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## STUDY OF BEHAVIOURAL RESPONSE OF AIR- BREATHING CATFISH *MYSTUS CAVASIUS* (HAMILTON) EXPOSED TO ELECTROPLATING INDUSTRIAL EFFLUENT CHROMIUM

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### ABSTRACT

In the present experiment effect of electroplating industrial effluent chromium on the behavioral responses of freshwater air-breathing cat fish *Mystus cavasius* was studied. The toxicity of chromium to aquatic life is strongly influenced by the form of chromium and quality of water. The two most prevalent chromium forms found in plating industry waste water are hexavalent chromium ( $\text{Cr}^{+6}$ ) and trivalent chromium ( $\text{Cr}^{+3}$ ). The fishes exhibited various behavioral responses – locomotory, physiological, neurological and morbidity responses under influence of chromium industrial effluent. One of the major advantages of using data on behavioral effects is that they are more sensitive indicators of potential for impacts on survival in the field than are measures of lethality. Study noted the possible utility of the behavior responses as rapid biomonitoring assessment technique for qualitative evaluation of various industrial pollutants.

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**INTRODUCTION:** The indiscriminate discharge chromium rich electroplating industry effluent into the natural water pose a serious threat to the flora and fauna including fishes. Behavioral effects are important in the assessment of risk from chemical exposure in the environment. Chromium (III) and (VI) have been shown to accumulate in many aquatic species, especially in bottom-feeding fish, such as the brown bullhead *Ictalurus nebulosus*<sup>1</sup>.

The present study was carried out to assess the behavioural responses of air-breathing fish *Mystus cavasius* to sublethal exposure of electroplating industrial effluent. Sublethal exposure is considered to be most sensitive indicators of environmental disturbances than extreme endpoints such as organisms mortality<sup>2</sup>.

**MATERIALS AND METHODS:** Healthy adult fish *Mystus cavasius* (13 - 20 gm weight and 12 - 18 cm length) were procured locally and acclimatized in 28°C and 12:12 L:D cycle a minimum 2 weeks prior to testing. The fish were 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.

The percentage survival of *M. cavasius* at various concentrations of waste water was determined by adopting the procedure laid down by Doudoroff and Katz<sup>3</sup> for industrial waste waters. The test medium was changed daily<sup>4</sup> to maintain the constant toxic concentration. The effluents were prepared in the required proportions with tap water according to methods laid down by ISI. The LC<sub>50</sub> value was obtained by Finney<sup>5</sup>.

The 1/3 of sublethal concentration of chromium (0.25%) was used to experimental fishes for 24h, 48h, 72h and 15d, 30d, 60d, 90d and 120 days and behavioral responses of fish were noted.

**RESULTS AND DISCUSSION:** The experiment clearly revealed that the behavior of fishes remarkably changed due to the influence of electroplating industrial effluent chromium (**Table 1**).

**TABLE 1: PHYSICAL REACTIONS OF M.CAVASIUS (HAM) AT VARIOUS PERIODS OF EXPOSURE IN ELECTROPLATING WASTE WATER (EFFLUENT) CHROMIUM**

Time of exposure	Responses
24 h	Restlessness, hyperactivities, excitation, active air-breathing
48 h	Active air-breathing, opercular beats vigorous
72 h	Vigorous surfacing jumping out reflex, high opercular beats
15 d	Surfacing frequent, opercular movement slightly irregular
30 d	Quick surfacing, jumping out of reflex
60 d	Tail twitch often, one or two coughs recorded
90 d	Fanning, Burst swimming
120 d	Coughs many, surfacing normal, Tail twitching observed

The various locomotory responses exhibited by the fishes at initial stages of exposure included restlessness, excitation, faster swimming, jumping and overall hyper activity. The overall hyperactivity suggested their tendency to get out of the test aquarium containing effluent. The overall changes in activities may be related to the alteration of metabolic pathway to yield energy under oxygen demand. The physiological evidence of fish gulping and rapid opercular movement was indicative of respiratory inconveniences triggered by the absence of dissolved oxygen in the effluent.

Similar findings in relation to respiration were also recorded <sup>6</sup>. Rapid mouth and opercular movement were also reported for the common guppy *Poecilia reticulata* for Ni and Cr exposure <sup>3</sup>. Ganeshwade *et al.*, <sup>7</sup> have reported increased opercular rate and coughing in the common carp exposed to industrial effluents. Infact, coughing response is shown to have direct relationship with concentration of pollutant water <sup>8</sup>.

The chromium effluent exposure induced mucous film secretion on the body and gill of *M. cavasius*. Such observation was also made by metal pollution in fish <sup>9</sup>.

The neurological behavioral changes reflected by loss of balance during the effluent exposure period due to influence on sensory-motor interaction of the nervous system. The effluent chromium might act as neurotoxic leading to disorganization of nervous coordination. The findings were in the line of earlier report of Ram and Gopal <sup>10</sup> in fish intoxicated by pollutants. High concentration of zinc (1.4 and 1.5mg l<sup>-1</sup>) causes behavioral changes like fish flickering, convulsions and muscle spasms in *Tilapia sparrmanii* <sup>11</sup>.

The present study clearly demonstrated behavioral changes in the fishes under electroplating industrial effluent chromium stress. Indiscriminate discharge of this effluent would be deleterious to aquatic life even at a low concentration. Hence we must ensure implementation of effluent, control measures properly to keep our environment clean. Further, it is suggested that role of environmental education will lead to the water free pollution and thus rise in nature history.

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