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VARIATION OF LIPID CONTENT AND CATALASE ACTIVITY IN HEPATOPANCREAS AND GONADS OF FRESH WATER SNAIL, *BELLAMYA BENGALENSIS* AFTER MERCURY TOXICOSIS

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ABSTRACT

Study was conducted to evaluate the effect of mercuy chloride on lipid content and catalase activity in various tissues of fresh water gastropod snail's, *Bellamya bengalensis.* The effect on snail's was studied under two groups. Group A was maintained as control, group B of snail's was exposed to chronic LC $_{50/10}$ dose of $HgCl_2$ (0.109ppm) for 21 days. Lipid content and catalase activity in selected tissues hepatopancreas and gonads of *Bellamya bengalensis.*from both groups were estimated after 7, 14 and 21 days. Significant decrease in glycogen content and catalase activity were observed in $HgCl_2$ exposed snail's as compared to control.

KEYWORD: Mercury, Lipid content, Catalase activity and Bellamya bengalensis.

INTRODUCTION

The pollution of the aquatic environment by heavy metals is a subject of great concern. Heavy metals pose a serious threat to the aquatic environment because of their toxicity, Heavy meals are one of the more serious pollutants in our natural environment due to their toxicity, persistence and bioaccumulation problem (Tam and Wong, 2000). The heavy metals such as cadmium, lead and mercury have no known beneficial effect and their accumulation over the time in animals can cause illness (Hawkes, 1997). Mercury is considered global pollutants of high concern regarding their adverse effects on environmental and human health (Barboza et al., 2018; Guilhermino et al., 2018; Wright and Kelly, 2017). Lipids are molecules that contain hydrocarbons and make up the building blocks of the structure and function of living cells. Lipid is the most efficient organic reserves of most of the bivalves and other animalsalong with major structural components of the body tissues (Anderson and Webber, 1977). Many workers studied the lipid alterations in various animals after exposure to toxicants (Zambare, 1991; Deshmukh and Lomte, 1998; Waykar and Lomte, 2004; Shaikh, 2011). In general, lipid generates more heat and energy than carbohydrates. Phospholipids, also called structural lipids, are playing an importantrole in the cell membrane's formation (Martinez-Pita etal, 2011).

Catalase (CAT) which is the first line of defense against oxidative stress (Smaoui-Damak W, Hamza Chaffai A, 2003)Under normal physiological condition, animals maintain a balance between eneration and neutralization of reactive oxygen species (ROS). However when organisms are subjected to xenobiotic compounds, the rate of production of ROS, such as superoxide anion radicals (O2 •−), hydrogen peroxide (H_2O_2), hydroxyl radicals (•OH) and peroxyl radicals (ROO−) exceeds their scavenging capacity (Halliwell and Gutteridge, 2007). Therefore, antioxidant parameters and oxidative stress indices are considered potential biomarkers and are frequently used as screening tools to assess the impacts of environmental stress. Important antioxidant enzymes are catalase (CAT), superoxide dismutase (SOD), glutathione- S-transferase (GST) and glutathione peroxidase (GPx).The aim of our study was to determine Variation in lipid content and catalase activity in hepatopancreas and gonads of freshwater gastropod snails, *Bellamya bengalensis.*

MATERIALS AND METHODS

The healthy active snail's of approximately medium size and weight were chosen. These snail's were divided into two groups, such as group A and B. The snail's of group A were maintained as control. The snail's from group B were exposed to chronic concentration (LC 50 value of 96 hr/10) of heavy metal salt, Mercuric chloride (0.109 ppm) upto 21 days. During experimentation snail's were fed on fresh water algae. The hepatopancreas and gonad of snail's from A and B group's were collected after every seven days and tissues of hepatopancres and gonad were dried in oven at 75 ^{0C} to 80 ^{0C} till constant weight was obtained and blended into dry powder. The total lipids from the tissues were esstimated by vanilline reagent method as given by Barnes and Blackstock (1973) using Cholesterol as standard. All values are the averages of three repeats and are expressed as percentage of dry weight. Standard deviation and students 't' test of significance are calculated and expressed in respective tables.

Tissue processing

The removed wet tissue after 7,14 and 21 days was homogenate in blender with M/150 phosphate buffer at 1-4^{0c} and centrifuge.stir sediment with cold phosphate buffer and allowsstanding in the cold with shaking occasional then repeating the extraction once or twice and using the supernatant for assay of catalase.

Biochemical analyses

Catalase activity (CAT) was measured following decrease of absorbance at 240 nm due to H_2O_2 consumption (Luck H,1974).

OBSERVATION AND RESULTS

The lipid contents was estimated from the hepatopancreas and gonad of experimental model the freshwater snail's, *Bellamya bengalensis* from control and experimental groups are presented in respective tables. Thus from the above investigation the results obtained indicates that there was severe alteration in the lipid metabolism in the fresh water snail's,*Bellamya bengalensis* after exposure to $HgCl_2$. In the present study, significant decrease in the lipid content was observed in the hepatopancreas and gonad of experimental snail's as compared to those of the control snail's.The lipid content in hepatopancreas and gonads in control snails is 4.080 ± 0.0008 to 3.840 ± 0.0007 and 1.320 ± 0.0005 to1.240 ± 0.007 while in experimental snails lipid content in hepatopancreasa and gonads is 3.760 ± 0.0014 to 3.332 ± 0.0016 and 0.960 ± 0.0007 to 0.720 ± 0.0070 respectively.

Table A: Variation of Lipid Content In Hepatopancreas And Gonads Of *Bellamya Bengalensis* After Chronic Mercury Intoxication.

Treatment	**Sr No.**	**Body Tissue**	**The lipid content (%) ± S.D.**		
			7 Days	**14 Days**	**21 Days**
(A) Control	I	H	4.080 ± 0.0008	3.920± 0.001	3.840 ± 0.0007
	II	G	1.320 ± 0.0005	1.280± 0.005	1.240 ± 0.007
(B) 0.109 ppm $HgCl_2$	I	H	3.760 ± 0.0014*** -27.659 •	3.480 ± 0.0010*** - 11.458•	3.332 ± 0.0016*** - 15.246•
	II	G	0.960 ± 0.0007*** - 37.500•	0.840 ± 0.0004*** - 52.380•	0.720 ± 0.0070*** - 72.222•

H.- Hepatopancreas, G - Gonads, • - Compared with respective A

*** - P < 0.005 , ** - P < 0.01, *** - P < 0.001**

CAT activity is significant increased with increasing exposure period of heavy metal salts, $HgCl_2$. CAT activity in hepatopancreas and gonads of control group of snail is 38.87 to 38.97 and 16.37 to 17.84 while in experimental group of snails CAT activity is 42.43 to 49.47 and 18.36 to 21.24 respectively. Mean catalase activity was highest in snails from treatments exposed to the heavy metal concentrations as compared to control group of snails.

Table B: Variation of Catalase Activities In Hepatopancreas and Gonads of Bellamya Bengalensis After Mercury Intoxication.

Treatment	Sr No.	Body Tissue	Catalase activity (U/mg.protein/ min.)		
			7 Days	14Days	21 Days
(A) Control	I	H	38.87	38.65	38.97
	II	G	16.37	16.97	17.84
(B)0.109ppm $HgCl_2$	I	H	42.43 (9.158 %)	45.85 (918.628%)	49.47 (26.943%)
	II	G	18.36 (12.156%)	19.37 (14,142%)	21.24 (19.058%)

D.G – Digestive gland,*- % Variation is 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 . Patil et al, (2011) reported a decrease in lipid content in the foot of a freshwater snail, *Indoplanorbis exustus* exposed to heavy metals. 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.*

Antioxidant systems are efficient protective mechanisms against reactive oxygen species (ROS) produced by endogenous metabolismor by the biotransformation of xenobiotic.The activity of these systems may be induced or inhibited after chemical stress. Aninduction can be considered an adaptation, allowing the biological systems to partially or totally overcome stress resulting fromexposure to an unsafe environment. In present study that exposure of freshwater gastropods snails to ($LC_{50/10}$ concentration of 96 hours) 0.109 ppm $HgCl_2$, only influence the oxidative stress on the antioxidant enzymes (CAT) in hepatopancreas and gonads of *B.bengalensis* A wide variety of stressors encountered in aquatic environments is able to alter the levels of catalase activity (Mena et al., 2014)

In bivalves increased CAT activity is associated with tissue burden accompanied by heavy metals (Cheung et al,2004) .CAT is the primary scavengers of H2O2 in the cell. Increased

CAT activity presently seen exposed to trace metals in *P.viridis*, further indicate that pollution stress has elevated the formation rate of H_2O_2. These results are comparable to those found in other studies, where CAT activity increases at sites contaminated with metals (Lima et al,2007). Heavy metals could induce increased CAT activity in bivalves (Verlecar et al,2008). Variations of CAT activity are consistent with other findings, showing decreased and increased activities exposed to cadmium, copper, lead and zinc (Regoli F,1988). Trace metals seem to influence directly on the antioxidant defence enzyme due to biological factors which regulate fluctuations of defences (Bebianno et al,2005). CAT was more active in the digestive gland, confirming the expression characteristics of this enzyme (Power and Sheehan, 1996).

CONCLUSION

In the present study, significant differences have been recorded in the lipid content and activities of antioxidant enzyme (CAT) in the freshwater gastropod snails, *B.bengalensis*, after exposed to mercury as compared with the control snails.The lipid content in hepatopancreas and gonads was decreased increase of exposure period of $HgCl_2$ and CAT activities in hepatopancreas and gonads was increase .This indicates that there is an increased level of oxidative stress due to the presence of heavy metals, and that an imbalance is generated between pro-oxidants and antioxidants. The study made in *B.bengalensis* can help to understand mechanism through which metals exert their toxicity in organisms.

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