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ORIGINAL RESEARCH ARTICLE

Changes In Protein Content In The Muscle Of *Mystus cavasius* (Ham) Exposed Electroplating Industrial Effluent Chromium

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ABSTRACT

Protein content in the muscle of *Mystus cavasius* (Ham) exposed to 1/3 of sublethal concentration of electroplating industrial effluent chromium (0.25%) for period of 30 days has been studied. After 24, 48, 72 hrs and 15 days of exposure the muscle showed significant depletion from -9.77%, -20.45%, -26.14% and -31.82% over the control.

Key words: Electroplating industry effluent, chromium, protein, *Mystus cavasius*, muscle

INTRODUCTION

In India chromium is widely used in all electroplating industries. Potassium dichromate is an oxidizing agent in chrome tanning industries. Vast quantities of effluent containing chromium are dumped in inland water bodies. The chromium which is used in chrome tanneries is potential pollutant to Indian freshwater bodies for fish culture and public health. Natural water receives Cr from anthropogenic sources such as industrial effluent derived from the production of corrosion inhibitor and pigments (Galvin 1996), which then become a pollutant of aquatic ecosystem and thus harmful to aquatic organisms (Srivastava and Singh 1981). The toxicity of Cr is affected by species, body sizes and life stage of the organisms as well as the pH of the water and to a lesser extent, by harness, salinity and temperature (Holdway 1988).

The protein content in the tissues of animals plays a role in the metabolism of animals (Palanivelu *et al* 2005). Morthy and Priyamvada (1982) stated that the protein content of the cell may be considered as an important tool for evaluation of physiological standards. The soluble protein fraction represents the activity level of enzymes in general. The structural protein fraction forms the structural moiety of a cell (Lehninger 1978). Begam and Vijayaraghavan (1996) observed protein depletion in the fish indicates the physiological strategy in order to meet the energy demand and to adapt itself to the changed metabolic system which may lead to the stimulation of degradative processes like proteolysis and utilization of degraded products for increased energy metabolism. In general, organophosphorus and organochlorine pesticides are known to depress blood protein in fishes (Grant and Mehrle 1973; Mukhopadhyay and Dehadrai 1980). Depletion of tissue protein in fishes exposed to various pesticides toxicant has been reported by many workers (Eisler and Edmunds 1996; Mehrle *et al* 1971 and Kabar *et al* 1978; Mukhopadhy and Dehadrai 1980). Further it has been reported that acute or chronic treatment of pesticide cause biochemical alterations in the organs involved in detoxification mechanisms (Dishit *et al* 1975; Sastry and Sharma 1979; Avan Maruthi
et al 2000; Shobana Rani *et al* 2000 and Prabhakar *et al* 2002). The aim of present study has been to get information about disturbance in protein metabolism due to electroplating industrial effluent chromium exposed air-breathing cat fish *Mystus cavasius*.

MATERIALS AND METHODS

Healthy adult fish *Mystus cavasius* (14 - 22 gm weight and 12 - 18 cm length) were and acclimated to the laboratory conditions with softened tap water under the following conditions: Ca, 0.725 mm; Mg, 0.135 mm; pH 7.1 ± 0.4; D.O, 7.4 ± 0.2 mg/ l. Water was checked daily for NH_3,

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nitrite, and nitrate and replaced every 2 days for half of the volume. Water was filtered with a trickling filter and biological kits were used for NH_3, nitrite and nitrate measurements to ensure that levels never exceeded 0.1, 1 and 20mg l^{-1}, respectively. The percentage survival of *M.cavasius* at various concentrations of waste water was determined by adopting the procedure laid down by Doudoroff and Katz (1953) for industrial waste waters. The test medium was changed daily (Sprague, 1971) to maintain the constant toxic concentration. The LC_{50} value was obtained by Finney (1971). The 1/3 of sublethal concentration of chromium (0.25%) was used to experimental fishes for 24, 48, 72 hours and 15 days. At these concentrations, the fishes survived indefinitely without any ill effect. The Protein content estimated by Lowry *et al.,* (1951) and statistical significance of difference between control and treated groups of different exposure period were tested by using't' test (Zar 1984).

RESULT AND DISCUSSION

Alteration in physiological and biochemical parameters of toxicant treated fish has recently emerged as an important tool for the water quality assessment in pathological studies of fish in the field of environmental toxicology (Racicot *et al* 1975; Wieser and Hinterleitner 1980 and Kulshrestha *et al* 1995). Protein as one of the main sources of energy and it plays an important role in the maintenance of blood glucose (Jrueger *et al* 1968). It is the most fundamental and abundant biochemical constituent present in the animal body and the estimation of protein is considered to be important (Ravichandran *et al* 1994). Mule and Lomte (1995) have reported that the protein content of an animal is an important organic constituent, which plays a major role in cellular metabolism. After the exposure of electroplating effluent chromium protein content in the muscle of *M.cavasius* was significantly affected. After 24, 48, 72 hr and 15 days of exposure the muscle showed constant depletion in the amount of protein from -9.77%, -20.45%, -26.14% and -31.82% over control. Gradual decrease of protein 24, 48, 72 hr and 7^{th} day of exposure may be due to the influence of exogenous factors like toxic environment as has been suggested by Castell *et al* (1970). The loss of protein under effluent chromium to long period may attribute to the utilization of amino acid in various catabolic reactions. Another probability is that might have occurred blocking of the protein synthesis and proteolysis on exposure to chronic period of stress condition. This is in support with studies if Srinivas Rao (1987). Similar observations was made by Jana and Bandyo Padhay (1987) who noticed the reduction of total protein in the muscle of tissue *C. punctatus* after the treatment of heavy metals. Khillare and Wash (1989) recorded protein declined in muscle of *Puntius stigma* after exposure of endosulfan, malathion and sevin. Ravichandran et al (1994) observed the effluent of phenol, found decreased the protein in muscle *Oreochromis mossambicus*. Lomte and Sabhia Alam (1984) studied effect of Malathion on the biochemical components of prosobranch, *Belamia bengalensis* and reported that the decrease in glycogen, protein and lipid under pesticidal stress. Rajan (1990) reported the effect of textile mill effluent on *Cyprinus carpio*. There was a significant decrease in protein content of muscle, liver and intestine. Govindan *et al* (1994) observed the decrease protein in the muscle of *Gambusai affinis* exposed to Phosphoridon. Jone Nelson and Sunil kumar (1996) reported the decrease level of protein in the muscle of *Etroplus maculates* after exposure of Ekalux. Vijaya mohan (2000) noticed the decreased protein content of muscle in *Orechromis mossambicus* after the exposure of titanium dioxide.

Table 14. Electro plating industrial effluent chromium (0.25 %) change the protein content in the Air-breathing fish *Mystus cavasius* (Ham)

Samples	Controls	24 hrs	48 hrs	72 hrs	15 days
Muscle	8.80 ± 1.71	7.94 ± 1.60*-9.77	7.00 ± 1.53*-20.45	6.50 ± 1.08**-26.14	6.00 ± 1.15**-31.82

Each value is the mean of 6 individual determinations ± indicates SE
The signs + or – indicate percent increase or decrease over control
Values significant at *P<0.05, **P<0.01,

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