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EFFECT OF NICKEL ON THE HAEMATOLOGICAL PARAMETERS OF AN EXOTIC CARP, *CYPRINUS CARPIO* VAR. COMMUNIS (LINN.)

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ABSTRACT

Haematological studies of *Cyprinus carpio* in the present work include the erythrocyte count, haemoglobin concentration and haematocrit value or packed cell volume of blood, and subsequently absolute values of M.C.V., M.C.H. and MCHC were calculated by the respective formulae. The major effects of nickel on the blood parameters are concerned with total count of RBC, their size and differential count of WBC. The significance of the present study is concerned with metallic pollution of major rivers of Jharkhand state.

INTRODUCTION

Metals and their salts have proved to be highly toxic and long retained substances. In the Jharkhand state there are many commercial plants of ores and mining products, metal processing factories and galvanizing plants. Heavy metals coming out from these sources enter the freshwater bodies like Swarnrekha river and bring about morphological and physiological changes in water biota. Nickel is primarily used in the production of steel and other alloys. It is also used in electroplating in the form of nickel sulphate. Nickel hydroxide is used in nickel cadmium batteries. Effect of heavy metals on haematological parameters of different fishes have been studied by various workers (Goel & Sharma 1987, Nanda & Behera, 1996, Kumari 2002, Nandan 2002). In the present study effects of nickel on the haematological parameters of an exotic carp, *Cyprinus carpio* have been discussed.

MATERIALS AND METHODS

From the local market live specimens of the fish *Cyprinus carpio* were collected. After acclimatization in laboratory conditions for 10 days, the fish of same size and body weights (25-30g) were taken for experimentation. For each control and experiment 10 fish were used. There were 3 glass aquaria for sublethal concentration of nickel sulphate for 10, 20 and 30 days treatment to the fish. Preliminary bioassays showed that 10 ppm of nickel was the sublethal concentration for this fish in chlorine free water.

Blood was collected from each control and experimental fish after 10, 20 and 30 days from the caudal region. The erythrocyte count/mm^3 was determined by Naubar double haemocytometer. Haemoglobin concentration in g/l00mL was determined by Sahli's Haemometer. Haematocrit value or packed cell volume (%) was determined with microhaematocrit pipette.

Absolute values of M.C.V., M.C.H. and M.C.H.C. were calculated by the following formulae:

$$\text{M.C.V.} = \frac{\text{Haematocrit value/100mL blood}}{\text{RBC count (million/mm}^3\text{)}} \times 10$$

$$\text{M.C.H.} = \frac{\text{Haemoglobin in g/100mL blood}}{\text{RBC count (million/mm}^3\text{)}} \times 10$$

$$\text{M.C.V.} = \frac{\text{Haemoglobin in g/100mL blood}}{\text{Haematocrit value/100mL blood}} \times 10$$

The size of RBC, their nuclei and their surfaces were measured on air-dried methyl alcohol fixed blood films. The surface area was measured by the formula:

$$\text{Surface area} = \frac{GD}{2} \times \frac{LD}{2}$$

Where, GD = Greater diameter of RBC/their nuclei

LD = Lesser diameter of RBC/their nuclei

The WBC were counted on morphological basis through L.M. and on the basis of morphological differences.

RESULTS AND DISCUSSION

Changes in blood parameters of *Cyprinus carpio* from control and sublethal concentration of nickel after different days are given in Table 1. It is clear that nickel has an effective influence on the blood parameters. TEC, Hb content and PCV (%) showed a decrease during all the three periods. The length breadth ratio of erythrocyte and their nuclei is almost near to the control values in all the cases of exposure showing no changes in shape. In some cases hypochromasia and eccentrically placed

Table 1: Changes in blood parameters of *Cyprinus carpio* from control and sublethal concentration of nickel after different days.

Parameters	After 10 Days		After 20 Days		After 30 Days	
	Control	Nickel	Control	Nickel	Control	Nickel
Length of RBC (HM)	10.75	10.54	10.82	10.70	10.48	10.86
BreadthofRBC(HM)	8.74	8.62	8.56	8.56	8.60	8.75
Length of RBC nucleus (HM)	4.51	8.62	4.48	4.56	4.48	4.58
Breadth of RBC nucleus (HM)	4.14	4.15	4.18	4.17	4.02	4.10
TEC × 10^6/mm^3	2.79	2.51	2.72	2.36	2.58	2.42
Hb (g %)	14.38	12.72	13.78	12.78	13.94	13.36
PCV (%)	29.95	25.52	30.24	24.64	28.50	26.30
MCV(μm^3)	107.35	101.67	111.18	104.41	110.46	108.68
MCH (pg)	51.54	50.68	50.66	54.15	54.03	55.21
MCHC (%)	48.01	49.84	45.57	51.87	48.91	50.80i
Differential Counts of WBC						
LL	26.62	34.58	28.20	36.00	26.10	33.10
SL	58.60	43.02	57.80	45.00	58.90	48.30
M	5.58	8.10	6.20	7.80	6.20	7.30
N	1.57	3.10	1.80	2.50	1.80	2.50
E	1.63	1.63	4.00	4.70	5.00	5.70
B	6.0	9.57	2.00	4.00	2.00	3.10

P.C.V. = Packed Cell Volume, L.L. = Large Lymphocyte, S.L. = Small Lymphocyte, M = Monocyte, N = Neutrophil, E = Eosinophil, B = Basophil

nucleus were observed. Significant alteration in absolute values such as MCH, MCHC and MCV were also noticed. The TLC increased in number after nickel treatment. Significant increase in LL count and insignificant increase in monocytes and neutrophils were observed.

Haematological studies are important from the pollution load, stress and disease point of view. Effect of heavy metals on blood parameters has been proved a burning subject. The increase in the RBC count and Hb concentration suggests enhanced erythropoiesis. PCV % is directly correlated with the total erythrocyte count (TEC) in fishes. Significant alteration in absolute values such as MCH, MCHC and MCV were also observed (Goel et al. 1985).

REFERENCES

Goel, K.A., Gupta, K. and Sharma, M.L. 1985. Haemoto-chemical characteristic of Heteropneutes fossilis under the stress of zinc. Ind. J.Fish, 36:186-188.

Goel, K.A., Sharma, S.D. 1987. Some Haemato-chemical characteristic of Clarias batrachus under metallic stress of arsenic. Comp. Physiol. Eco. 12:63-66.

Kumari, I. 2002. Effect of water pollutants on some aspects of physiology of teleost, C. fesciatus. Ph.D. Thesis, Magadh University. Bodh Gaya. India.

Nanda, P. and Behera, M.K. 1996. Nickel induced changes in some hemato-Biochemical parameters of a catfish H. fossilis. Environ. Ecol. 14(1): 82-85.

Nandan G. 2002. Toxic effects of cadmium on the physiological processes of two Indian fresh water teleosts, A. testudineus and L. rohita. Ph.D. Thesis, Magadh University, Bodh Gaya.