Cadmium induced alterations in certain aspects of protein metabolism of the freshwater mussel, *Lamellidens marginalis* (Lamarck) and freshwater fish, *Labeo rohita* (Hamilton)

M.VENKATA CHANDRUDU AND K. RADHAKRISHNAIAH

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SUMMARY

The levels of glutamine, ammonia and urea and the activities of alanine and aspertate aminotransferases (AlAT and AAT) and glutamate dehydrogenase (GDH) were estimated in the organs of mussel and fish exposed to acute concentration (7.0mg/l) of cadmium relative to their controls at day 1, 2 and 3. The AlAT and AAT activities decreased with an increase in GDH activity and glutamine levels in all the organs of the mussel and fish, greater in degree in fish than in mussel. The level of ammonia increased with a decrease in urea level in all the organs of mussel and fish. Eeither the increase or decrease in parameters was more in fish than in mussel and they were in the order day 1 < 2 > 3 in mussel and day 1 < 2 < 3 in fish over time of exposure. Among the organs, the degree in all the changes of all the parameters of protein metabolism were more or less insignificant and inconsistent but in general they were in the order ctenidium > mantle > hepatopancreas > foot in mussel and kidney > liver > gill > muscle in fish. In between the two animals, the degree of either the decrease or increase, as the case may be, in the parameters studied was more in the organs of fish and less in mussel. Further, the changes were progressive overtime of exposure in fish, but a slight recovery was observed at day 3 in mussel. The results indicated increased deamination, ammonia accumulation and suppression of urea synthesis in the organs of both the animal groups exposed to acute cadmium stress, with a greater in degree and progressive over time of exposure in fish.

See end of the article for authors' affiliations

Correspondence to :
K.RADHAKRISHNAIAH
Department of Zoology, Sri Krishnadevaraya University, ANANTPUR (A.P.) INDIA

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In recent years, high concentrations of heavy metals are entering the aquatic system due to the injudicious and unprogrammed discharge of industrial wastes, agricultural effluents and sewage waters and indirectly from aerial fallout, bioaccumulation of metals in the eutrophicated sections of Yamuna has been well reported by Sharma *et al.* (2000). The Ogba river which was once considered safe for drinking water was also contaminated by the heavy metals like Cu, Mn, Zn, Cd, Cr, Ni and Pb and the fishes in it with higher levels of metals bioaccumulated in their tissues reported unsafe for human consumption (Obasohan, 2007). More than permissible levels of heavy metals were reported in water and sediment, and plankton and fish tissues in lake Egirdir, Turkey (Yigit and Altindag, 2006). The physico-chemical properties of heavy metals in aquatic systems are the principal factors for their accumulation in animals. Chronic pollution of bottom sediments of water bodies leads to a decrease in the biodiversity of fauna and the development of specific metal tolerant communities (Davyd Kova *et al.*, 2005). Jain (2004) stated that heavy metals are causing greatest threat to the health of Indian aquatic ecosystems due to their toxicity and accumulation behaviour. Many effluents discharged into near by ponds and drains without any treatment contain highly toxic heavy metals (Mathur *et al.*, 2005).

Cadmium (Cd) is the second member of Group II B triad (Zn, Cd, Hg) in the periodic classification of elements. It has the atomic weight 112.4, atomic number 48, density 8.6, melting point 320.9^{0}C and boiling point 765^{0}C. It is a hexagonal crystalline, silver-white malleable metal with stable oxidation state +2. It has a medium class B character compared to zinc and mercury. This character imparts moderate covalency in bonds and high affinity for sulfhydryl groups leading to increased lipid solubility, bioaccumulation and toxicity. The chloride, sulphate and nitrates of cadmium are soluble compounds whereas carbonate and hydroxides are not. Cadmium is one of the most toxic and widespread heavy metals, and is a recognized carcinogen in mammals (Pruski and Dixon, 2002). There has been rapid and continuous increase in the worldwide production and use of cadmium since 1925. It is used in a number of industrial