



Effects of Mercury Chloride on Oxygen Consumption & Behavioural Changes to Freshwater Fish, *Cyprinus carpio*

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ABSTRACT: The rate of oxygen consumption was measured in mercury chloride treated freshwater fish, *cyprinus carpio* for 96h and compared to control group. The present investigation showed that average oxygen rate was decreased in all treated animal as compared to controlled group. Behavioural changes was also recorded in both concentration. The behavioural alterations observed like surfacing, erratic movement, increased mucous secretion, decreased opercular movement and loss of balance. The present study revealed that, mortality rate increased with increases in concentration.

Keywords: Behavioural changes; *Cyprinus carpio*; mercury chloride; mortality and erratic, mucous.

INTRODUCTION: The heavy metals are important pollutants for fishes, because these are not eliminated from aquatic systems by natural methods, Mercury has been recognized as one of the most hazardous aquatic pollutants due to its toxicity, bioaccumulative and non-biodegradable properties Clarkson, (1990)¹. Heavy metals contribute to the pollution problem in rivers and streams resulting in adverse impacts on biota including fish. Fish population is generally considered very sensitive to all kinds of environmental changes to which it is exposed as they are exclusively aquatic with external mode of fertilization. Certain stages in the life cycle of fresh water fish are more susceptible to environmental and pollution stresses (VonWesternhagan, 1988)². Even though many studies are available in toxicity of various fishes (Jagadeesan *et al.*, 2001; Francis *et al.*, 2002)³⁻⁴, hence the present study has been carried out on *Cyprinus carpio*, with reference to mercury chloride.

MATERIAL AND METHODS: *Cyprinus carpio*, ranging between weighing about 150gm. were collected from a nursery pond at Nanded. The animals were brought to the laboratory and were acclimatized to lab condition for four day where they feed with rice cake and groundnut cake. The experimental animals were divided in two groups each containing ten animals and were exposed to mercury chloride for lethal & sub lethal concentration. One group keeps as control. The 50% mortality was reached on fourth day the median lethal concentration (LC₅₀) of mercury chloride for 96h. The behavioral changes during four days of ex-

posure were noted. The rate of oxygen consumption was studied by Winkler's iodometric method as modified by Saroja (1959). All the fishes were sacrificed at each successive hour of exposures; the blood was collected by direct heart puncturing using sterile disposable plastic syringe with a 22-gauge needle. The blood sample was taken in a tube rinsed with EDTA as an anticoagulant, & was mixed gently by rotation. Each blood sample was then separated into two sets and stored in a refrigerator at 4°C. One set of preserved blood samples was used for hematological studies, while another set was used for the estimation of various biochemical parameters and isolates liver tissues, homogenized and stored at refrigerators for further biochemical studies.

RESULTS AND DISCUSSION: The results are represented in the form of graph, in the present investigation fishes were exposed in lethal concentration of mercury chloride the rate of oxygen consuming capacity was significantly decreased in 96h, while in case of sublethal the rate of oxygen consumption was significantly decreased at 96h. Similar observation by Mushgeri and David (2003)⁵ and Jadhav and Sontakka (1977)⁶. The decrease in oxygen consumption at sub lethal concentrations of the toxicant indicates lowered energy requirements which in turn indicate pronounced hematological changes (Tilak & Satyavardhan, 2002)⁷. Similar reduction in oxygen consumption has been reported in *Channa striatus* exposed to organophosphate pesticide (Natarajan, 1981)⁸, *S. mossambicus* due to

organochlorine intoxication (Vasanthi & Ramasamy, 1987)⁹. Rate of oxygen consumption showed a significant decrease in both sexes of crab with increase in duration of exposure to fluoride. (V. D. Suryawanshi & P. B. Deshmukh, 2016)¹⁰. Changes in the gill surfaces and increased mucus production is consistent with observed histological effects such as hyperplasia, necrosis and lamellar aneurysms in all the three fish exposed to sub lethal concentration of technical grade fenvalerate. Kumaraguru *et al.* (1982)¹¹ reported that the gill is the target organ for synthetic pyrethroid toxicity in fish. During investigation some observation was found that, severe respiratory distress, rapid opercular movements, leading to the higher amount of toxicant uptake, increased mucus secretion, higher ventilation volume, and decrease in the oxygen uptake efficiency, laboured breathing and engulfing of air through the mouth were observed exposed to both the concentrations. Surfacing phenomenon was more in fish exposed to lethal concentration over the control. Hyper excitation, loss of equilibrium, increase in production of mucus from the gills. A film of mucus was observed all over the body and also on the gill. study on behavioral and respiratory dysfunction as an index of copper sulphate Similar changes observed by V.D. Suryawanshi & R.K. Pardeshi, (2017)¹² in their toxicity in *Cyprinus carpio* clearly reported, controlled fish were active, with coordinated movement, while exposed fish exhibited irregular, erratic and darting movements and loss of equilibrium due to inhibition of AChE activity. The results of the present study suggest that the altered rates of respiration of fresh water fish may serve as a rapid biological monitor of the toxicant exposure to important components of fresh water community.

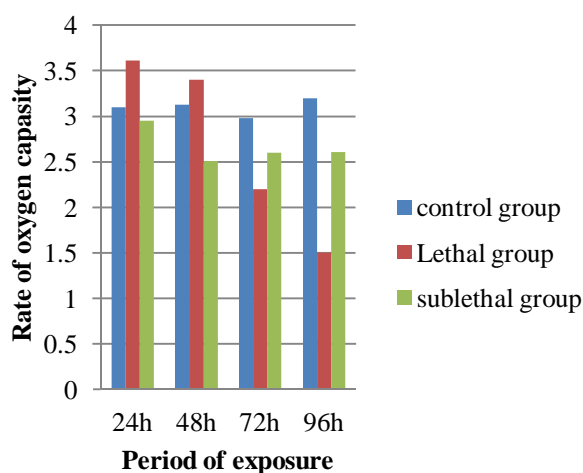


Figure 1: Effects of mercury chloride on oxygen capacity of freshwater fish, *Cyprinus carpio* for diff. time interval.

CONCLUSION: From the above study it is cleared that, the mercury chloride is highly an aquatic pollutants that its produce profound effects on many aspects on fish physiology.

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REFERENCES:

- Clarkson T.W. (1990) Human health risks from methyl mercury in fish. *E T C.* 9:821-823.
- Von Westernhagan, H. (1988) Sub lethal effects a pollutant on fish eggs and larvae. In fish physiology VOL.XI PARTA, Academic press N. Y. USA., 253-346.
- Jagadeesan, G., Jebanesan, A., Mathivanan, A. (2001) In vivo recovery of organic constituents in gill tissue of *Labeo rohita* after exposure to sub lethal concentrations of mercury. *J. Exp. India.*, 3: 22-29.
- Francis S., Mohan, K. G., Oommen., V.(2002) Influence of steroid hormones on plasma proteins in fresh water Tilapia *Oreochromis mossambicus*. *Indian J. Exper. Biol.*, 40: 1206-1208.
- Mushigeri SB and David M. (2003) Assessment of fenvalerate toxicity on oxygen consumption and ammonia excretion in the fresh water fish, *Cirrhinus mrigala*. *J. Ecotoxicol. Environ. Monit.*, 13: 191-195.
- Jadhav SM and Sontakka VB. (1977) Studies on respiratory metabolism in the freshwater bivalve, *Corbicula striatella* exposed to carbaryl and cypermethrin. *Pollut. Res.*, 16: 219-221
- Tilak KS and Satyavardhan K. (2002). Effect of fenvalerate on oxygen consumption and haematological parameters in the fish, *Channa punctatus* (Bloch). *J. Aquatic Biol.*, 17: 81-86.
- Natarajan GM. (1981) Effect of Lethal LC₅₀ / 48h concentrations of metasystox on selected oxidative enzymes, tissue respiration and histology of gill of fresh water air breathing fish, *Channa striatus*. *Curr. Sci.*, 50(22): 985-991.
- Vasanthi M and Ramasamy M. (1987) A shift in metabolic pathway of *Sarotherodon mossambicus* (Peters) exposed to thiodon (endosulfan). *Proc. Indian Acad. Sci., (Anim.Sci.)* 96:56-69.
- Suryawanshi VD and Deshmukh PB. (2016) Effects of Fluoride on tissue respiratory metabolism

of fresh water Crab, *Barytelphusa*
cies, *I.J.Medicinal chemistry & Drug discovery*,
Vol.1, Issue (2) pp.667-672.

11. Kumaraguru A. K, Beamish F. W. H., Ferguson H. W. (1982) Direct and Circulatory paths of permethrin causing histopathological changes in the gills of rainbow trout. *J. Fish Biol.*, 29
12. V.D.Suryawanshi, A.N.Mote, R.K.Pardeshi, S. R. Gaur (2017) Toxicity of Copper Sulphate on Behavioral Changes to freshwater fish, *Cyprinus Carpio*. *Global Journal for Research Analysis* Vol.6, Issue (10).