

Bioaccumulation, Elimination, and Toxic Effect of Cadmium on Structure of Gills and Hepatopancreas of Freshwater Prawn *Macrobrachium sintangese* (De Man, 1898)

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Abstract The objectives of this study were to determine the acute toxicity of cadmium and to examine the bioaccumulation and elimination of cadmium in different tissues of the freshwater prawn *Macrobrachium sintangese*. It also evaluated the structural damage of gills and hepatopancreas of *M. sintangese* when administered to sublethal cadmium concentration and when exposed prawns were transferred to cadmium-free media. According to the mortality data, the 96 h LC₅₀ value of Cd to *M. sintangese* was 86 µg/L. The highest cadmium accumulation was observed in gills, followed by the hepatopancreas, and the abdominal muscle. After being transferred to cadmium-free media, the highest cadmium elimination was observed in abdominal muscle, followed by the gills and hepatopancreas. The gills of prawns exposed to cadmium exhibited a severe hyperplasia, vacuolization, and multiple necroses which

resulted to the swelling of lamellae. After transferring the cadmium-exposed prawns into the control media, the histopathological effects decreased. Severe alterations to the hepatopancreatic tissue were observed in prawns exposed to cadmium. The tubular epithelial cells were heavily vacuolated and even ruptured. The number of large vacuoles and R cells appeared in the tubular epithelial cells of the hepatopancreas. After transferring to the control media, the histological alterations of the hepatopancreas decreased. The tubular epithelial cells began to rearrange to the normal structure. The number of R cells and B cells were noted in the epithelial cells. The thickness of tubular epithelial cells was comparable to the controls. Due to the sensitivity of *M. sintangese* to cadmium, therefore this species potentially can be used as a test organism in toxicity assays.

Keywords Bioaccumulation · Elimination · Cadmium · Gills · Hepatopancreas · *Macrobrachium sintangese*

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1 Introduction

The evaluation of acute lethal toxicity in aquatic animals represents a prior step for studying sublethal effects in the species under study. The median lethal concentration (LC₅₀) is one of the parameters more commonly used to refer to the acute lethal toxicity of pollutants. This parameter is often estimated in the more sensitive species and/or stage of a particular community and is a potential tool to establish safe