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STUDIES ON IMPACT OF ZINC ELECTROPLATING INDUSTRIAL EFFLUENT ON HEMATOLOGY AND BIOCHEMICAL PARAMETERS OF CYPRINUS CARPIO

KEYWORDS: Impact, Zinc Electroplating,industry,effluent, hematology, Biochemical parameters, Cyprinus carpio,

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ABSTRACT *Present study deals with the impact of zinc electroplating industry effluent on hematology and biochemical properties of muscle, gills and liver of Cyprinus carpio, when exposed to 0 (control), 2, 4, 6, 8 and 10% effluent concentration. Hematology parameters such as total WBC count, eosinophils, hemoglobin, RBC count, haematocrit, MCHC and platelets count were decreased with increasing effluent concentration when compared to control group. Among biochemical parameters higher protein, carbohydrate and lipid content was shown in control (0% effluent concentration). The least protein, carbohydrate and lipid content were shown in 10% effluent concentration.*

INTRODUCTION

Rapid industrialization in India has resulted in the substantial increase in the liquid waste, which is traditionally discharged into open land or into nearby natural water, causing a number of environmental problems including threat to plants and animal lives and also creating problems such as surface water logging, ground water contamination and salinizing good quality land due to the presence of high quality salt (Ramona et al., 2001). Continuous discharge of industrial effluents into the aquatic environment can change both aquatic species diversity and ecosystems, due to their toxicity and accumulative behavior. Among industries, electroplating industries plays an important role in creating heavy metal pollution in water bodies through direct discharge of effluent in water bodies. Aquatic organisms including fish accumulate metals many times higher than in water or sediments (Madhusudan *et al.*, 2003; Surec, 2003 and Olaifa *et al.*, 2004). The zinc electroplating industries discharge higher amount of zinc. Zinc is an important trace nutrient for humans, plants and animals and it is important for body growth and immunity. Even though Zinc is an essential element in low concentrations, it is discharged into the fresh water environment in higher concentrations severely affects the freshwater fauna, especially fishes. Excessive intake of zinc causes digestive problems and causes kidney damage. The studies related to the impact of zinc electroplating industry effluent on hematology and biochemical parameters of *Cyprinus carpio* totally wanting. Hence the present study was carried out.

MATERIALS AND METHODS

For the present study, zinc electroplating industry effluent was collected from Vilangudi, Madurai, Tamil Nadu, India, in plastic containers (20L), transported to the laboratory and stored for experiment use. Freshwater fish *Cyprinus carpio* were procured from Pandian fish farm Dindigul, Tamilnadu, India and transported to the laboratory. The fish were acclimatized in laboratory condition for 15 days. After 15 days healthy fingerlings were selected. For rearing experiments effluent concentrations such as 0 (control), 2, 4, 6, 8 and 10% were prepared since the sub-lethal concentration was 12%. These media was taken in plastic troughs (45cm L×30cm B×15cm H). The volume of medium in each trough was maintained as 10 liters. In each concentration 10 fishes (5.834 ± 0.253g) were reared. The control fish were reared in fresh water (effluent free water). The experiment was continued for 45 days. After 45 days haematological variables such as total white blood cell count (WBC), total red blood cell count (RBC), haemoglobin concentration (Hb), haematocrit (Hct), mean corpuscular volume (MCV), mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC)were determined. Hematocrit was determined according to the method described by Korzhuev (1964) and the WBC, RBC and MCV values were obtained by employing a Sysmex CC-120 Microcell Counter. The Hb was determined by using the cyanmet- haemoglobin method (Blaxhall and Daisley, 1973). MCH and MCHC were calculated using the methods described by Dacie and Lewis (1963). MCH was calculated in picograms/cell = Hb/RBC x 10 and MCHC = Hb in 100 mg blood/Hct x 100. Biochemical parameters such as protein (Lowry *et al,* 1951), carbohydrate (Carrol *et al,* 1956) and lipids (Folch *et al,* 1957) were estimated in muscle, gills and liver of Cyprinus carpio.

RESULTS AND DISCUSSION

Impact of different concentration of zinc electroplating industry effluent on hematology are presented in Table 1. In the present study, total WBC count, eosinophils, hemoglobin, RBC count, haematocrit, MCHC and platelets count were decreased with increasing zinc electroplating industry effluent concentration when compared to control. The concentration of hemoglobin decreased in the blood of fish exposed to short term zinc exposure (Witeska and Kosciuk, 2003). Vinodhini and Narayanan, (2009) reported the impact of toxic metals. The present results are in accordance with earlier works (Vutukuru, 2005).

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TABLE 1: EFFECT OF DIFFERENT CONCENTRATION OF ZINC ELECTROPLATING INDUSTRY EFFLUENT ON HAEMATOLOGICAL PARAMETERS OF CYPRINUS CARPIO

S. No	Parameters	Effluent Concentration (%)					
		0(Control)	2	4	6	8	10
1.	Total WBC Count (cells/cumm)	1,03,500	95,372	83,900	77,573	64,530	62,432
2.	Polymorph Neutrophils (%)	07	06	08	07	06	05
3.	Lymphocytes (%)	95	93	92	98	96	99
4.	Eosinophils (%)	4.23	4.01	3.87	3.62	3.43	2.97
5.	Haemoglobin (gm/dl)	6.5	6.4	6.2	5.9	5.7	5.2
6.	RBC Count (millions/cmm)	0.81	0.76	0.72	0.67	0.63	0.60
7.	Haematocrit (PVC) (%)	13.9	13.4	13.03	12.5	12.2	11.7
8.	MCV (fl)	171	174	179	182	185	189
9.	MCH (pg)	80	76	73	72	69	66
10.	MCHC (g/dl)	47	44	41	39	37	34
11.	Platelets Count(lakhs/cumm)	89,000	82,573	81,000	74,000	72,583	69,793

The effect of zinc electroplating industry effluent on biochemical parameters of *Cyprinus carpio* were presented in Table 2. The biochemical parameters such as protein, carbohydrates and lipid contents were also decreased with increasing effluent concentration when compared to control. Ahmed et al., (1997) also reported alterations in total protein in aquatic organisms exposed to toxicants. According to Dhavale and Masurekar (1986) reported decreased level of carbohydrate in tissues of toxicant exposed animals and may be due to the prevalence of hypoxic condition in the tissues in relation to pollutant stress. In the present study lipid content in muscle, gills and liver decreased with increasing concentration of zinc electroplating industry effluent.

TABLE 2: EFFECT OF DIFFERENT CONCENTRATION OF ZINC ELECTROPLATING INDUSTRY EFFLUENT ON BIOCHEMICAL CHANGES OF CYPRINIUS CARPIO

Organs	Components (mg/g wet tissue)	Effluent Concentration (%)					
		0(Control)	2	4	6	8	10
Muscle	Protein	37.25±0.113	34.43±0.127	33.57±0.117	32.32±0.134	30.12±0.143	29.17±0.127
	Carbohydrate	14.43±0.098	13.89±0.121	12.34±0.095	11.21±0.111	9.75±0.122	7.95±0.97
	Lipid	9.23±0.087	8.02±0.092	7.59±0.112	7.12±0.098	6.78±0.079	6.47±0.089
Gills	Protein	17.12±0.154	16.41±0.143	15.57±0.147	15.12±0.132	14.72±0.127	14.17±0.137
	Carbohydrate	9.43±0.097	8.75±0.087	7.99±0.092	7.21±0.12	6.65±0.123	6.25±0.099
	Lipid	5.21±0.111	5.02±0.124	4.79±0.112	4.12±0.134	3.78±0.154	3.47±0.112
Liver	Protein	32.15±0.124	31.43±0.142	30.27±0.133	29.32±0.156	28.17±0.143	27.57±0.137
	Carbohydrate	23.34±0.112	22.59±0.132	21.34±0.144	20.53±0.137	19.75±0.132	18.97±0.147
	Lipid	7.23±0.117	7.02±0.111	6.59±0.097	6.12±0.112	5.78±0.089	5.47±0.098

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