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EFFECT OF MERCURIC CHLORIDE AND ARSENIC TRIOXIDE ON BIOCHEMICAL CONSTITUENT IN FRESHWATER BIVALVES, *LAMELLIDENS CORIANUS*

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ABSTRACT

The freshwater bivalves, *Lamellidens corrianus* exposed to $LC_{50/10}$ concentration 0.212 ppm and 2.310 ppm of Mercuric chloride and Arsenic trioxide respectively on glycogen content in the tissue of mantle, gills and digestive glands for 9 days exposure. Compare to control group there was significant change in glycogen contents from mantle, gills and digestive glands in heavy metal exposed groups. The percent decrease of total glycogen content was in the order of digestive gland, gills and mantle. The result showed that heavy metal induces significant depletion in glycogen metabolic profiles in mantle, gills and digestive glands might be due to increased proteolysis and possible utilization of the products of their degradation for metabolic purpose.

KEYWORDS: Glycogen content,Mercuric chloride,Arsenic trioxide, L.corrianus.

INTRODUCTION

The heavy metal such as mercury, arsenic and lead are more toxic even in least amount. In addition, the successive accumulation of heavy metals in the bodies can cause very serious illness to the living creatures.According to literature; the heavy metals directly affected to the tissue and may interact with cell membrane (Rothstein, 1959). It is also known that, heavy metal affects the biologically active moleculessuch as amino acids, co-enzymes and to other binding ions such as sulphur, phosphate, etc. (Ghosh and Chatterjee, 1995). Higher concentrations of toxicants in aquatic environment cause adverse effect on the aquaticorganisms at cellular or molecular level and ultimately disturbed proximate biochemicalcomposition of the organism.

Arsenic is a chemical that bioaccumulates in tissues of aquatic organisms but does not biomagnify in the aquatic food chain (Woolson,1975;Wagemann et.al,1978; Spehar, 1980 Maeada et.al,1990; Chen and folt,2000 and manson et.al, 2000). Less is known about the forms of arsenic in freshwater fish, but there is evidence that organic arsenic may be prevalent,Field based study or considerably less (Kaise et.al,1997; Meada et al,1992, 1993; suhendrayatna and Maeda,2001,2002). Mercury discharged into the environment throught effluent and solid waste routes, contaminating the adjucent aquatic and terrestrial ecosystem respectively.The secoundly contamination occurs through the chimney from the mercury cell house into the atmospheare and it's fallout by the process of precipitation. Industrial discharges occure Bothe's effluent and solid wastes and causea hazardous effect on living organisms (Agarwal and Kumar, 1978).

The decrease in glycogen may be due to enhanced breakdown of glycogen to glucose by glycolysis,and more decrease in glycogen level in digestive glands might be due to glycogenolysis, similar to that of vertebrete liver as suggested by Kabeer *et. al.* (1977); Similar type of work done by Mayers (1977); Koudinya and Rammurthi, (1979). The effect of heavy metals on animal life in fresh water is an important aspect of pollution and the information available on the physiological effects of exposure to different pollutants is meagre These environmental pollutents bring about damage to different organs or disturb the physiological and biochemical processes within the organism. Therefore, in the present study the glycogen content was estimated in the mantle,gills and digestive glands of the freshwater bivalve, *Lamellidens corrianus* after exposing to chronic concentration of heavy metals mercuric chloride and arsenic trioxide.

MATERIALS AND METHODS

i) Animal collection and maintenance

For present investigation, the freshwater bivalves, *Lamellidens corrianus* were collected from of Suki dam which is about at the distance of 31 K.M. away from

Savda City of Maharashtra State. First they were made acclimatized to laboratory condition for 2-3 days. The water in the aquarium was changed regularly after every 24 hours. Mature acclimatized healthy bivalves s was exposed to heavy metal mercuric chloride and arsenic trioxide.

ii) Intoxicants

Two toxicants were selected for this study is heavy metals, mercuric chloride and arsenic trioxide.The bivalves, *L.corrianus* exposed to $LC_{50/10}$ concentration of $HgCl_2$ (0.212ppm) and AS_2O_3 (2.310ppm) upto 9 days.

iii) Experimental Design

The experimental bivalve's were divided into three groups, such as group A,B and C. The bivalve's of group A were maintained as control. The bivalve's from group B were exposed to chronic concentration (LC_{50} value of 96 hr/10) of heavy metal, mercuric chloride (0.212 ppm) and the bivalve's from group C were exposed to chronic concentration (LC_{50} value of 96 hr/10) of heavy metal, arsenic trioxide (2.310ppm) upto 9 days. During experimentation bivalve's were fed on fresh water algae. The mantle,gills and digestive glands of bivalves from A, B and C group's were collected after every three days and dried in oven at 75 ºC to 80 ºC till constant weight was obtained and blended into dry powder. Glycogen contents from dried powders of different tissues of control and experimental animals were estimated by the method of Dezwann and Zandee (1972) using anthrone reagent and glucose as standard.

iv) Statistical analysis

The values of glucose obtained were converted to glycogen values by multiplying with the factor 0.927. All results of the biochemical analysis are given as the mean of three readings with ± standard deviation (SD). Percentage of variation is compared with respective control and both heavy metals.

OBSERVATIONS AND RESULTS

glycogen contents in different tissues of *Bellamya bengalensis* after exposure to $HgCl_2$ (0.212 ppm) and AS_2O_3 arsenic trioxide (2.310 ppm) have been summarised in table's A and B. That the glycogen contents in mantale,gonad and digestive glands of *Bellamya bengalensis* in presence of mercuric chloride and arsenic trioxide decreased with the increase in exposure period as compared control. The glycogen content is more decresae those snail's exposed in mercuric chloride as compared to those exposed in arsenic trioxide.

Table Glycogen content in various tissues of freshwater bivalves, *L.corrianus Bellamya bengalensis* after chronic exposure to heavy metals, $HgCl_2$ and As_2O_3.

Treatment	Sr No.	Body Tissue	The glycogen content (%) ± S.D.		
			3 Days	6 Days	9 Days
(A) Control	i	M	1.321 ± 0.031	1.142 ± 0.042	1.090 ± 0.011
	ii	G	2.489 ± 0.056	2.387± 0.014	2.232. ± 0.092
	iii	D.G	3.465 ± 0.027	3.321 ± 0.039	3.119 ± 0.018
(B) 0.212 ppm $HgCl_2$	i	M	1.045 ± 0.078, (-20.89 %)	0.875 ± 0.044, (-23.38 %)	0.701 ± 0.047, (-35.68 %)
	ii	G	2.187 ± 0.029, (-12.13%)	1.867 ± 0.043, (-21.78%)	1.689 ± 0.072, (-24.32%)
	iii	D.G	3.008 ± 0.012, (-13.18%)	2.879 ± 0.098, (-13.30%)	2.586 ± 0.022, (-17.08%)
(C) 2.310 ppm As_2O_3	i	M	1.120 ± 0.031, (-15.21%)	0.975 ± 0.067, (-14.65%)	0.889 ± 0.087, (-18.44%)
	ii	G	2.224 ± 0.039, (-10.64%)	1.913 ± 0.055, (-19.85%)	1.779 ± 0.023, (-20.29%)
	iii	D.G	3.145 ± 0.067, (-9.23%)	2.995 ± 0.098, (-9.81%)	2.787 ± 0.021, (-10.64%)

M-Mantle, G-Gills and D.G.-Digestive glands , In braket value was compared with respective A

DISCUSSION

The change in biochemical composition of an organ due to heavy metal stress indicates the change in activity of an organism . It reflects light on the utilisation of their biochemical energy to counteract the toxic stress. Heavy metal salts affect the metabolism of the fresh water snail's, *Bellamya bengalensis*. Alterations in metabolic pocesses, following exposure to heavy metal stress have been always used as an indicator of stress. But there is a vast difference in the pattern & metal induced physiological alterations from metal to metal & animal to animal.

Glycogen content in the tissue of animal is an important essential organic constituent which plays a vital role in the cellular metabolism. All enzymes are proteins in nature and they control subcellular functions and accelarate the rate of metablic action in the body of organism. Ramanarao and Ramamurthi (1978) studied the protein content in the tissue of *Pila globosa* after

exposure to pesticide. In present study, in the *Bellamya bengalensis*. the protein contents in the selected tissues was decreased in chronic concentration of mercuric chloride as compared to the control and $LC_{50/10}$ concentration with 5 mg/lit. According to Abel (1974) the decrease of protein may be due to alterations of membrane permeability. The depletion in the protein content was reported from the muscles of fish, *Clarias batrachus* after treatment with pesticide by the Yagana Bano et al. (1981). Nagabhushanm and Kulkarni (1979) studied variation in protein metablism in *Barytelephusa cunicularis*. Joseph et al. (1987) observed the effect of copper on biochemical composition of *Cyprinus carpio* and found that total protein content of the brain, liver and muscles was declined.Mukherjee and Sinha (1993) studied the effect of heavy metal toxicity on haematological and biochemical aspect in the fresh water major carps, *Labeo rohita*. Katticaran et al. (1995) studied the copper induced alterations in total carbohydrate and protein level in the bivalve, *Sunetta scripta*.

CONCLUSION

In present stress, ionic mercuric chloride might have caused severe disturbances of the metabolism in the animal. Chronic exposure of mercuric chloride and arsenic trioxide showed a remarkable decrease in glycogen content in *Bellamya bengalensis* as compared to normal.

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