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ANTIOXIDANT DEFENCE ACTIVITY IN HEPATOPANCREAS OF THE FRESHWATER MUSSELS, *LAMELLIDENS CORRIANUS* AFTER ZINC EXPOSURES

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ABSTRACT

In present study to investigate the antioxidant defence activity (Catalase activity) in hepatopancreas of the freshwater mussels, *Lamellidens corrianus* after zinc exposures. The mussels were divided into two groups, the group A kept as control and group B mussels expose in chronic concentration of Zinc sulphate (0.320 ppm) upto 18 days. Catalase activities in hepatopancreas of control and experimental mussels from A and B groups were estimated after 6,12 and 18 days. During experimentation mussels feed on freshwater algae. CAT showed a significant increased activity with increasing exposure period of heavy metal, $ZnSO_4$. Catalase activity (CAT) was measured following the decrease of absorbance at 240 nm due to H_2O_2 consumption (Luck H.1974).

KEYWORDS: *Catalase activity, zinc, Lamellidens corrianus.*

INTRODUCTION

All organisms have their own cellular antioxidative defence system (ADS), with both enzymatic as well as non-enzymatic components. An enzymatic pathway consists of superoxide dismutase - SOD, catalase - CAT and glutathione peroxidase - GSH-Px. ADS may be induced after exposure to pollutants, this response reflecting an adaptation of the species to their environment. This system may also be inhibited, which may lead to antioxidant-mediated toxicities (Winston and Di Giulio, 1991; Doyotte et al., 1997; Cossu et al., 1997). Mining and smelting operations and discharge of most of the industrial wastes into the aquatic environment lead to the accumulation of inorganic pollutants like mercury, cadmium, nickel, copper, lead, chromium, iron and zinc in dissolved and suspended forms (Chukwu and Ugbeva, 2003).

Zinc is an element commonly found in the Earth's crust. It is released to the environment from both natural and anthropogenic sources; however, releases from anthropogenic sources are greater than those from natural sources. The primary anthropogenic sources of zinc in the environment (air, water, soil) are related to mining and metallurgic operations involving zinc and use of commercial products containing zinc. Zinc is capable of forming complexes with a variety of organic and inorganic groups (ligands). SOD is the antioxidant enzyme that catalysed the dismutation of the highly reactive superoxide anion to O2 and to the less reactive species H2O2. Peroxide can be destroyed by CAT or GPx reactions (Vinodini and narayanan,2008). Among the biomarker of stress, the primary key events in oxidative damage are lipid peroxidation (MDA) (powell et al, 1996;Wilson et al,2000,Ford ,1985 and charissou et al,2004).

Catalase (CAT)which is the first line of defense against oxidative stress (Smaoui-Damak W, Hamza Chaffai A, 2003). Such trends in CAT activity can be found in mussels at polluted sites according to the levels and duration of pollutant exposure (Tsangaris et al., 2010).The aim of our study is to investigate antioxidant defence activity (Catalase activity) in hepatopancreas of the freshwater mussels, *Lamellidens corrianus* after zinc exposures.

MATERIALS AND METHODS

The mussels, *Lamellidens corrianus* were acclimatized to laboratory condition for 2-3 days and healthy active snails of approximately medium size and weight were chosen. These mussels were divided into two groups, such as group A and B. The mussels of group A was maintained as control. The mussels from group B was exposed to chronic concentration ($LC_{50/10}$value of 96 hr.) of heavy metal, Zinc chloride (0.320 ppm) up to 18 days. The experimental mussels from both groups were dissected after 6, 12 and 18 days and hepatopancreas were removed.

Tissue processing

The removed wet tissue was homogenate in blender with M/150 phosphate buffer at 1-4^{0}c and centrifuge.stir sediment with cold phosphate buffer and allows standing 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

Antioxidant defense activity (Catalase activity) in hepatopancreas of the freshwater mussels, *Lamellidens corrianus* after zinc exposures were increased significantly with increasing exposure period of zinc chloride.Increase in activity was proportional to days of exposure as well, with highest CAT activity in hepatopancreas on the 18th day. (Table A) Mean catalase activity was highest in mussels from treatments exposed to the heavy metal concentrations as compared to control group of mussels.CAT activity in hepatopancreas of mussels after 6,12 and 18 days of exposure to $ZnCl_2$ 41.33, 40.13 and 41.10 in control while 45.61,48.64 and 49.00 in experimental mussels respectively. The antioxidant defense activity is increased due to zinc chloride stress.

Antioxidant Defence Activity (Catalase Activity) In Hepatopancreas Of The Freshwater Mussels, *Lamellidens Corrianus* After Zinc Exposure.

Treatment	Body Tissue	Catalase activity(U/mg.protein)		
		6 Days	12 Days	18 Days
(A) Control	H	41.33± 0.014	40.13± 0.046	41.10± 0.041
(B)0.320ppm $ZnCl_2$	H	45.61± 0.043(10.355%)	48.64± 0.051(21.206%)	49.00± 0.037(19.221%)

H- Hepatopancreas, • - In braket % variation compared with respective A.

DISCUSSION

It is obvious from the present study that exposure of freshwater mussels, Lamellidens corrianus to ($LC_{50/10}$ concentration of 96 hours) zincs, only influence the oxidative stress on the antioxidant defence enzymes (CAT) in hepatopancreas. Catalase, a well-established biomarker, is an essential enzyme of antioxidant defence system, which is present virtually in all aerobic organisms. This enzyme catalyzes the decomposition of hydrogen peroxide (H_2O_2) into water and oxygen. A wide variety of stressors encountered in aquatic environments is able to alter the levels of catalase activity (Chandran et al., 2005; Mena et al., 2014)

In this study, the tested heavy metal salt, exhibited various levels of catalase activity against fresh water mussels, *Lamellidens corrianus*, Zn was found to be most effective against this mussels.The CAT activity in hepatopancreas is increasing significantly increasing exposure period as compared to control groups of mussels. The antioxidant CAT is an extremely important component of intracellular and antioxidant defenses of organisms (Jamil , 2001). At high H_2O_2 concentrations, organic peroxides are metabolized by Catalase. Geret *et al.,* (2002) observed Hg to have a significant inhibitory effect on the activity of CAT and glutathione peroxidase for the first day at concentration 25 µg/L. In the present study slightly reduced CAT and GPx activities were noted on the first day for lower mercury concentrations.

CONCLUSION

In the present study, significant differences have been recorded in the activities of antioxidant enzyme (CAT) in the freshwater gastropod mussels, *Lamellidens corrianus* exposed to zinc as compared with the control mussels. 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. Zn exposed mussels are likely to adapt themselves even to the highest concentration.

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