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Impact of chromium trioxide on haematological parameters of freshwater fish, *Channa punctatus (*Bloch)

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ABSTRACT

An attempt has been made to investigate the impact of Chromium trioxide on haematological parameters of freshwater fish, Channa punctatus exposed to sub lethal concentration for 7, 15, 30 and 60 days. Haematological parameters viz; Hb %, CT, ESR, TEC, TLC PCV, MCH, MCV and MCHC were analysed for different period. Exposed fishes showed an increase in Hb %, and decrease in TLC throughout the experiment as compared to control. However, increasing trend in TEC and PCV was noticed from 7 to 30 days but it decline after 60 days. Both, CT and ESR exhibited a declining trend from 7 to 30 days but abrupt increases in these parameters were recorded after 60 days. MCH and MCV showed fluctuating value. Whereas, MCHC exhibited declining trend throughout the experiment as compared to control.

Key words: Chromium trioxide, haematological parameters and *Channa punctatus*

INTRODUCTION

The metallic ion enters into the fish body and gets accumulated in vital organs such as liver and kidney [1].Heavy metal toxicity to fishes had already been discussed by many authors [2, 3, 4, 5 and 6]. Chromium compounds are found to have toxic, mutagenic and carcinogenic effects on man and other animals [7 and 8]. The chromium toxicity on the haematological parameters of several freshwater fishes has been well described [9, 10 and 11]. According to Celik [12], fish blood is very important to evaluate the health of species. Chemical pollutants causes either increase or decrease in haematological parameters and their effect depends on fish species, age, the sexual cycle of spawners and diseases [13]. In view of this, the present investigation is carried out to assess the alterations in various haematological parameters of the freshwater fish, *Channa punctatus* after 7, 15, 30 and 60 days exposure of sub lethal concentration of Chromium trioxide.

MATERIALS AND METHODS

The freshwater food fish, *Channa punctatus* of approximately equal in size (11±2 cm) and weight (15±2 g) were collected with the help of local fisherman from water bodies of Lucknow. The fish was properly washed with tap water and treated with 0.02% KMNO4 and 0.004% formalin solution to remove any contaminants. The fish were acclimatized to laboratory conditions for 30 days before starting experiment. The animals were fed TOKYO (made in Japan) on 7 pm everyday. The fish were divided into 5 equal groups consisting of 10 each and each group was transferred separately to glass aquaria of 100 liter volume. Group I fish were maintained as control without any treatment, the group II, III, IV and V fish were exposed to sub lethal concentration of Chromium trioxide for 7,15, 30 and 60 days. The blood from the caudal vein of control and experimental fish was collected for investigation of haematological parameters *viz*; Hb %, CT, ESR, TEC, TLC, PCV, MCH, MCV and MCHC as per standard

methods of [14 and 15]. The data shown are the average of three replicates ± SD and statistical significance was tested at p<0.05 , P<0.01 and P< 0.001level.

RESULT AND DISCUSSION

In present investigation, Haemoglobin percentage (Hb %) were found to be increase as 5.02%, 10.06% and 17.61% after 7, 15 and 30 days of exposure respectively but after 60 days of exposure there was a decline of 23.3 % recorded as compared to control. Clotting time (CT) was found to be decrease as 5.85%, 11.68 % and 49.18 % after 7, 15 and 30 days of exposure respectively but abrupt increase of 49.18 % was observed after 60 days of exposure. There are declining trend in Erythrocyte sedimentation rate (ESR) was noticed as 10.34 %, 41.37% and 51.72 % after 7, 15 and 30 days of exposure. However, the value of ESR was increased as 51.72% after 60 days of exposure. Total erythrocyte count (TEC) was found to be increases as 29.04 %, 157.66% and 156.95 % respectively after 7, 15 and 30 days of exposure and significantly decrease of 31.25 % after 60 days of exposure as compared to control. Whereas, the percentage of Total leucocytes count (TLC) was found to be decline as 9.72 %, 22.76%, 38.92% and 43.67% after 7, 15, 30 and 60 days of exposure as compared to control (Table-1). Increase in Packed cell volume (PCV) value was noted as 10.167%, 42.856% and 89.609% after 7, 15 and 30 days and these value decreases as 11.68 after 60 days of exposure. However, Mean corpuscular haemoglobin (MCH) showed declining trend with 17.491 % and 58.590 % after 7, 15 days but it was decreased by 54.844 % as compared to control and finally increase of 9.955 % after 60 days was observed. Mean carpuscular volume (MCV) was decreased by 8.554 % after 7 days, 43.147 % after 15 days, 28.299 % after 30 days and increase of 26.278 % was recorded after 60 days as compared to control. Finally, Mean corpuscular haemoglobin concentration (MCHC) exhibited decreasing trend throughout the experiment as compared to control. The decline was 10.529 %, 24.521 %, 37.56 % and 13.754 % after 7, 15, 30 and 60 days respectively. Results clearly indicate that Chromium trioxide is extremely toxic to the fish and induce several haematological disorders.

Parameters	Exposure Periods				
	Control	7 Days	15 Days	30 Days	60 Days
Hb % (gm %)	10.60±.200	11.13±0.306^{n}	11.66±0.236**	12.46±0.115***	8.13±0.643^{n}
CT (Sec)	40.00±0.00	37.66±0.577**	35.33±0.577***	20.33±0.577***	45.00±1.000^{n}
ESR	9.66±0.577	8.66±0.577^{n}	5.66±0.577***	4.66±0.577***	14.66±0.577^{n}
TEC (x10^{6}/mm^{3})	3.12±0.176	4.03±0.057**	8.04±0.070***	8.02±0.155***	2.14±0.723^{n}
TLC (x10^{3}/mm^{3})	60.16±2.36	54.16±6.212^{n}	46.46±1.280***	36.75±0.661***	29.33±2.754^{n}
PCV %	25.66±0.577	30.33±0.577***	36.66±0.577***	48.66±1.115***	22.66±1.556^{n}
MCH	33.48±4.686	27.62±0.528^{n}	14.50±0.403**	15.11±0.153**	36.81±2.159^{n}
MCV	82.33±4.469	75.29±2.447^{n}	46.80±0.450***	59.03±2.326**	103.96±0.975^{n}
MCHC	41.04±0.906	36.72±1.667^{n}	30.98±0.947***	25.62±0.746***	35.40±2.436^{n}

*±SD; *P<0.05, **P<0.01, ***P< 0.001, n = Non signi ficant*

Table-1: Showing alterations in haematological parameters of *Channa puncta* exposed to CrO_3 for different period.

In present investigation, the impact of sub lethal concentration of Chromium trioxide has been analysed on haematological parameters of freshwater fish, *Channa punctatus* for 7, 15, 30 and 60 days. Changes in haematological parameters *viz*; Hb %, CT, ESR, TEC, TLC PCV, MCH, MCV and MCHC were recorded has been summarized in Table-1.

Singh *et al*. [16] reported that the Hb%, RBC and PCV% decreased significantly after 15, 30 and 45 days of exposure periods respectively and WBC counts, ESR, CT and MCV values were found significantly increased after 15, 30 and 45 days of exposure of sublethal concentration of copper sulphate as compared to control in freshwater fish, *Channa punctatus* .However, the chromium chloride-treated *Labeo rohita* exhibited decreased levels of total erythrocyte count (TEC), haemoglobinn (Hb gm%) and PCV whereas, total leucocyte count (TLC) was increased under the stress of chromium metal. The decreased WBC count found after 30 days along with depleted Hb content and RBC count indicate dysfunctioning of haemopoietic systems along with dysleucopoiesis. An increasing trend in the mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were recorded when fish exposed to sublethal doses of chromium chloride [17].

A significant decrease in total RBC, Hb% and PCV in the fish, *Heteropneustes fossilis* after nickel sulphate treatment for 15 days were recorded [18]. Haemolysis of erythrocytes was also observed after exposing to 2mM dichromate for 24 hours [19]. Haematological effects of hexavalent chromium were examine in fresh water teleost, *Oreochromis mossambicus* [20] and in Indian Major Carp, *L. rohita* [21] and reduction in Hb, TEC and Hct values were noticed .The declining trend in WBC count, Hb content and RBC count indicates dysfunctioning of haemopoietic systems along with dysleucopoisis, may be due to bone marrow depression and liver dysfunction [6 and 22]. According to Singh [2] TEC, hemoglobin per cent, MCH and hematocrit value were found to be significantly decrease in *Channa punctatus* exposed to both copper and chromium indicates that the metal induces

acute anemia under toxic conditions. More or less similar patterns of results were obtained in present investigation as suggested by previous authors, [23, 24 6, 16, 17, 22, 25 and 26].

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