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Short Communication

Changes in respiratory metabolism uncovered by mercuric chloride in freshwater catfish, *clarias batrachus*

B.S. Kamble[1], J.M. Patwari[2] and R.K. Narkhede[2]
[1]Dept. of Zoology, Maharashtra Udayagiri Mahavidyalaya, Udgir, Maharashtra, India
[2]Dept. of Environmental Science, Maharashtra Udayagiri Mahavidyalaya, Udgir, Maharashtra, India
bankat.k@gmail.com

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Abstract

In this recent work we present the knowledge and adverse effects of man-made activities such as industrial development throughout the world. Industrial waste contains amount of heavy metals mix-up with the nearby water bodies and damage to tissue of fishes and finally causing death. Respiration is an important physiological body activity for each and every animals. Similar weighted catfishes Clarias batrachus were chosen for the study of respiration. They were found in the muddy fields of water which have barbles. The selected fishes were experimented with lethal concentration in the laboratory for two days. The concentration of mercuric chloride was imparted at 1.2ppm for 96 hours. Winkler's method was used to measure the respiratory mechanism. In this investigation it was found that the gradual descending trend of oxygen consumption when exposed to Mercuric Chloride for 96 hrs.

Keywords: Mercuric chloride, *Clarias batrachus*, Oxygen consumption.

Introduction

The consumption of oxygen in fish is one of the most important tests to observe the entry of toxicant into the body of fish. Use of recently developed chemicals and industrial wastes are well known for the adverse effects on the aquatic organisms. The toxicity of metal generally affects the central nervous system and extending towards the stress on physiological status of the fish. This physiological stress and status can be determined by the estimation of biochemical effects. This change in physiological form causes the increase in the consumption of the oxygen for more work by the body of fish finally which leads to imbalance in the natural status of fish.

In aquatic animals particularly in fishes, gills are the main respiratory organ. Water born toxic contaminants damages initially to gills of fishes. Saroja[1] literature review found that in aquatic ecosystem when contaminated by toxic pollutants it relates with the concentration of pollutants to which that much attention has not given. In the present study focus was given on respiratory study through oxygen consumption rate of *Clarias batrachus* when exposed to mercuric chloride with different time period of 24hrs, 48hrs, 72hrs, and 96hrs.

Materials and methods

All same sized (180-200gm) weight of healthy freshwater *Clarias batrachus* test fishes were collected from the fisher man, Nanded. In order to their good settlement they were brought to the laboratory condition. Catfishes then were made to settle for four days and later they were used for experimental work. The fishes were offered the small pieces of earthworm, rice or wheat flour balls. The fishes were exposed to mercuric chloride concentrations.

The respiratory metabolic function was measured by "Winkler's Method"[2]. For analysis of oxygen content from the sample, dark bottles having inlet and outlet for control separate bottles were used. The selected animals were kept in a chamber and sample was collected for the estimation of oxygen. Sufficient time was given to the animal for both control and experimental. Then the samples were collected and analyzed for the oxygen uptake the difference between initial and final oxygen content was determined.

Results and discussion

The freshwater experimented catfish *Clarias batrachus* showed fluctuation in oxygen uptake and oxygen consumption rate after treating with mercuric chloride up to 96 hours.

The present observation show that oxygen consumption of catfish due to mercuric chloride, it was 0.90, 1.00, 1.51 and 1.75 ml (C.C.) of O_2/catfish/hr. at the time of 24, 48, 72 and 96 hrs respectively in experimented group. In control group oxygen consumption was 2.98 ml (C.C.) of O_2/catfish/hr. which indicate descending order to compare with the normal group.

The rate of oxygen uptake was 0.21, 0.16, 0.13 and 0.07 ml (C.C.) of O_2/animal/hr. wet. wt. of fish during 24, 48, 72 and 96

hours respectively there was reduced rate of oxygen consumption as compared with control. In control group rate of oxygen consumption was 0.23 ml (C.C.) of O_2/animal/hr. wet.wt. of fish. Hence oxygen consumption observed descending trend in treated group up to 96 hours as compared with control.

Table-1: Total Oxygen Consumption and Rate of Oxygen consumption of catfish (*Clarias batrachus*).

Consumption of Oxygen	Normal	Experimental			
		24hrs	48hrs	72hrs	96hrs
Total O_2 Uptake in CC of O_2 /Animal/hr.	3.17+0.34	2.82+2.37	2.19+0.25	1.71+ 0.19	1.05+0.15
Rate of O_2 Uptake in CC of O_2/gm/hr. Wet Weight	0.045+0.05	0.020+0.005	0.016+0.004	0.013+0.002	0.007+0.003

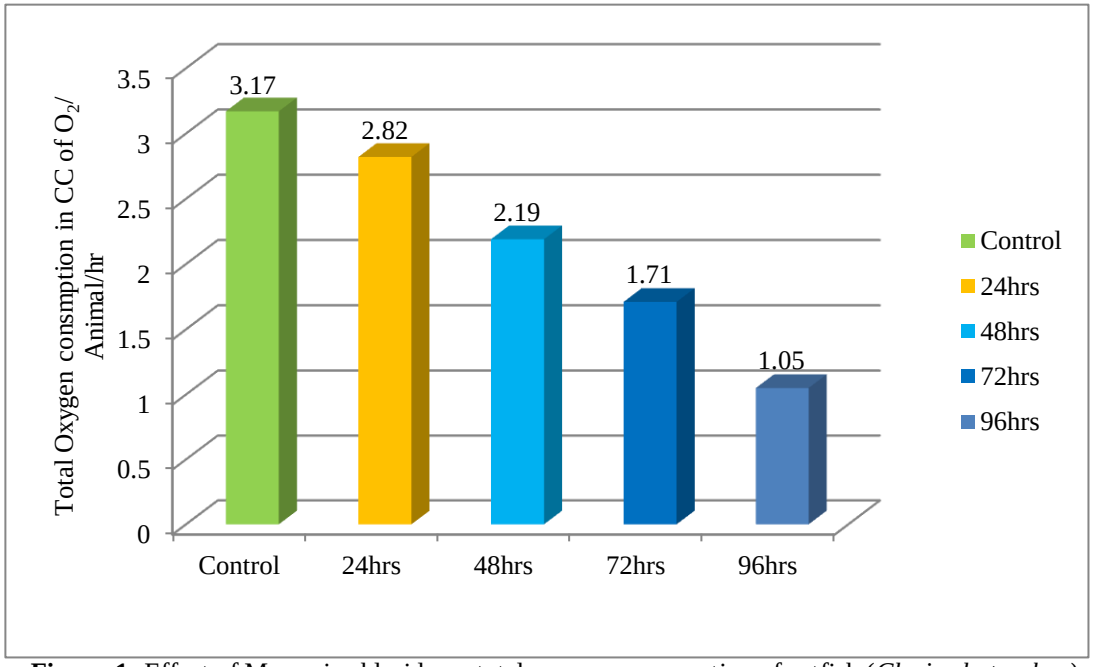

Figure-1: Effect of Mercuric chloride on total oxygen consumption of catfish (*Clarias batrachus).*

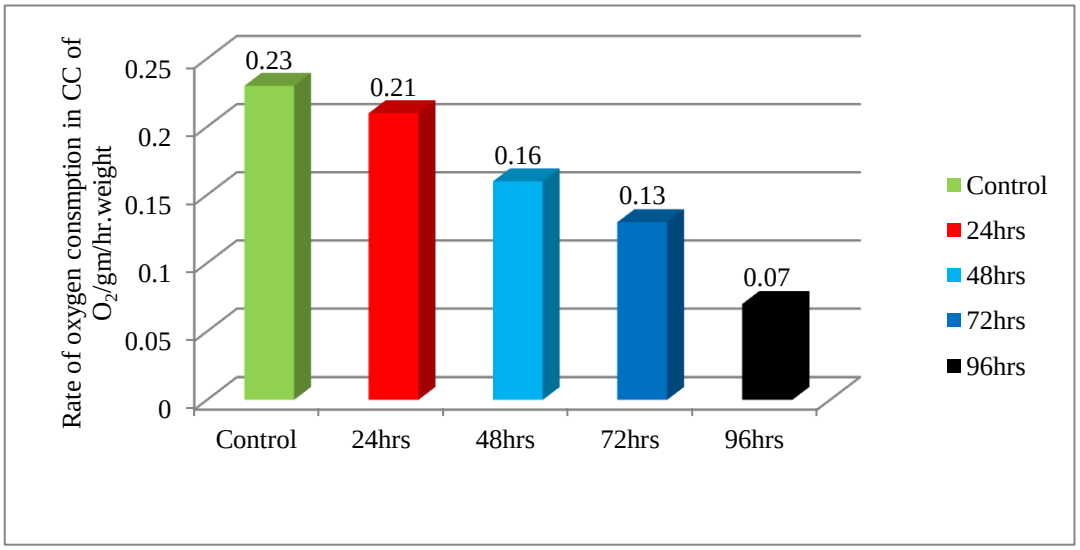

Figure-2: Effect of Mercuric chloride on rate of oxygen consumption of catfish (*Clarias batrachus).*

Discussion: As per the recent observation made here, the effect of mercuric chloride is showed clearly. As a result oxygen consumption and rate of oxygen consumption was declined due to the toxic effects of mercuric chloride on physiology of catfish *Clarias batrachus*[3]. The oxygen consumption was determined by the respiratory study. As per result it was found that the mercuric chloride was toxic. They have capacity to change the respiratory function of the body of catfish. It changes the normal physiological working in respiration and oxygen consumption rate was reduced. Any change in oxygen consumption of catfish is for the reason that there was change in the aquatic environmental condition. It is often used to determinate metabolic fluctuation. Water contains mercuric chloride showed declined effect in oxygen consumption and rate of oxygen consumption[4]. Oxygen consumption and rate of oxygen consumption was found to be decreased in all the experimented groups.

The oxygen consumption decreased when time exposure period increased by 24 hours to 96 hours. The mercuric chloride after entering in the respiration system of catfish it became complicated. It varies from metal to metal and also from species to species[5]. It is observed that there was oxidative respiratory dysfunction[6]. Water pollutions are artificial process responsible for the threat of discharges from various sources[7]. The damage of organ depends upon the toxicants and the species of fish. Various toxicants dissolved in water and affect the fresh water aquatic life as well as marine water life[8]. When freshwater catfishes are exposed to pollutants in water, the oxygen consumption and oxygen consumption rate of fishes was found to be decreasing, as a result of depletion of dissolved oxygen content in water. This increase in BOD level, reduction oxygen consumption in *Channa punctatus* when exposed to metasystox[9]. Another effect of pesticide was noticed that on fresh water fish *Channa punctatus* and reported that rate of respiration declined in the fresh water fish[10]. Verma and Dale[11] observed that oxygen consumption reduced due to the existence of suspended solid materials in the fresh water which would cause injury to aquatic animal and disturb normal life of fish.

It is observed that the total oxygen uptake was reduced when exposed to concentration of 1.2ppm of mercury chloride. The physiological disturbance of metabolic respiratory activity may be an sign of stress caused due to the pollutants[12]. The different workers reported that there was adverse effect of heavy metals on respiratory metabolism of aquatic animals. The Similar changes were also observed by Chinnayya[13], Nagabhushanam and Diwan[14] and Nagbhushanam and Kulkarni[15], there is significant drop in rate of oxygen consumption in fresh water fishes.

Conclusion

In this investigation it was found that the gradual descending trend of oxygen consumption when exposed to Mercuric Chloride for 96 hrs.

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