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RESEARCH ARTICLE

HISTOPATHOLOGY OF KIDNEY OF THE FRESHWATER FISH *Mystus vittatus* EXPOSED TO CADMIUM

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ABSTRACT

Mystus vittatus was exposed (10% sublethal concentration of 96 hr LC_{50}) for a period of 10, 20 and 30 days under laboratory conditions. The kidney of the treated fishes were examined under microscope and noticed significant changes such as enlargement renal tubules hyperplasia, vaculation of the epithelial cells of renal tubules, necrosis and shrinkage of glomeruli. Results suggests that a comparatively low concentration cadmium is enough to elicit pathological changes in *Mystus vittatus*.

INTRODUCTION

Industrialization, intensification of agriculture and rapid growth of human population have led to the increased discharge of pollutants which are harmful to the above biotopes. Four principal categories of pollutants which jeopardize the marine environmental resources are viz., petroleum hydrocarbons, pesticides and heavy metals. Among these, heavy metals are most dangerous because of their stability in the biological system. Metallic contamination in a stream may constitute a danger to public health if the water is to be used subsequently for drinking and other purposes. Increasing concern has been voiced in recent years on the effects of the different heavy metals on the freshwater ecosystems by surface run of either from rain or other sources Cadmium (Cd) is one of the most toxic heavy metals (Jones, 1964; Hellwell, 1989). It tends to accumulate in fish tissues showing particular affinity to kidney (Bentley, 1991; Kock *et al.*, 1996; Dallinger *et al.*, 1997) and causes various physiological disturbances (Jezierska and Witeska, 2001). The presence of Cd in natural waters is largely due to use of chemical fertilizers in agriculture. Super phosphate is an important fertilizer used at the time of plantation of paddy seedlings. It was estimated to contain 3 mg Cd in 1 kg of super phosphate (Pillai, 1985). The present communication records the renal lesions induced by sublethal exposure of Cd in a freshwater fish *Mystus vittatus*.

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MATERIALS AND METHODS

Fish *Mystus vittatus* weighing approximately 10 g were collected from ponds in around Thanjavur. They were maintained in the laboratory for 15 days in large cement tanks of 250 L capacity. The water was renewed every 24 hrs. During the period of experiment the fishes were not feed. Stock solution of cadmium was prepared by diluting cadmium sulphate and the toxicity tests were conducted following the methods of Finney (1964). Based on the acute toxicity studies the LC_{50} value for the test fish was found to be 2.5 mg/l. For histological studies *Mystus vittatus* were reared in sublethal concentration (10% of 96 hr LC_{50}) for a period of 10, 20 and 30 days.For histological studies the kidney was surgically removed and fixed in Bouin's solution for about 24 hrs. After tissues were washed thoroughly in running tap water dehydrated in ascending series of alcohol, cleared in xylene and embedded in paraffin wax at 6°C. Sections were cut at 6µ and stained with haematoxylin and eosin and mounted in DPX.

RESULTS AND DISCUSSION

Kidney of control fish had a normal size and structure of renal tubules, glomerulus and epithelial cells (Fig.1). The histological abnormalities in kidney of *Mystus vittatus* were time dependent. The kidney of fish treated with Cd in 10 days exposure enlargement of renal tubules and hyperplasia were observed (Fig.2). In 20 days treated fish, vacuolation of epithelial cells of renal tubules and karyolysis were noticed (Fig.3).

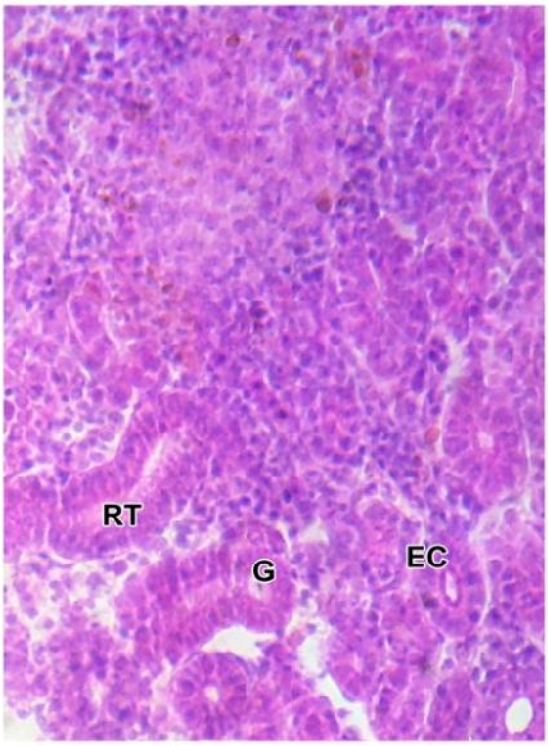

Fig. 1. Control kidney

G - Glomeruli, RT - Renal tubules

EC - Epithelial Cells

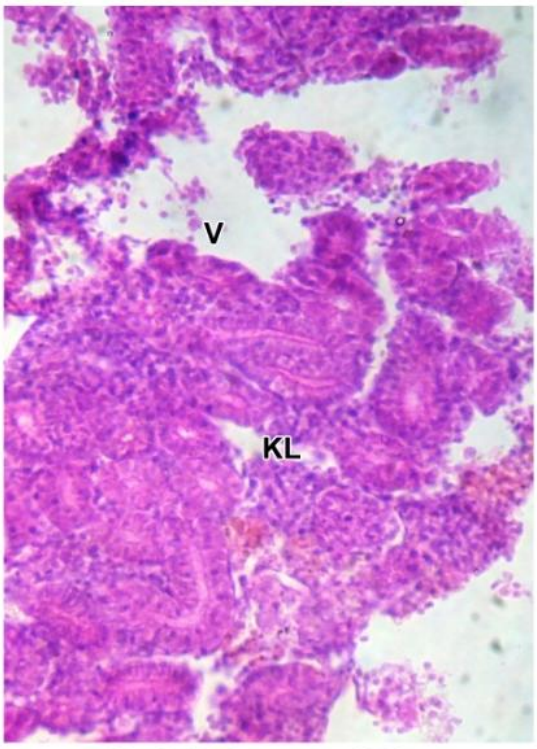

Fig. 2. 10 days treated kidney

KL - Karyolysis, V-Vacuolization

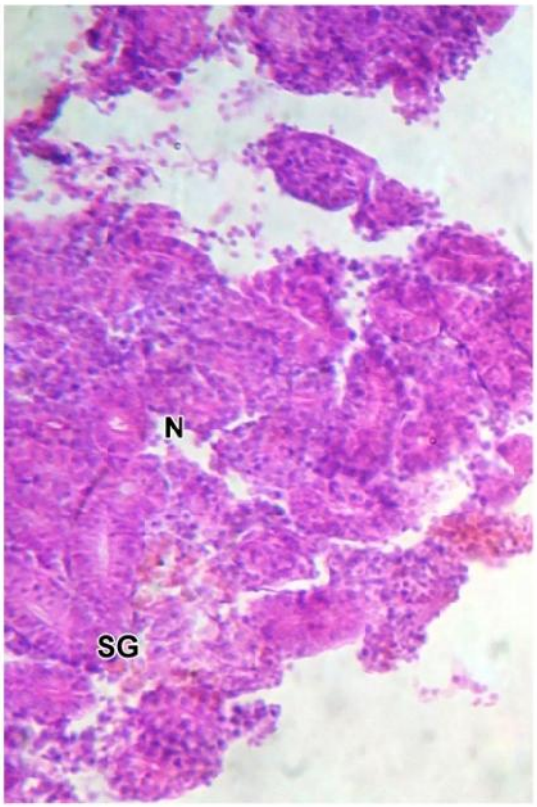

Fig.3. 20 days treated kidney

N - Necrois

SG - Shrinkage of glomeruli

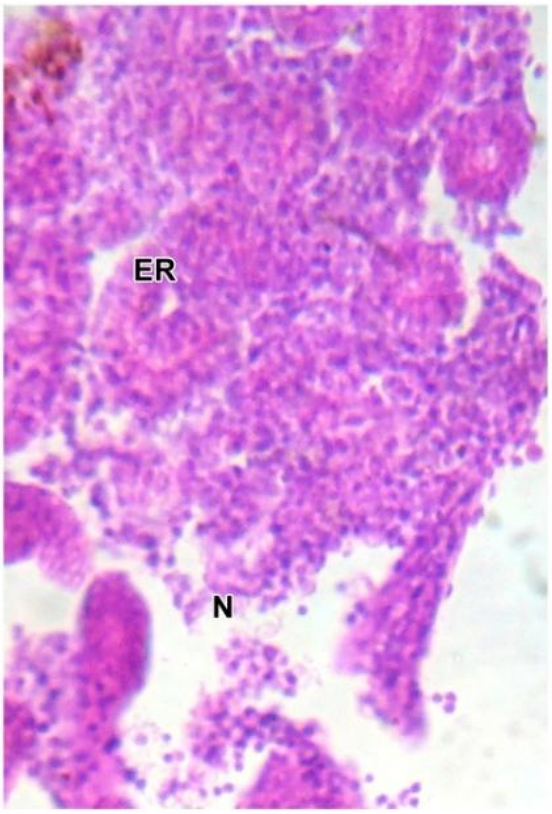

Fig.4. 30 days treated kidney

N - Necrois

ER - Enlargement of renal tubule

In fish treated upto 30 days the changes observed in the kidney were marked necrosis and shrinkage in glomeruli (Fig.4). Kidney of fishes receives much the largest proportion of post branchial blood and therefore renal lesions might be expected to be good indicators of environmental pollution (Juan *et al*., 2003) Pandey *et al.* (1997) reported cytolysis of epithelial cells of renal tubules, hypertrophy and necrosis of renal cells of the kidney of *Liza parsia* on exposure to lead. Tilak *et al.* (2005) reported the histopathological changes in kidney lead to cloudy swelling in renal tubules, severe necrosis and cellular hypertrophy in *Cirrhinus mrigala* acutely exposed to chlorpyrifos. The deformation of renal tubules was observed by Athikesavan *et al. (*2006) on *Hypophthalmichthys molitrix* chronically exposed to nickel. Thus even a low sublethal concentration of cadmium may result in severe histological disturbances in fishes.

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