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***Research Article** (Open Access)*

# PROTEIN CHANGES IN TISSUES OF GILLS AND HEPATOPANCREAS OF BIVALVE, *PARRESIYA CYLINDRICA* DUE TO HEAVY METALS INTOXICATION

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**ABSTRACT**
Freshwater bivalves, *Parresiya cylinrica* were exposed to lethal doses of heavy metals for 96 hrs for metal accumulation. Amongst the different body parts in control group of animals the protein (mg/100 mg) was more in hepatopancreas followed by gills , During chronic exposure of 9 days with mercury chloride,arsenic trioxide and lead nitrate the decrease in protein content during 3,6 and 9 days from 43.13 to 29.45, 48.45 to 41.26 and 51.32 to43.25 respectively in hepatopancreas . The depletion in gills during 32.34 to 26.46 , 36.35 to 30.98 and32.34 to 26.46 in lead nitrate, arsenic trioxide and mercury chloride respectively. The average protein content of the bivalve *Parresiya cylinrica* was decreased after acute exposures of lead nitrate, arsenic trioxide and mercury chloride The most pronounced change was observed in mercuric chloride treated bivalves as copared to lead nitrate and arsenic trioxide.

***Keywords:*** *Bivalve, Parresiya cylinrica, Heavy Metals, Protein*

## INTRODUCTION

The quqlity of water is contamination day by day due to human activitiesis the major cause an increase of a substance in fresh water, sediments and organisms above the natural habitat and ground level for that area and for those organisms (Clark, 2001). ncreases use of metal based fertilizers and micronutrient in agricultural revolution could result in the continued rises in the concentration of metal pollutants in fresh water due to the water run-off (Adefemi *et al.*, 2008; Prasath and Arivoli, 2000 ).

Metallic mercury is used in oral thermometers, barometers, sphygmomanometers (devices used to test blood pressure), wall thermostats for heating and cooling, fluorescent light bulbs/tubes, some batteries, electric light switches, some indoor gas meter regulator. It is one of most dangerous non essential heavy metal. It exists in environment in varieties of forms with different toxicity (Clarkson and Magos, 2006).Arsenic (As) is considered a toxic element, widely distributed in the environment. It is mobilized by water and it can be released from natural sources by weathering of rocks, wind-blown dirt and volcanic activity, or from human activities such as mining, industries, and application of fertilizers and pesticides, followed by atmospheric deposition (Chen *et al.*, 2009).

The metal contaminants are mixed in the aquatic system through smelting process, effluents, sewage and leaching of garbage which cause severe harm to the aquatic system (Pandey and Madhuri, 2014).The aquatic systems deposition of contaminants, including heavy metals, can lead to elevated sediment concentrations that cause potential toxicity of the aquatic biota (Yang and Rose, 2003; Heyvart *et al*., 2000; Maurya and Malik, 2016).

Proteins are long chains of amino acids forming three dimensional structures. Proteins do play both structural and functional role of cellular level. Being an integral part of the cell membrane, intracellular and extra cellular passages are linked through it.The studies on biochemical response of a bivalve to stressors have led to the better understanding as to how bivalve scope with the stressor at the biochemical level (Suryawanshi *et al.,* 2014).This study was carried out to investigate the effect of heavy metal salts

Hg, As and Pb on protein content in tissues of gills and hepatopancreas in an experimental model, the fresh water bivalve, *Parresiya cylinrica.*

## MATERIALS AND METHODS

Healthy active bivalves of approximately same size and weight were chosen. The acclimatized active bivalve were divided into four groups, such as group A, B, C and D. The group A of acclimatized bivalve was kept as control set. The group B of acclimatized bivalve was exposed to chronic concentrations ( $LC_{50}$ value of 96 hr/10) of heavy metal salt $HgCl_2$ (0.128 ppm). The group C of acclimatized bivalve was exposed to chronic concentrations ( $LC_{50}$ value of 96 hr/10) of heavy metal salt $As_2O_3$ (0.201 ppm). The group D of acclimatized bivalve was exposed to chronic concentrations ($LC_{50}$ value of 96 hr/10) of heavy metal salt $PbNo_3$ (4.116 ppm). as chronic doses up to 9 days. After 3, 6 and 9 days exposure the control and experimental the bivalves were sacrificed to their different body parts gill and hepatopancreas were separated. The tissues were weighed and they were then kept in hot air oven at $80^{0C}$ till constant weights were obtained. The dried product was ground to obtain fine powder. From the replicates of three samples the total protein was analyzed by using Lowry's method (Lowry *et al.* 1951) using bovine serum albumin as standard from each powder. The amount of protein was calculated by regression equation and expressed in terms mg/100mg dry powder.

## RESULTS

*Parresiya cylindrica* after exposure to LC50/10 concentration of mercuric chloride (0.128ppm). arsenic trioxide(0.201ppm) and lead nitrate (4.116ppm) up to 9 days,the protein content in tissues of hepatopancreas and gills have been summarised in table.

It was observed that after chronic treatment of mercuric chlorid,arsenic trioxide and lead nitrate upto 9 days to, *Parresiya cylindrica* the protein content in hepatopancreas and gills were decreased significantly as compared to control bivalve.The protein content in tissues of hepatopancreas is 43.13 to 29.45, 48.45 to 41.26 and 51.32 to43.25 respectively. The protein content in tissues of gills is 32.34 to 26.46 , 36.35 to 30.98 and32.34 to 26.46 respectively.The proein conent is significantly decrease inhepatopancreas and gills of bivalves those exposed to $HgCl_2$ as copared to $PbNO_3$. The present study indicates that mercuric chloride is more toxic as compared to lead nitrate

**Table: The protein content in tissues of gills and hepatopancreas of fresh water bivalves,** *Parresiya cylindrica* **after chronic exposure to heavy metal salt, $HgCl_2$ ,$As_2O_3$ and $PbNo_3$ .**

| Treatment | Tissues | The protein content (%) ± S.D. | | |
|---|---|---|---|---|
| | | 3 Days | 6 Days | 9 Days |
| (A) Control | G | 41.42 ± 0.531 | 40.12 ± 0.780 | 39.44 ± 0.501 |
| | H | 54.11 ± 0.372 | 52.09 ± 0.461 | 51.34 ± 0.536 |
| (B) $HgCl_2$ (0.128 ppm) | G | 32.34 ± 0.441 ( -21.921 ) | 28.52 ± 0.560 ( -28.913 ) | 26.46 ± 0.771 ( -32.910 ) |
| | H | 43.15 ± 0.334 ( -20.255 ) | 35.45 ± 0.557 ( -31.944 ) | 29.45 ± 0.289 ( -42.637 ) |
| (C) $As_2O_3$ (0.201 ppm) | G | 36.35 ± 0.253 ( -12.240 ) | 33.92 ± 0.244 ( -15.153 ) | 30.98 ± 0.694 ( -21.450 ) |
| | H | 48.45 ± 0.228 ( -10.460 ) | 44.55 ± 0.330 ( -14.474 ) | 41.26 ± 0.764 ( -19.633 ) |
| (D) $PbNo_3$ (4.116 ppm) | G | 39.14 ± 0. 343 ( -5.504 ) | 36.62 ± 0.280 ( -8.723 ) | 33.43 ± 0.551 ( -15.238 ) |
| | H | 51.32 ± 0.298 ( -5.156 ) | 48.59 ± 0.431 ( -6.719 ) | 43.25 ± 0.524 ( -15.757 ) |

*Figure in bracket indicates percent variation in the protein content with respective control*
*G – gills and H - hepatopancreas*

## DISCUSSION

Heavy metals affect the metabolism of the freshwater bivalve, *Parresiya cylindrica.* Alterations in metabolic processes following exposure to heavy metal stress have always been used as indicator of stress. But there is a vast difference in the pattern of metal induced physiological alterations from metal to metal & animal to animal.After chronic treatment, the protein content from tissues of hepatopancreas and gills were decreased. In the present study, the protein was more in hepatopancreas (54.11 to 51.34) followed by gills (41.42 to 39.44) in control bivalves. Further, the protein was decreased in mercuric chloride,arsenic trioxide and lead nitrate when it was compared with control animals.The protein content during 3,6 and 9 days from 43.13 to 29.45, 48.45 to 41.26 and 51.32 to43.25 respectively in hepatopancreas . The depletion in gills during 32.34 to 26.46 , 36.35 to 30.98 and32.34 to 26.46 in lead nitrate, arsenic trioxide and mercury chloride respectively.The studies on biochemical response of a bivalve to stressors have led to the better understanding as to how bivalve scope with the stressor at the biochemical level.

The results obtained in the present study are supported by several investigators who reported decrease in protein of various organisms under influence of different metals. Andhale and Zambare (2011), studied the nickel induced biochemical alterations in freshwater bivalve, *Lammellidens marginalis* and reported that the protein contents were decreased in treated animals than the control. In the present study ascorbic acid recovered the total protein content and it play important role as detoxication of nickel which recovered the protein content.

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 *et al.,* (1981). Nagabhushanm and Kulkarni (1979) studied variation in protein metablism in *Barytelephusa cunicularis*. Mahajan and Zambare (2001) showed that after acute and chronic exposure to HgCl2, protein contents in different tissues of freshwater bivalve *Corbicula striatella* were found that highly depleted and maximum protein depletion was found in foot.Protein content decreased on exposure to chromium in all the three tissues like gill followed by adductor muscle and mantle of freshwater bivalve *L. marginalis* (Satyaparameshwar *et al*., 2006). It is in the level of tissue protein may also be due to excessive proteolysis to overcome the metabolic stress, as deposited protein in the cytoplasm can easily be used to replace the loss of proteins that occur during physiological stress (Patil, 2011). The decreasing of protein, vitamins after acute exposure 24hr & due to the consumption of Zn and Pb for using energy generation which used for defense mechanisms against heavy metals and formation of lipoprotein which involve in repair of damaged cells and tissue organelles (Almamoori *et al*., 2014).

In present study, in the bivalve, *Parresiya cylindrica*, the protein content in hepatopancreas and gills is significantly decrease.Th heavy metal mercuric chloride is highly toxic as compared to arsenic trioxide and lead nitrate

## CONCLUSION

In conclusion the current study suggests that heavy metals creates physiological stress on bivalves ,due to this resons bivalves utilized more amount of proteins for generation of energy and thus protein conents in hepatopancreas and gills is decrease significantly.

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