, figures in parenthesis are percentage decrease over control.

** = Significant at one percent level.* = significant at five percent level.NS = non significant.

CONCLUSION

All haematological parameters except WBC were decreased from the control. The WBC was increased in all exposures. From the above investigation it can be inferred that the aquatic animals will be adversely affected by the detergents.

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