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Impact of effluent of River Ramganga on the haematology of fresh water fish (*Heteropneustes fossilis*)

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ASTRACT

The haematological parameters of both clear and polluted water fish species of *Heteropneustes fossilis* was calculated. In the present analysis, several hematological parameters of *Heteropneustes fossilis* also altered as a result of exposure to various toxicants in river water. Parameters like TLC, MCV and MCH were amplified whereas, TEC and MCHC decreased under such conditions.

Key words: *Heteropneustes fossilis,* Ramganga, Hematology,

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. The morphology and case reports of trypanosomiasis in fish have been well documented. The contribution of Ribeiro *et al.* (1987), Gupta *et al.* (2000) amongst others have described species of *Trypanosoma* from fresh and marine waters. Pollution strength of sewage - polluted water is determined by its biochemical oxygen demand. BOD is the amount of oxygen taken up by the micro-organisms present in water.

The industrial wastes are discharged in the nearby rivers or streams through flash-lines of factories. The textile sugar and fertilizer factories, oil refineries, synthetic plants for manufacturing of drugs, rubber, plastic and rayon fibers, paper industries and chemical factories all produce chemical pollution.

MATERIALS AND METHODS

Live fishes were collected for transportation to the laboratory in wide mouthed plastic containers of 10 liter capacity. They were maintained in the laboratory under suitable environmental conditions. Blood was collected directly from just behind the anal fin, a drop placed on a clean microscopic slide and blood smears were prepared and stained in Giemsa's solution.

METHODS FOR HAEMATOLOGICAL ESTIMATIONS:

The haematological parameters of both clear and polluted of *Heteropneustes fossilis* were calculated. During the present course of haematological study *Heteropneustes fossilis* were divided into two groups Group-A and Group B.

Group-A - Fishes of this group were again divided into two sub- groups according the their standard length, Group-A I (9-15cm) and Group-A II (16-24cm)

Group-B - Fishes in hebetating the polluted sites were also divided into two sub-groups, Group-BI (9-15cm) and Group-BII (16-24cm).

The following blood parameters were examined:-

- Total Erythrocyte Counts (TEC) (Dacie and Lewis,1975) using the Neubauer's chamber...
- Total Leucocyte Counts (TLC) Neubauer's haemocytometer.
- MCHC = (Hb / PCV)·100,
- MCH = (Hb / RBCC) X 10
- MCV = (PCV / RBCC) X 100.

RESULT:

TOTAL ERYTHROCYTE COUNT (TEC):

Erythrocytes mainly help in transport of oxygen and carbon dioxide. Haemoglobin carries 97 to 99% of oxygen from the lungs to the body tissues as oxyhaemoglobin. RBC of vertebrates is nucleated except mammals. The formation of RBC is called erythropoiesis whereas the organs forming cells are called erythropoecitic organ. But in case of protozoan infection, fishes become anemic resulting in low production and destruction of red blood cells. In clear site of Ramganga, the average value was $2.50 \pm 0.03 \times 10^6$/cmm and polluted site, $1.88 \pm 0.06 \times 10^6$/cmm (Table-1)

TOTAL LEUCOCYTE COUNT (TLC):

White blood corpuscles are blood-cells containing no respiratory pigments. There are various types of WBC's which are usually classified as granular and non-granular and as basophile or acidophil according their staining reaction.Leucocytes from the defense system of the body. They possess the power of amoeboid movement and are colorless if the number of leucocytes decreases to less than 6000/cmm of blood, the condition is called leucopenia. Leucopenia is generally due to folic acid deficiency and tuberculosis. Enormous increase in number of leucocytes leads to a disease called leukemia or blood cancer. Leucocytes are formed in the bone marrow, lymph nodes, thymus and spleen and the process is called leucopoiesis. Average value of TLC in clear site of river Ramganga was 12,095.28±42.99/cmm but at polluted site it increased to 16,698.95±190.87/cmm due to water pollution (Table-1).

MEAN CORPUSCULAR HAEMOGLOBIN (MCH):

MCH value increased due to the infection of blood parasites. In clear site of river Ramganga, the average value was 51.35±0.68 Pg whereas at polluted site it was 55.09±0.58 Pg (Table-1).

MEAN CORPUSCULAR HAEMOGLOBIN CONCENTRATION (MCHC):

MCHC value also decreased during the infection of blood parasites. Mean value of 29.67±0.50% in clear site of river Ramganga and 26.80±0.43% at polluted site of river Ramganga were put on record was (Table-1).

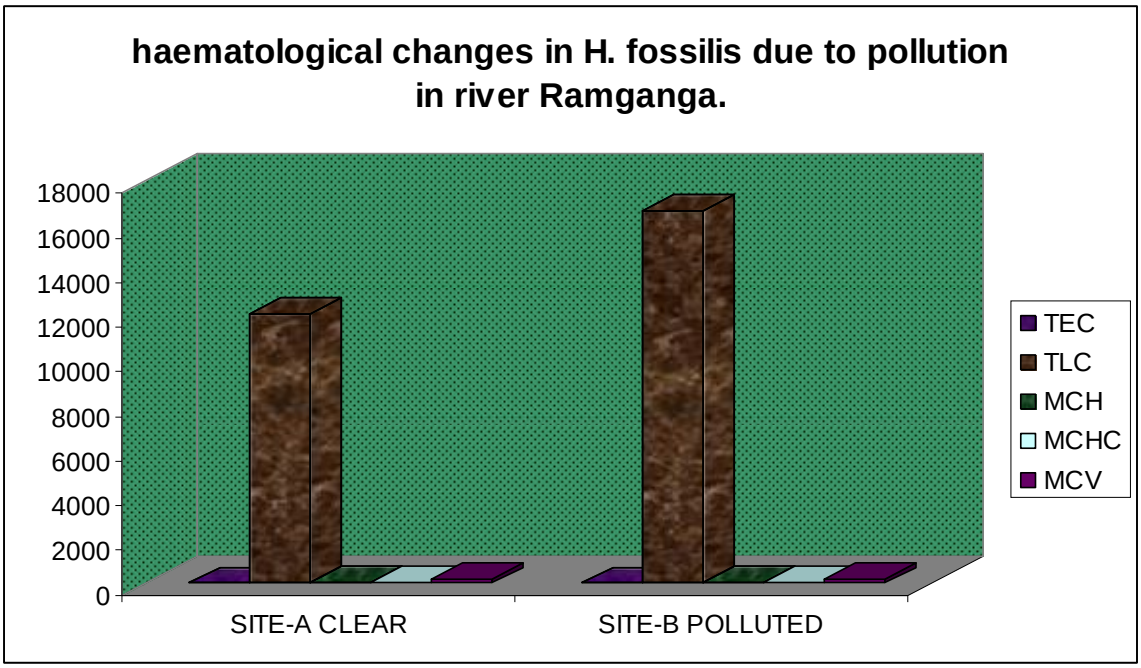
MEAN CORPUSCULAR VOLUME (MCV):

In clear site of river Ramganga, MCV was 173.10±1.21 fL and at its polluted site, the value of 205.58±2.78 fL was observed (Table-1).

Haematological Parameters			**TEC**	**TLC**	**MCH**	**MCHC**	**MCV**
Sites		**Sub Groups**	**($X10^6$/Cmm)**	**(/Cmm)**	**(Pg)**	**(%)**	**(fL)**
Ramganga Site-A (clear)	**Group-A**	A-I (9-15cm.)	2.49 ± 0.05	12,285.06 ± 28.86	*51.24 ± 1.01	**30.12 ± 0.76	*170.12 ± 1.92
		A-II (16-24cm.)	**2.51 ± 0.01	*11,905.50 ± 57.13	51.47 ± 0.35	29.23 ± 0.25	176.09 ± 0.51
Average			**2.50 ± 0.03**	**12,095.28 ± 42.99**	**51.35 ± 0.68**	**29.67 ± 0.50**	**173.10 ± 1.21**
Ramganga Site-B (polluted)	**Group-B**	B-I (9-15cm.)	*1.85 ± 0.08	16,675.90 ± 264.57	54.20 ± 0.99	*26.24 ± 0.64	**206.59 ± 3.25
		B-II (16-24cm.)	1.92 ± 0.05	**16,722.00 ± 117.18	**55.98 ± 0.18	27.36 ± 0.22	204.58 ± 2.31

Average	**1.88 ± 0.06**	**16,698.95 ± 190.87**	**55.09 ± 0.58**	**26.80 ± 0.43**	**205.58 ± 2.78**

Table - 1 : Showing haematological changes in *H. fossilis* due to pollution in river Ramganga.
*- minimum., ** maximum



DISCUSSION:

Piscine haematology is useful for assessing the health and general condition of the animal subjected to changing environmental conditions. In the modern world, the aquatic ecosystem is becoming highly affected due to the industrialization and agricultural development. This is a serious menace to pisciculture since both fish and their food are equally affected. Several workers have studied the deleterious effect of insecticides on haematological alterations on fishes (Narendra *et al.*,1993).

The general haematological tests are used for establishing the normal health status and to diagnose diseases caused by various factors viz., environmental stress, toxicants, and nutrition and parasite infections. Very few studies are available which have dealt with the effect of different toxicants on the fish blood (Bhatt and Farswan, 1992).

Anemia may be due to the inhibition of erythropoiesis, haemosynthesis and increase in the rate of erythrocyte destruction in the haemopoietic organs. Tandon and Joshi (1973) reported erythrocyte counts and haemoglobin values due to haemoflagellates with usual increase in TLC values. TEC also decreased at all the three polluted sites due to haematozoan infection. The present work finds support from, Komarovskiy (1969) who showed a pronounced decrease in haemoglobin volume and erythrocyte count in fish after toxic exposure to pesticides based on triazines. Total leucocyte count increased in *Heteropneustes fossilis* in the polluted site river Ramganga (38.06%). Similar elevation of TLC was also observed in fish exposed to pesticides (James and Sampath, 1996).

Elevated values were obtained for the three red cell indices MCH, MCHC and MCV. The MCH value increased in the polluted sites of river Ramganga, it was (7.28%). MCV value increased to the maximum (18.77%) in polluted site of river Ramganga. whereas MCHC (9.67%) decreased to the maximum in river Ramganga. The reduction in MCHC concentration with a simultaneous increase of MCV could be due to macrocytic anaemia (Rao *et al.*, 1985).

CONCLUSION:

In the present investigation, several haematological parameters of *Heteropneustes fossilis* also altered as a result of exposure to various toxicants in river water. Parameters like TLC, MCV and MCH increased whereas TEC and MCHC decreased under such conditions.

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