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Hematological changes due to the impact of Lead nitrate on economically important estuarine fish *Mystus gulio*

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ABSTRACT

The estuarine fish *Mystus gulio* exposed to Lead nitrate at three sub lethal concentrations for 24 hrs, 48 hrs, 72 hrs and 96 hours show changes in the Hematological studies. The Total Erythrocyte count, Total Leucocyte count, Thrombocytes, Lymphocytes, Basophils, Neutrophils, Monocytes and Eosinophils Shows a decrease in level against the normal values of control animals leading to mortality.

Keywords : Lead nitrate ,Hematological studies, Lead poisoning

Introduction.

Lead contamination is worldwide and it is mainly due to human activities. Lead toxicity results in loss of appetite, neurological and hematological problems in young animals including man (Pagalia et al., 1975).

Anthropogenic activities like mining, ultimate disposal of treated and untreated waste effluents containing toxic metals as well as metal chelates from different industries, e.g. tanner, steel plants, battery industries, thermal power plants etc. (Amman et al., 2002).

With the advent of agricultural and industrial revolution, most of the water sources are becoming contaminated (Khare and Singh, 2002).

Materials and methods

The count of RBC in the blood of estuarine fish *Mystus gulio* carried out with improved Neubauer ruling (Weber & Sons, England). Blood is diluted 200 times in the standard RBC pipette with Hendrick's fluid coloured light blue with methylene blue.

The WBC count studied in the *Mystus gulio* blood, in order to prevent blood from clotting, the syringe and needle were rinsed with 1% EDTA before bleeding (Mainwaring and Rowley, 1985).

Blood smears were prepared on clean slides. The smears were stained by the Panoptic method of Hoffman (1977). On the dry smear 10 drops of May – Grunwald solution was added and after 3 minutes an equal amount of distilled water added. Without rinsing, the slides were immersed in Giemsa's solution (1 part in 9 parts distilled water) and stained for 15-30 minutes. The slides were rinsed in running water and observed under microscope. The individual types of cells were counted and converted to percentage to get the Leukocytes differential count.

Results

A detailed observation on the Hematological study in control fish reveals the presence of total erythrocyte count is 1.49 10⁶/ mm³, total leucocyte count 103/ mm³ 17.40 Haemoglobin 7.5 g/dl, Lymphocytes 36 per cent, Monocytes 12.0 per cent, Eosinophils 2.0 per cent, Neutrophils 49.0 per cent, Basophils 1.0 per cent and Thrombocytes 2.0 per cent.

The Table 1 presents hematological parameters changes in TEC, TLC, thrombocytes in estuarine fish *Mystus gulio* exposed to lead nitrate for 24 hrs, 48 hrs, 72 hrs and 96 hrs in three sub-lethal concentrations. The impact of lead nitrate on the TEC, TLC and on Thrombocytes are in decreasing order. The TEC decreases from 1.48 per cent to 1.42 per cent the TLC shows a decreasing trend from 17.38 to 17.30. The Thrombocytes shows a decreasing trend from 2.0 to Nd (Not detectable). The above findings are perused from the (Table 1).

Table 1 Hematological changes in (TEC, TLC, Thrombocytes) estuarine fish *Mystus gulio* exposed to lead nitrate for 24, 48, 72 and 96 hrs in three sublethal concentrations

SLC – Sublethal concentration.

Blood cells	Treatment with lead nitrate	Exposure period (Hrs)			
		24 hrs	48 hrs	72 hrs	96 hrs
T. Erythrocyte count. 10 ⁶ / mm ³ Millions per cubic millimeter	Control	1.49	1.49	1.49	1.49
	Conc.09.60 mg/l SLC-I	1.48	1.47	1.46	1.45
	Conc.15.50 mg/l SLC-II	1.46	1.45	1.44	1.43
	Conc.26.50 mg/l SLC-III	1.45	1.44	1.43	1.42
Total leucocyte count 10 ⁶ / mm ³ Thousands per cubic millimeter	Control	17.40	17.40	17.40	17.40
	Conc.09.60 mg/l SLC-I	17.38	17.36	17.35	17.33
	Conc.15.50 mg/l SLC-II	17.35	17.33	17.33	17.32
	Conc.26.50 mg/l SLC-III	17.34	17.33	17.31	17.30
Thrombocytes 10 ⁶ / mm ³ lakhs per cubic millimeter	Control	2.0	2.0	2.0	2.0
	Conc.09.60 mg/l SLC-I	2.0	1.0	1.0	1.0
	Conc.15.50 mg/l SLC-II	1.0	Nd	Nd	Nd
	Conc.26.50 mg/l SLC-III	Nd	Nd	Nd	Nd

The Table 2 presents hematological parameters changes in differential count of estuarine fish *Mystus gulio* expose to lead nitrate for 24 hrs, 48 hrs, 72 hrs and 96 hrs in three sublethal concentrations. According to the data of table 11 the lymphocytes show a decreasing path from 35 to 27 per cent, Neutrophils show a downward in number from 48.0 to 39.0,

Monocytes show decrease from 11.0 to 7.0 per cent, Eosinophils also shows a decreasing attitude in number from 2.0 per cent to Nd (Not detectable limit). Similar the basophil exhibits the same as the above parameters with a decreasing trend from 1.0 per cent to Nd (Not detectable limit) (Table 2).

Table 2 Hematological changes in differential counts of estuarine fish *Mystus gulio* exposed to lead nitrate for 24, 48, 72 and 96 hrs in three sublethal concentrations

Blood cells	Treatment with lead nitrate	Exposure period - Differential count (%)			
		24 hrs	48 hrs	72 hrs	96 hrs
Lymphocytes	Control	36.0	36.0	36.0	36.0
	Conc.15.60 mg/l SLC-I	35.0	33.0	32.0	31.0
	Conc.15.50 mg/l SLC-II	32.0	31.0	30.0	3\29.0
	Conc.26.50 mg/l SLC-III	30.0	29.0	28.0	27.0
Monocytes	Control	12.0	12.0	12.0	12.0
	Conc.09.60 mg/l SLC-I	11.0	11.0	10.0	9.0
	Conc.15.50 mg/l SLC-II	11.0	10.0	9.0	9.0
	Conc.26.50 mg/l SLC-III	9.0	8.0	7.0	7.0
Eosinophils	Control	2.0	2.0	2.0	2.0
	Conc.09.60 mg/l SLC-I	2.0	1.0	1.0	1.0
	Conc.15.50 mg/l SLC-II	1.0	1.0	1.0	1.0
	Conc.26.50 mg/l SLC-III	1.0	Nd	Nd	Nd
Neutrophils	Control	49.0	49.0	49.0	49.0
	Conc.09.60 mg/l SLC-I	48.0	46.0	45.0	42.0
	Conc.15.50 mg/l SLC-II	45.0	43.0	42.0	40.0
	Conc.26.50 mg/l SLC-III	43.0	45.0	42.0	39.0
Basophils	Control	1.0	1.0	1.0	1.0
	Conc.09.60 mg/l SLC-I	1.0	1.0	1.0	1.0
	Conc.15.50 mg/l SLC-II	Nd	Nd	Nd	Nd
	Conc.26.50 mg/l SLC-III	Nd	Nd	Nd	Nd

Nd – Not detected.

The Table 3 presents hematological parameters changes in haemoglobin of estuarine fish *Mystus gulio* exposed to lead nitrate from 24, 48, 72 and 98 hrs in three sublethal concentrations. The studies on haemoglobin shows a decreasing trend. The observations are 7.3 to 6.8 g/dl (Table 3).

Table 3 Hematological changes in haemoglobin of estuarine fish *Mystus gulio* exposed to lead nitrate for 24, 48, 72 and 96 hrs in three sublethal concentrations

Blood cells	Treatment with lead nitrate	Exposure period			
		24 hrs	48 hrs	72 hrs	96 hrs
Hb (g/dl)	Control	7.5	7.5	7.5	7.5
	Conc.09.60 mg/l SLC-I	7.3	7.2	7.1	7.0
	Conc.15.50 mg/l SLC-II	7.0	7.0	6.9	6.9
	Conc.26.50 mg/l SLC-III	6.9	6.9	6.8	6.8

Discussion

Haematological parameters examined include Pack cell volume (PCV), Haemoglobin (Hgb), Total erythrocyte count (TEC), Total leukocyte count (TLC) and Erythrocyte Sedimentation Ratio (ESR) which all decreased significant ($P < 0.05$), the decrease being proportional to the increase in Portland cement powder in solution (Mohamed and Sambo, 2008).

Heavy metals are serious pollutants of the aquatic environment of their environmental persistence and ability to be accumulated by aquatic environment. *Clarias batrachus* was exposed to 0.02, 0.04, 0.06, 0.08 and 0.10 ppm of $HgCl_2$ for 35 days. After 35 days of exposure red blood cells (RBC) count

(1.66, 1.59, 1.54, 1.42 and 1.23, 106 mm³) and Hb content (67.2, 50.8, 42.6, 31.6 and 29.2 g/dl) decreased when compared to the control (RBC – 1.77, 106 mm³ and Hb – 75.0 g/dl) (Maheshwaran et al., 2008).

The sublethal effect of lead on haematological profile of *Clarias batrachus* were studied. Lead nitrate was used to prepare stock solution from which different standard concentration were prepared. A total of 64 specimens of *Clarias batrachus* (weight 80-100 g and 18-20 cm respectively) were used in the study. They were divided into four groups and each group has 16 fishes. They were than exposed to various concentrations of 10, 50 and 100 mg/l of lead nitrate for acute and chronic studies. In exposed fishes various haematological changes were noticed. The RBC counts, haemoglobin percentage and serum protein levels were decreased significantly in comparison to control groups (Mastan et al., 2009). The above similarities observed in the present study a decrease in TEL, TLC, Hb, differential count and thrombocytes were observed in both male and female fish *M. gulio*. The present observations show similarities with the findings of Mohamed and Sambo, 2008. This leads to the diseases and tissue damages to this animal.

Summary

Marine animals are the commonest food for man. The heavy metal contamination passes to man through food chain leading to similar hematological problems, Human beings are more prevalent to these diseases. So steps must be taken to reduce the levels of Lead pollutants in our environment.

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