EFFECTS OF MERCURY CHLORIDE ON HEMATOLOGICAL PARAMETERS TO FRESHWATER FISH

CYPRINUS CARPIO

Lone V.B. V. D. Suryawanshi Jagtap H.S.
vijay1351976@gmail.com
Dept. of Zoology
1-2 *Sant Ramdas College Ghansawangi, Dist-Jalna. (MH)Indi*
M.S.P.Mandals, Shree Shivaji College Parbhani

ABSTRACT: *Cyprinus carpio was exposed to mercuric chloride 0.9, 1.1,1.2 and 1.3ppm of $HgCl_2$ for 96h. After exposure, red blood cell (RBC), Hb, HCT, MCV, MCH, MCHC significantly decreasedat 96h when compared to the control.The number of white blood cells (WBC) increased in mercuric chloride treated fish. The results are statistically significant.*

Keywords: *Cyprinus carpio, mercuric chloride, RBC, WBC, Hb.HCT, MCV, MCH, MCHC*

INTRODUCTION:

Water pollution is recognized globally as a potential threat to both human and other animal populations which interact with the aquatic environments (Biney, Calamari, Membe, Naeve, Nyakageni, & Saad, 1987; Svensson, Nilsson, Jonsson, Schutz, Akesson, & Hagmar, 1995). Mercury (Hg) is a naturally occurring metal due to erosion from earth crusts and volcanoes, but anthropogenic sources have increased the exposure in recent time. The most common forms of Hg in the environment are elemental Hg (Hg0), inorganic Hg (Hg+ and Hg2+), and organic compounds such as methyl mercury (MeHg), while ethyl mercury (EtHg) is more uncommon (Clarkson, 2002). Mercury has no biological function, potentially toxic and causes serious impairment in the metabolic and physiological function of the body. The toxic effect of mercuric in fish has been documented)Pandey *et al.*, 2005 and Bly *et al.*, 1997). Aquatic organisms are able to accumulate HM up to concentrations that are tenths and even thousands of times higher than their concentrations in the environment)Gremyachikh *et.al*., 2006; Moiseenko, 2003; Podgurskaya *et.al.,* 2004; Perevoznikov, *et al.,* 1999). Hence, The present study on effect of mercuric chloride on hematological parametrs of freshwater fish *cyprinus carpio* **t**he toxicity of fish by mercuric pollution at different lakes in Egypt at the level of cyto-genetic mechanism was described by Siegel et al., (1994), Adel (2003) & Ahmed et *al.*, (2008). The toxicity of fish by mercuric pollution at different lakes in Egypt at the level of cyto-genetic mechanism was described by Siegel *et al.,* (1994), Adel (2003) & Ahmed et al., (2008).

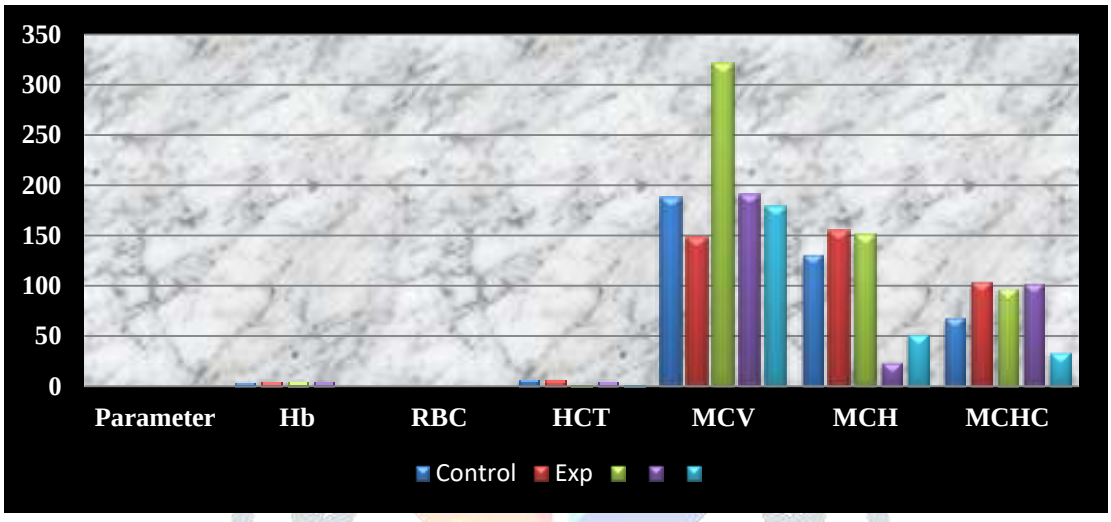
MATERIALS AND METHODS:

Fresh water fish *Cyprinus carpio*, weighing 110-120 gm and measuring 6-8 cm were collected from nearby nursery pond at umri tahsil, Dist- Nanded. They were safely brought to the laboratory. Fish were acclimatized for about 5 to 6 days before the commencement of the experiment. During acclimatization period, fish were fed with rice bran and ground nut oil cake in the form of dough once in daily. Water replaced every 24h after feeding in order to maintain a healthy environment for the fish. 10 healthy fishes were introduced into each tub. The mortality of fish in control and Mercuri chloride treated tubs was recorded after 24h and the concentration at which 50% mortality of fish occurred was taken as the median lethal concentration (LC_{50}) for mercuri chloride to fish *Cyprinus carpio* for 96h. was found to be 1.3 ppm.

Collection of Blood:

The blood was collected by direct heart puncturing using sterile disposable plastic syringe with a 22-gauge needle (Molnar, 1960). 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. All the hematological parameters like WBC, RBC, Hb, HCT, MCV, and MCH & MCHC were determined by fully automated Cell Counter (Trivitron Selenium Jr.). Both the tests were compared with control test.

RESULT: All the treated fishes in mercuri chloride showed profound effects on hematological parametrs at 96h. All the hematological parameters like Hb, RBCs, HCT, MCV, MCH and MCHC significantly decreased as compared to control & represented in the form of graph.



.Graph 1 Effects on haematological parameters of fresh water fish, *Cyprinus carpio* exposed in lethal concentration of mercuri chloride for different time interval.

DISCUSSION: During the present investigation considerable effect on haematological parameters when exposed to the toxicant, mercury are observed as per the data pertaining Haemoglobin (HB), White Blood Cells (WBC), Red Blood Corpuscles (RBC), Haematocrit (HCT), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) & Mean Corpuscular Haemoglobin Concentration (MCHC), revels changes which influence the haematological parameters of the fish. Hlynezak and Ubranksa (1987) reported a significant decrease in blood hemoglobin and hematocrit of Catfish, Cows & rats exposed to fluoride. Hhaematological variables have been used more to determine the concentrations of pollutants (Wedemeyer and Yasutake, 1977). Blood parameters are considered pathophysiological indicators of the whole body and therefore are important in diagnosing the structural and functional status of fish exposed to toxicants (Adhikari *et al.*, 2004). A number of hematological indices such as hematocrit (Hct), hemoglobin (Hb), red blood cells (RBCs) and so on, are used to assess the functional status of the oxygen carrying capacity of the bloodstream and have been used as indicator of metal pollution in the aquatic environment (Shah and Altindag, 2004a hemoglobin (Hb). Heamatological studies done by Mc Kim *et al.*, (1976) reported that mercury accumulates in the fish blood. Decline in Haemoglobin and haematocrit was observed in *Channa punctatus* exposed to Mercury (Sastry and Kamana Sharma,)1980). Haematocrit decreased significantly in the mercuric chloride treated fish when compared with the control fish. similar results was obtained during the present investigation. The disturbed hemoglobin synthesis due to an effect of leadon ALA-D may result in anemia (Santos and Hall, 1990). In the present investigation hemoglobin RBCs were significantly decreases. similar results were reported in another study the ddecrease in RBC count, haemoglobin and PCV value were also noticed in *Nile tialapa* exposed to the pesticide edifenphos (S.L.Shah *et al.*, 2004). The significant decrease in haemoglobin concentration of fishes under toxic stress could be either due to increased rate of destruction of haemoglobin or due to decrease rate of synthesis of haemoglobin (P.M.Reddy *et al.*, 1989). In the present investigation,

significant decrease in MCHC exposed to mercury. The MCHC was found to decrease with increase in dosage. MCHC is the indication of average concentration of haemoglobin in RBC cells, calculated based on Hb and PCV. Decrease in Hb and PCV coupled with increase in MCV might be the reason for the decreased MCHC. The present results are in line with the findings of Sandeep *et al*. (2013), Raina and Sachar (2014) and Sharma and Langer (2014). Such changes in MCHC may be either due to the increased lysis of RBCs or reduction in cellular blood iron thereby resulting in reduced Hb synthesis (Sharma and Langer, 2014). Alterations in MCV, MCH and MCHC clearly indicated that the fish are under chemical stress, which lead to pathological condition in the tissues. Gill *et al.* (1991) have also studied the hematology of different fish in response to different chemical stresses and the present observations corroborate with their findings.

CONCLUSION:

The hematological studies helped to check the systemic responses during stress conditions due to mercury the main haematological alteration resulting from exposure of *Cyprinus carpio* to various concentrations of mercury chloride for 24h, 48h 72h & 96h include significant decrease in hematological parameters. MCHC exhibited a significant decline when compared to control fishes. MCV and MCH values were found to exhibit a significant decrease in treated fish than in control. The changes in the hematological parameters indicated that they can be used as indicators of mercury related stress in fish.

REFERENCES

Adhikari S, Sarkar B *et al*. (2004) Effects of cypermethrin and carbofuran on certain hematological parameters and prediction of their recovery in a freshwater teleost, *Labeo rohita* (Ham). *Ecotoxicol. Environ. Saf.* **58**: 220–226.

Biney, C., Calamari, D. Membe, T. W., Naeve, H., Nyakageni, B., & Saad, M. A. H. (1987). Scientific bases for pollution control in African inland waters. FAO Fisheries Report, 369, 9-23

Bly, J. E., Quiniou, S. M. and Clem, L. W. (1997): Environmental effects on fish immune mechanisms. Dev. Biol. Stand. 90: 33-43

Clarkson TW.(2002): The three modern faces of mercury. Environ Health Perspect 2002; 110 (Suppl 1):11 – 23.

Gill S, Tewari H, Pande J.)1991(Effects of waterborne copper and lead on the peripheral blood in the Rosy Barb, Barbus (Conchonius Hamilton). Environ. Contam. Toxicol.; 40:606-612

Gremyachikh, V.A., Grebenyuk, L.P., Komov, V.T., and Stepanova, I.K.(2006), Accumulation of Mercury and its Teratogenic Effect upon Larvae of Chironomus riparius Meigen (Diptera: Chironomidae), Biologia Vnutrennih Vodno. 1, pp. 99–107

Hlynczak, A. J. and A. Urbanska, (1987). The biochemical parameters in the blood of breeding animals exposed to fluoride compounds in the environment. Foliamed. Cracov. 28: 89-96.

Moiseenko, T.I., Zakislenye Wod. , (2003) Factory, Mehanismy, Ecologicheskiye Posledstviya (Water Acidification. Factors, Mechanisms, Ecological Consequences), Moscow: Nauka, 276 p.

P.M.Reddy, M. Bashamo., (1989). hideen,Fenvalerate and cypermethrin induced changes in the hemotological parameters of cyprinus carpio,Acta Hydrochim.Hydrobiol.17; 101-107.

Pandey S, Kumar R, Sharma S, Nagpure NS, Srivastava SK and Verma MS. (2005): Acute toxicity bioassays of mercuric chloride and malathion on air-breathing fish Channa punctatus (Bloch). Ecotoxicol Environ Saf. 61(1):114-20.

Perevoznikov, M.A. and Bogdanov, E.A., (1999) Heavy Metals in Freshwater Ecosystems, St. Petersburg: GosNIORKh, , 228 p.

Podgurskaya, O.V., Kavun, V.Ya., and Luk'yanova, O.N.,)2004(. Accumulation and Distribution of Heavy Metals in Organs of Mussel Crenomytilus grajanus and in Modiolus modiolus from upwelling regions of the Okhotsk Sea and Sea of Japan, Biologia morya, vol. 30, no. 3, pp. 219–226

Raina S, Sachar A. (2014). Effect of heavy metal zinc and carbamate pesticide sevin on haematological parameters of fish, Labeo boga. International Journal of Innovative Research in Science, Engineering and Technology.; 3(5):12636-12644.

S.L.Shah, A.Altindag.,(2004).Hemotological parameters on tench (Tinca tinca L.) after acute and chronic exposure to lethal and sublethal mercury treatment, Bull Environ.Contam.Toxicol.73911-918.

Sandeep V, Praveena M, Kavitha N, Jayantha Rao K. (2013) Impact of Tannery Effluent, Chromium on Hematological Parameters in a Fresh water Fish, Labeo rohita (Hamilton). Res. J of Animal, Veterinary and Fishery Sciences. 1(6):1-5.

Santos MA and Hall A (1990) Influence of inorganic lead on the biochemical blood composition of the eel, *Anguilla anguilla* L. *Ecotoxicol. Environ. Saf.* **20**: 7-9.

Sastry KV and Sharma K (1980) Mercury inducedhaematological and biochemical anomalies in *Ophiocephalus* (*Channa punctatus*). *Toxicology Letters.* **5**: 245-249.

Sharma J, Langer S. (2014) Effect of Manganese on haematological parameters of fish, Garra gotyla gotyla. Journal of Entomology and Zoology Studies. 2(3):77-81.

Svensson, B., Nilsson, A. , Jonsson , E. , Schutz, A. , Akesson, B., & Hagmar, L. (1995) Fish consumption and exposure to persistent organochlorine compounds, mercury, selenium and methylamines among swedish fishermen. Scand. J. Work Environ. Health, 21, 96- 105.

Wedemeyer CA and Yasutake WT (1977) Clinical methods for the assessment of the effects of environmental stress on fish health. United States Technical Papers and United States Fish Wildlife Services. 89: 1-18.