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BIOACCUMULATION AND DEPURATION STUDIES OF LEAD NITRATE ON ECONOMICALLY IMPORTANT SHRIMP PENAEOUS MONODON.

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INTRODUCTION: Current study of Bioaccumulation and Depuration of Lead nitrate on marine shrimp Penaeous monodon shows Lead nitrate accumulation more in hepatopancreas compared to muscle and the depuration level of heavy metal Lead nitrate was more through hepatopancreas comparing to muscle tissues, when comparing to the control animals.This shows the major role of Hepatopacreas in Bioaccumulation and depuration in this study on muscle tissues and hepatopancreas tissues

Key Words. :Lead nitrate, Bioaccumulation, Depuration.

Lead (Pb) is one of the oldest metals known to man. It is found naturally on the earths crust (about 20 mg/kg) in the form of Sulfide Galena (PbS). Several lines of evidence implicate high-level lead exposure as a cause of many of pathological conditions such as renal insufficiency, gout and hypertension (Wedeen *et al.*, 1979; Batuman, 1993; Ding *et al.*, 2001). Lead exposure and accumulation in children are especially serious in that lead is incorporated into the matrix of rapidly growing bone (Committee on the Environmental Health, 2005). Advancement in technology as well as increase in population have led to environmental concerns relating from indiscriminate dumping of refuse and discharge of industrial effluents, petroleum waste water and crude oil spills replete with most common heavy metals in our environment (Wills, 2000). About 43 million tons of lead produced in a year. Its toxic properties has been used in piping, building matrials, soldering, paints, ammunition and casting. More recently Pb has been used mainly in storage batteries (35%), in gasoline as tetraethyl lead (5% but is continuously decreasing), cable covering (10%), solders (10%) and chemicals (15%) (Demayo *et al.*, 1984). Lead nitrate is crystalline, poisonous salt, soluble in water, and is used in calico painting. Pb is ubiquitous in aquatic ecosystem. Lead as a pollutant has assumed importance because of its high toxicity to humans, especially causes brain retardation in children. Environmental exposure to low level of Pb has been shown to affect a wide range of metabolic disorders and neuropsychological deficit particularly in children (Nriagu and Pacyna, 1988). Combustion of oil and gasoline alone accounts for 50% of all anthropogenic emissions. Now government plans to cut the use of tetraethyl Pb additions to gasoline, by substituting unleaded petrol, but 10% of lead is used as additive. In India, Pb level has been reduced from 0.56 g/l to 0.013 g/l (in 2000). Lead gets absorbed into our system via skin and organic lead compound (tetraethyl lead) enters faster comparing to inorganic lead (lead nitrate, lead acetate and lead oxides (Current Status of Lead in India, 2001).

MATERIALS AND METHODS

Collection of specimen

The marine shrimp *Penaeus monodon* size of around 10 cms length and weight around 25 grams were collected from Velankanni Private Culture Pond and transported to Thanjavur using a private car to Lab condition using oxygen cylinder and acclimatized for lab conditions for ten days dead and diseased animals were removed. The shrimps were fed with prawn feed. The same water from the pond transported to the laboratory at A.V.V.M. Sri Pushpam College, Poondi, Thanjavur district.

BIOACCUMULATION

Accumulation test done for four days at acute level (25% of LC_{50} value) Lead nitrate dissolved in 25 Lit of water in 50 Lit glass tank. The water aerated through the period of study and 5 Shrimps were left in each glass tank. Bioaccumulation of Lead nitrate in Muscle and hepatopancreas were estimated after four days.

DEPURATION TEST

The depuration period of this Shrimp was carried out with 50 animals of each of same size exposed to sub lethal concentration i.e. 10 per cent of the LC_{50} values, Shrimps were transferred to metal-free water and allowed for leaching of accumulated metal from the body and 5 number of Shrimps were sacrificed periodically for the determination of the metal content in the respective tissues.

Similarly control animals were maintained for 21 days. Then after the prescribed period of 21 days, the Shrimps were sacrificed and the vital tissues were subjected to Heavy metal analysis.

The vital organs were dissected from the Shrimps. The major parts are 1. Muscle and 2. Liver(Hepatopancreas) were washed in double distilled water and preserved in 10 per cent formalin. The water present over the tissues were removed using filter paper and the tissues were weighed and acid digested with Perchloric acid and concentrated nitric acid in the ratio of 1:1 (V/V) (FAO, 1975). The final acid digested extract was analyzed for Lead using Atomic absorption spectrophotometer

RESULTS

Control animals:

The vital organ like muscle and hepatopancreas were studied and the lead nitrate was not found in the tissues and they are below the detectable limits lead nitrate treated tissues.

Experimental animals:

Bioaccumulation of *Penaeus monodon*

The table 1 presents bioaccumulation experiment of lead nitrate in various tissues of *Penaeus monodon* in acute toxicity studies (value in µg/g dry wt.). The muscle shows a minimal deposit of 124 µg/g for 48 hrs and 360 µg/g for 96 hrs. Hepatopancreas with 2335 µg/g for 48 hrs and 3280 µg/g for 96 hrs. Hepatopancreas accumulates more lead nitrate comparing muscle tissue (Table 1).

Table 1 :Bioaccumulation experiments of lead nitrate accumulation in various tissues of *Penaeus monodon* in acute toxicity studies dry wt.

Tissues	Control	48 hrs	96 hrs	(µg/g)
Muscle	Nd	124	360	(µg/g)
Hepatopancreas	Nd	2335	3280	(µg/g)

Nd : Not detected

Depuration of *Penaeus monodon*

The table 2 presents depuration experiment of metal elimination in various tissues of shrimp *Penaeus monodon* in acute toxicity studies (value in gm %). Depuration experiment of metal elimination in various tissues of shrimp *Penaeus monodon* in acute toxicity studies (value in µg/g dry wt.). The muscle is the least that depurates 190 µg/g at 48 hrs and 92 µg/g at 96 hrs. The hepatopancreas deputation 785 µg/g at 48 hrs and 236 µg/g at 96 hrs (Table 2).

Table 2: Depuration experiments of metal elimination in various tissues of *Penaeus monodon* in acute toxicity studies dry wt. for 48 and 96 hrs

Tissues subjected to test	48 hrs	96 hrs	(µg/g)
Muscle	190	92	(µg/g)
Hepatopancreas	785	236	(µg/g)

DISCUSSION

The high accumulation of lead in the liver which also noted in their findings, is related to the fact that liver plays a key role in accumulation and detoxification (Gbem *et al.*, 2001). The main routes of accumulation of metals by fish are through the gills, skin and food (Ni *et al.*, 2005). Trace metals such as copper (Cu), zinc (Zn), cadmium (Cd) and iron (Fe) were found to bioaccumulate in liver followed by gills and muscles in fish (Taylor *et al.*, 1985; Chan, 1995; Wong *et al.*, 1999; Ni *et al.*, 2005).

Similar observations found in the present bioaccumulation studies showing similar result of heavy metal accumulation comparing from the control shrimp *P. mondoon*. The lead nitrate in the marine Shrimp *P. monodon* shows higher state of lead nitrate accumulation in hepatopancreas comparing muscle tissues.

The concentrations of lead in these tissues declined on transfer of fish to lead-free water. The recovery of fish was faster for those placed in lower concentrations of lead than those that had been placed in higher concentrations. The effects of heavy metals such as lead on the environment is usually highlighted and addressed in respect to their effects on man (Olaifa, 2003).

The organisms tend to accumulate elements / metals whether they are essential or non-essential, until reaching a threshold concentration / level after which they have to eliminate or face the damages and the consequent difficulties; this has necessitated the concurrent development of a mechanism for the elimination of these elements by each of the various groups of organisms (Bryan, 1968; Cearley and Coleman, 1974).Similarly in shrimp *P. monodon* the level of accumulation and elimination are high in hepatopancreas.

Summary

The marine shrimp P.monodon Lead nitrate accumulates more in hepatopancreas compared to muscle and more metal elimination through hepatopancreas comparing to muscle tissues.

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