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Research Paper

Changes in the glycogen content of *Lammellidens marginalis* after exposure of acute toxicity of Cadmium in winter season.

Shaikh Yasmeen* and T. S. Pathan
Department of Zoology, Dr. Rafiq Zakaria College for Women, Navkhanda Palace, Jubilee Park, Aurangabad (M. S.), India
Department of Zoology, Kalikadevi Arts, Commerce and Science College, Shirur Kasar District. Beed (M. S.) India
*****Corresponding author Email: shaikhyasmeen7862@gmail.com

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Abstract: Toxicity of cadmium on some metabolic processes can lead to disturbances and imbalance of various physiological activities. The present study reflects the effect of cadmium chloride on glycogen in some vital organs of the fresh water Bivalve mollusks *Lammellidens marginalis.* The bivalve were treated with different concentrations of cadmium chloride mortality rate was noted up to 96 h. The carbohydrates were estimated to study the stress caused by the cadmium chloride as a toxicant. The results showed a significant decline in the total carbohydrates in different. The significant role of cadmium chloride in some vital organs of the experimental animal is discussed and the results correlated and corroborated with the findings of the earlier researchers.

Keywords: *Lammellidens marginalis*, Cadmium chloride, glycogen, Toxicity

INTRODUCTION:

Cadmium is a ubiquitous, non essential element which possesses high toxicity to both human and aquatic organisms. It is classified as the second most dangerous metal in our environment. It occurs naturally in the environment and in insignificant amount. In the recent past, its concentration in aquatic systems is steadily and considerably increasing due to anthropogenic activities (Bryan and Langston 1992). Its deleterious effects on aquatic flora and fauna by adverse effect on various physiologica, biochemical and cellular processes have been reported (Gill et. al., 1988). Cadmium toxicity has become the focus of intense research globally next to mercury as the most notorious of heavy metal pollutant. After absorption into the gastro-intestinal tract it is transferred to the liver, kidney and finally excreted via urine. It becomes toxic when it is not metabolized by the body and accumulates in soft tissues, liver, kidneys and mostly as metalloprotein (Nodberg and Nodberg, 2000).

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Cadmium toxicity to aquatic ectotherms depends on complex biochemical interaction and a balance between rates of absorption, detoxification and excretion. It has been found that cadmium could change glycogen reserves and serum glucose levels in aquatic animals by affecting the activities of liver enzymes that have pivotal role in the carbohydrate metabolism such as gluconeogenesis, glycogenesis and glycolysis. Thus, the several biochemical parameters of aquatic animals could be used as an indicator of heavy metal toxicity and health status of aquatic population. The *Lammellidens marginalis* is well known for its high nutritive value and is commonly cultured by the local farmers. Cadmium causes instantaneous physiological disorders and alteration in the pathways of carbohydrate metabolism in tissues and organs. Biochemical parameters are the best indicator of stress caused by heavy metals and thus toxicity testing becomes an essential tool for assessing the effect and fate of a toxicant. Therefore, the studies were conducted to estimate the toxicity and variations in carbohydrate levels, in *Lammellidens marginalis* exposed to cadmium.

MATERIALS AND METHODS:

The freshwater bivalves Lamellidens marginalis (90 – 100 mm in shell length) were collected from Kutlaq Lake, Daultabad near Aurangabad (Maharashtra State) India. After bringing to the laboratory, the fouling biomass and mud on shell valves were removed without disturbing the siphonal regions. The equal sized animals were grouped nd kept in sufficient quantity of water (animal / litre) in aquaria with aeration for 24 hours to adjust the animals to laboratory conditions with renewal of water at interval of 12 to 13 hours. No food was given during this time and during experiments. After 24 hours animals of equal size (90 – 100mm shell length) were grouped in 10 and exposed to different test concentrations of cadmium. After 96hrs acute toxicity tests the biochemical constituent like glycogen from different body parts viz. mantle, gill, gonad, hepatopancreas, foot, was estimated from control, LC0 and LC50 groups. During each estimate pooled samples from five animals belonging to each group were used to determine the content of glycogen (De zwann and Zandee, 1972). The values of estimate for different tissues were subjected to statistical analysis using replicate of multiple variances to find out the significant differences between control, LC0 and LC50 groups. The results are expressed on wet weight basis (mg/gm).

RESULT AND DISCUSSION:

Table: Changes in the glycogen from different body parts of *Lammellidens marginalis* after exposure of acute toxicity tests of Cadmium in winter season. In Control group increased value from mantle (11.628±0.442) followed by gill (6.288±0.177), hepatopancreas (5.298±0.172), gonad (5.196±0.197) and foot
In LC0 group glycogen content was highest value showed in foot (11.335±0.398) followed by mantle (7.263±0.298), gill (5.119±0.223), gonad (4.503±0.141) and hepatopancreas (3.268±0.127).

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Table: Changes in the glycogen from different body parts of *Lammellidens marginalis* after exposure of acute toxicity tests of Cadmium in winter season.

Body Parts	Control	LC0 Group	LC50 Group
Mantle	11.628 ±0.442	7.263±0.298 (37.53%) ***	3.738±0.131 (67.85%) *** (48.53%)000
Gill	6.288 ±0.177	5.119±0.223 (18.59%) ***	4.417±0.127 (29.75%) *** (13.71%)000
Gonad	5.196 ±0.197	4.503±0.141 (13.33%) **	6.832±0.272 (231.4%) *** (51.72%)000
Hepatopancreas	5.298 ±0.172	3.268±0.127 (38.31%) ***	4.729±0.261 (189.26%) *** (44.70%)000
Foot	3.317 ±0.148	11.335±0.398 (241.7%) ***	8.276±0.288 (349.5%) *** (26.98%)000

(Bracket values shows percentage difference *, 0-P<0.05;**, 00-P<0.01;***, 000-P<0.001.*-compared to control group; 0-compared to LC0 group)

In LC50 group content of glycogen was highest value showed in foot (8.276±0.288) followed by gonad (6.832±0.272), hepatopancreas (4.729±0.261), gill (6.832±0.272) and mantle (3.738±0.131).

LC0 group compared with control group highest value of significantly found in foot (241.7% P<0.01) followed by hepatopancreas (38.31% P<0.001) and mantle (37.53%P<0.001) and gill (18.59% P<0.001). Decreased value of significant found in gonad (13.33% P<0.01).

LC50 group compared with Control group high content of significant found in foot (349.5% P<0.001) followed by gonad (231.4%P<0.001), hepatopancreas (189.26% P<0.001), mantle (67.85% P<0.001) and gill (29.75% P<0.001).

When LC50 compared with LC0 group high value of significantly found in gonad (51.72% P<0.001) followed by mantle (48.53% P<0.001), hepatopancreas (44.70% P<0.001), foot (26.98 % P<0.001) and gill (13.71% P<0.001).

Glycogen is considered to be the major source of energy in animal tissues and maintenance of glycogen reserves is an essential feature of the normal organismal metabolism. It also plays an important role in the structural part of the cell membranes De Zwaan and Zandee, (1972). The decrease in glycogen content form the whole body of the bivalve, *L. marginalis* suggests the possibility of the glycogenolysis which in turn produce energy to cope up the adverse stress conditions.

According to (Berthelin, *et. al.*, 2000) energy metabolism affected by exogenous factors such as food availability and temperature as well as by endogenous factors such as energy demands for reproduction, metabolic reserves accumulated in tissues may be used in energy production or converted into various biochemical components. Bivalves store energy in the form of glycogen (Naimo, *et. al.*, 1998). High values of glycogen and carbohydrate were reported in bivalves when they are sexually inactive (Nagabhushnam and Deshmukh, 1974). Any stressful

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condition alters the biochemical composition. The change in metabolic rate leads towards the change in biochemical composition hence, the change in biochemical composition is an indicator of stress of chemical or physical nature in the surrounding which mainly affects glycogen contents.

Glycogen content in the gill tissue of exposed animals showed a general trend of reduction when compared with the controls. The reduction in glycogen values was found to be significant at almost all exposure periods significant depletion in glycogen level suggests possibility of its rapid utilization to provide excess energy for cellular biochemical process through glycolysis. Hypoxic condition might have been prevailed in the bivalve to provide excess energy by its utilization.

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