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Effect of Cadmium Toxicity on the Biochemical Parameters of Teleost *Channa punctatus* (Bloch)

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ABSTRACT

In the present paper the effect of Cadmium chloride on the biochemical parameters like glycogen, protein and lipid content of liver, kidney, testes and ovary were investigated in the teleost *Channa punctatus* (Bloch.). The decreasing level in all biochemical parameters of all targeted organs was observed after exposure of Cadmium compound significancantally in the present study.

Keywords: *Channa punctatus, Glycogen, Protein, Lipid.*

INTRODUCTION

Metal contimanination in the aquatic environment has become one of the most critical environmental issues of recent years (Alkhil, *et al*., 2004 and Cebrian *et al*., 2003). Heavy metals are non-biodegradable and once discharged into water bodies accumulate in the aquatic organisms including fish, causing harmful effects on them (Shete, *et al*., 2011).Fish population can be used as frontline indicators of suspected aquatic pollutants as they are sensitive to all kinds of environmental stresses (Surya *et al*., 2017; Khan *et al*., 2001; Nagjyoti *et al*., 2010; Akpor, 2011; Sujata, 2015; Bhanu and Deepak, 2015; Jose *et al*., 2013; Vadlamani *et al*., 2017 and Mukati and Bhattacharya, 2017).

The biochemical investigations help us to understand the mode of action of toxicants on the aquatic animals and cause of death by poisoning. Therefore, the present study shows the effect of LC_{50} concentrations of Cadmium as $CdCl_2$ on glycogen protein and lipid content in the liver, kidney, testes and ovary of *Channa punctatus* after chronic exposure of 30 days.

MATERIALS AND METHODS

Adult and live *Channa punctatus* were collected from the local fish market of district Darbhanga, India and brought to C.M. Science College Post Graduate Research Laboratory. Only healthy fishes (length 15-20 cms and weight 55-60 grams) were taken for experiment. Fishes were acclimatized in glass aquaria for 15 days and were fed with fish food (earthworms) and water in aquaria was replaced by freshwater at every 24 hours. Stock solution of Cadmium chloride was prepared by dissolving appropriate amount of $CdCl_2$ as Cd salt in distilled water.

For studying the glycogen, protein and lipid levels in the liver, kidney, testes and ovary, fishes were divided in two groups as control and experimental. In control group, fishes were kept in the normal laboratory conditions whereas in the experimental group, fishes were exposed to 2 sublethal concentrations *i.e.*, $1/5^{th}$ of 96 hrs, and $1/10^{th}$ of 96 hrs. of Cadmium as $CdCl_2$ for a chronic period of 30 days (Finney, 1971). At the end of exposure period, both

control and experimental fishes were sacrificed and the target organs were processed for glycogen, protein and lipid estimation (Lowry *et al*., 1951; Van der Viero, 1954 and Akpor, 2011).

RESULTS AND DISCUSSION

The experimental and observation of control and Cadmium exposed test fish *Channa punctatus* is depicted in Table 1, 2 and 3. A significant reduction in glycogen, protein and lipid levels in all studied tissues was observed in Cd exposed in comparison to control ones. In control fish, the glycogen levels were 42.50±3.68, 32.23±1.18, 21.64±2.27 and 18.59±1.83; protein levels were 169±33±1.56, 145.82±1.68, 74.58±1.45 and 109.81±1.62 and lipid levels were 57.15±1.60, 33.26±1.18. 22.62±1.23 and 28.04±1.64, whereas in Cadmium exposed fish, the recorded levels in glycogen profile were 20.24±1.81 (-52.03), 14.16±1.23 (-56.06), 12.47±1.37 (-32.53) and 16.65±2.35 (-24.61), in protein profile 132.36±2.95 (-21.83), 104.24±2.94 (28.51_, 61.43±1.21 (-32.53) and 92.13±0.97 (-16.1) and in lipid profile 45.35±1.27 (-21.83), 31.15±1.70 (-28.51), 19.43±0.89 (-32.53) and 23.34±0.68 (-16.76) in targeted tissues liver, kidney, testes and ovary respectively.

Table 1
Profiles of glycogen (mg/g wet tissue) in tissue of *Channa punctatus* chronically exposed to cadmium for 30 days. Values are mean ± SE of 5 observation

Tissue	Control	Cadmium Exposed
Liver	42.20±3.68	*** 20.24±1.81 (-52.03)
Kidney	32.23±1.18	*** 14.16±1.23 (-56.06)
Testis	21.64±2.27	** 12.47±1.37 (-32.53)
Ovary	18.59±1.83	* 16.65±2.35 (-24.61)

Decrease (-) over control values significant at:
* p<0.05 ** p<0.01 *** p<0.001

Table 2
Profiles of Total Protein (mg/g wet tissue) in Tissue of *Channa punctatus* Chronically Exposed to Cadmium for 30 days. Values are mean ± SE of 5 Observation.

Tissue	Control	Cadmium Exposed
Liver	169.33±1.56	** 132.36±2.95 (-21.83)
Kidney	145.82±1.68	*** 104.24±2.94 (-28.51)
Testis	74.58±1.45	* 61.43±1.21 (- 32.53)
Ovary	109.81±1.62	** 92.13±0.97 (-16.1)

Decrease (-) over control values significant at:
* p<0.05 ** p<0.01 *** p<0.001

Table 3
Profiles of Total Lipids (mg/g wet tissue) in Tissue of *Channa punctatus* Chronically Exposed to Cadmium for 30 days
Values are mean ± SE of 5 Observation.

Tissue	Control	Cadmium Exposed
Liver	57.15±1.60	** 45.35±1.27 (-21.83)
Kidney	33.26±1.18	NS 31.15±1.70 (-28.51)
Testis	22.62±1.23	* 19.43±0.89 (- 32.53)
Ovary	28.04±1.64	* 23.34±0.68 (-16.76)

Decrease (-) over control values significant at:
* p<0.05 ** p<0.01 *** p<0.001 NS = statistically non-significant

Many investigators have reported decrease in the glycogen, protein and lipid level in different tissues of fish exposed to different toxicants. Sujata (2015) reported the effect of $CdCl_2$ on reproductive organs of *Channa punctatus* as lower reduction of 36 ppm at $1/10^{th}$ of 96 hrs, whereas Prabhakar *et al*., 2012 studied the high and low both reduction on the biochemical parameters of *Cirrhina mrigala* on Cadmium exposure in gills, liver and kidney. Similar results were on the record by several workers (Vadlamani *et al*., 2017; Khan *et al*., 2017; Taju *et al*., 2014; and Sohn *et al*., 2015). These previous works resemble with the targeted organs of the present investigation.

CONCLUSION

From the above work it is clear that Cadmium causes biochemical alterations in liver, kidney, testes and ovary of the test fish *Channa punctatus* (Bloch.). It is clear that heavy metals and other aquatic pollutants affect the organs of fishes, thus affecting the target organs. This in turn would compel the process of decline in cells and tissues of the target organs as well as production of future offspring by fish thus declining their population too.

Hence it is suggested and recommended to prevent such pollution at the source or take strict legal measures against the sources of pollution including man-made pollution.

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