Determination of acute toxicity and LC50 value of Mercury chloride for a freshwater fish *Cyprinus carpio*

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Abstract
The present investigation is about to determine the acute toxicity and 96-hr LC50 value of mercury chloride for the fish *Cyprinus carpio.* The fish were exposed in different concentration of mercury chloride and the concentration was increased gradually for 96 hours to investigate the response of the fish. With the increase of the concentration of mercury chloride the fish mortality were increased gradually. The result showed that LC50 of mercury chloride for the fish, *Cyprinus carpio* is 0.782mg/l. The mortality of the fish is directly proportional to the concentration of the exposed mercury chloride.
Keywords: Acute toxicity, LC50, *Cyprinus carpio*, mercury chloride

Introduction

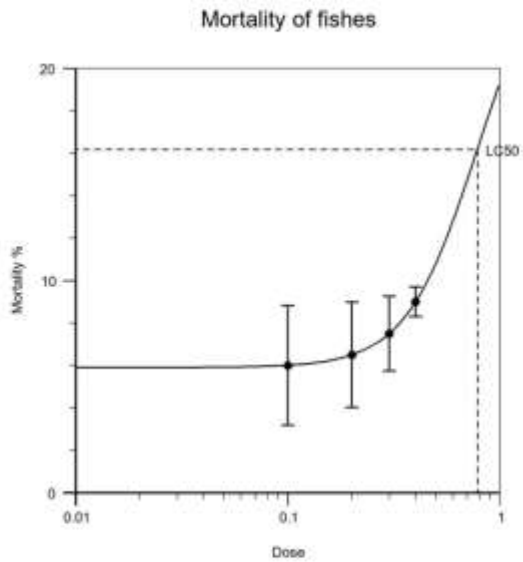
Fishes are widely used to assess water quality of aquatic ecosystems because they serve as pollution bio indicators [1-2]. Fish may concentrate large quantities of toxic metals from polluted aquatic environments [3]. The heavy metal concentration in the body of fish depends upon feeding habits, trophic status, and food availability, physico-chemical properties of water, and metabolic rate of animal and toxicity of heavy metals [4-5]. Acute toxicity is the discernible adverse effect induced in an organism within a short time of exposure to a substance. In the present test, acute toxicity is expressed as the median lethal concentration (LC50) that is the concentration in water which kills 50% of a test batch of fish within a continuous period of exposure which must be stated. Fishes have direct economic importance and are quite sensitive to the wide array of pollutants discharged in the aquatic ecosystems. Water pollution affects the fish severely and proves lethal to them. Fishes are mainly affected from the human activities. So, it is the need of time to pay adequate attention to this issue and execute necessary corrective measures. [6] Fishes die due to pollution of water from pesticides adjacent the cultivation fields. Pesticides flow off into the water proving fatal for the aquatic life. [7] Metals are the common pollutants of the rivers in Punjab province entering them with industrial and municipal waste waters. The heavy loads of metals in the rivers have adversely affected the original fish fauna, including major carp's viz. *Labeo rohita* and *Cirrhinus mrigala* that are on the verge of loss in the aquatic habitats. [8] Therefore, heavy metals are considered as chief environmental pollutants and have long been known as settled contaminants of aquatic environments. [9] Metals contamination of the environment results both from natural sources and industrial activities in accumulation an additional contribution from air. [10] The toxic effects of various heavy metals may hinder the physiological and metabolic functions, rate of growth, reproductive efficacy and ultimately causes mortality in fishes. [11] Toxicity tests have been performed on fishes to evaluate the effect of toxicants on various aquatic organisms under laboratory conditions. To assess susceptibility and survival potential of the test organisms 96 hr LC50 tests of some particular toxicants have been conducted. The fingerling stage of fish is more reliable to conduct toxicity test of various waterborne toxicants. [12,13]. Therefore our aim is to find out the acute toxicity and on LC50 value of mercury chloride for various concentration at different concentration.

MATERIAL AND METHODS: *Cyprinus carpio*, ranging between weighing about 150gm.were collected from a nursery pond Nanded, Dist-Jalna. The animals were brought to the laboratory and were acclimatized to lab condition for four day where they fade with rice cake and groundnut cake. The experimental animals were divided in two groups each containing twenty 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 is 0.782 mg/lit. The behavioral changes during four days of exposure 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 4oC. 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.

Table.No.1.
Showing the rate of mortality of Freshwater fish, Cyprinus carpio *e*xposed in lethal concentration of mercury chloride for various conc. at different time Intervals.

Hours of Duration	No. of animal exposed mercury carbide (Lethal)		
	Control	Lethal Concentration (mg/lit)	No.of animal dead in lethal con.in %
	10	00	01
24h	10	0.1	16
48h	10	0.2	11
72h	10	0.3	14
96h	10	0.4	10



Graph no.2
Showing the rate of mortality of Freshwater fish, Cyprinus carpio *e*xposed in lethal concentration of mercury chloride for various conc. at different time Intervals.

Statistical analysis: For acute toxicity tests, the mortality data were statistically analyzed by using online AAT Bioquest software. The 96-hr LC50 and lethal concentrations were determined along with 95% confidence intervals.

Results and Discussion: Ten individuals of fish, *Cyprinus carpio* were tested against mercury chloride concentration for the determination of both 96-hr LC50 and lethal concentrations of mercury chloride. During the present investigation the 96-hr LC50 of for the fish, *Cyprinus carpio* was found to be 0.782 mg/l. The total individuals of the exposed fish were 10 and the mortality rate was increased at the initial 24h and 72h for 0.1mg/lit & 0.3mg/lit as shown in graph 1 reveals the graphical representation of the mortality rate against log of concentration by using AA-BIQUEST online software. During present investigation, significantly maximum ammonia excreted by the fish was observed at higher concentrations. At higher concentrations of mercury chloride, the dissolved oxygen contents of the test mediums also decreased significantly. This shows that high concentrations of mercury chloride ions induced stress in the fish that resulted in the influence on the respiration of the fish. The mercury chloride is serious pollutant of the aquatic environment. They caused serious impairment in metabolic, physiological and structural system, when present in high concentration. In present study hyper- excitation and fast jerking movements were noted in fish before death. Too much behavioral changes at higher concentration might be due to manifestation of the disturbances in the physiological mechanism which is supposed to initiate, maintain and terminate the behavior[17]. Increased cough and yawn is due to the increased secretion of mucous which deposited on the gills to combat the toxicity produced by heavy metals. It also reduced the gaseous diffusion causing less supply of oxygen, causing immediate fish death.

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