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Evaluation of some metals toxicity in *Channa punctatus* from river Kosi, Bihar

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Abstract: This study was aimed to evaluate the bioaccumulation and concentration level of two heavy metals such as Cadmium (cd) and Chromium (cr) in a edible fish *Channa punctatus* obtained from River Kosi, Bihar. These heavy metals are released into the environment through industrial activities, municipal urban runoff and coal burning fertilizers etc. In order to estimate the effect of five concentrations of Cadmium and Chromium (10 m M, 1 mM, 0.1mM, 0.01mM and 0.001mmM) was studied at 24°C. All concentrations of Cadmium decreased the rate of glucose transport. Maximum decrease was recorded with 10 mM of Cadmium. The rate of transport decreased with an increase in the concentration level of Cadmium used. Chromium increased glucose absorption rate at all concentrations evaluated. The highest rate of absorption was recorded at 0.001 mM of Chromium.

Keywords: Heavy metals, bioaccumulation, industrial activities, Kosi River

INTRODUCTION

Cadmium and Chromium are important heavy metals that have been used in the manufacturing of household materials, plastic and electronic products[1], Cadmium (Cd) Chromium (Cr) and Mercury (Hg) are usually added to polymers and pigments, filters, Uv stabilizers and flame retardants.[2] Also Chromium, lead, chromate and cadmium salts are used in various household items like kitchen utensils, house painting produce colour that vary from red to orange and yellow. Due to various industrial and consumer wastes some heavy metals can infiltrate into the water, moreover, contaminated the entire aquatic system.[3] As per the estimate Central Pollution Control Board (CPCB) of India. The plastic consumption in India is 8 million tones per annum and annually about 5.7 million tones of plastic is converted into non-biodegradable wastes[4] which is matter of serious concern due to excessive release of these heavy metals into the water reservoirs in the form of coloured plastic and E-wastage. Further, biomagnificated into aquatic food chain and produce many times more toxic materials into the system.[2] The chromium has carcinogenic properties and is highly toxic in nature which generated many diseases such as sinus, cancer and skin ulcers.[5] However, Itai-itai disease and renal failure is observed due to toxicity of Cadmium.

The toxicity of Cadmium to teleost fish is well documented. Mc Carty *et al.* (1978)[6] studied the toxicity of cadmium to gold fish, *Carassias auratus* in hard and soft waters. Cadmium has been reported to produce hepatic storage alterations of Vitamin B12 in some fresh water fishes,[7] hypocalcemi in rainbow trout[8]. Pickering (1980)[9] reported toxic effects of Chromium, to fat head Minnow (*Pimiphalus promelas*), there is great concern about the potential risk to human health which is directly

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related to the consumption of such fishes which have accumulated these toxic metals through food chain. Thus this study has been undertaken to examine if, cadmium and chromium produce any alteration in intestinal absorption of glucose along with heavy metals.

MATERIALS & METHOD

The fish *Channa punctatus* measuring (20 + 4 cm. long, 70 + 10 gram) were collected from Koshi River and maintained in laboratory in glass aquaria. Fishes were allowed to acclimatize to laboratory conditions for one week, five concentrations (10 mM, 1 mM, 0.1 mM, 0.01 mM and 0.001 mM) of Cadmium and Chromium inkrebs ringer- bicarbonate solution containing 40 mM of glucose were prepared, intestinal sacs were filled with these solution according to the method of Musacchia and Bramante. In control fish glucose solution alone was used, the luminal fluids of both experimental and control fish were collected after one hours at 24ºC. The concentration of glucose in the recovered solutions was determined by adopting the method of Park and Johnson (1963)[10]. The dry weight of the intestine was recorded by keeping the tissues at 100ºC in an oven until the weight became constant. The t test described by Fisher (1950)[11] was used to estimate the significant level of difference between control and experimental values.

RESULTS AND DISCUSSION

Heavy metals like mercury, lead, Cadmium and Chromium are being used and their refuse is disposed in the environment which reaches through many ways in fresh water sources and are harmful to aquatic fauna. Heavy metals get enter in the body of fishes through the food chain and may affect digestion and absorption of food material. In the present study transport of glucose by the intestine of *Channa punctatus* was reduced by inclusion of cadmium in the instilled solution. All five concentrations cadmium produced significant decreases in the rate of absorption of glucose but the decreases were not proportional to the increases in the cadmium concentrations (Table 1).

Further, the decreases in the rate of transport of glucose were more marked in the cadmium concentration range of 1-10mM. Sugar and amino acid transport through the intestine is carrier mediated. According to Newcomer (1973)[12], a Protein carrier in the cell membrame, releasing them into the cytoplasm. Csaky (1965)[13] and Alvardo (1966)[14] have suggested a common carrier mechanism for amino acids and sugars in the intestine. Transport of sugar by carrier protein is sodium dependant. Heavy metals are heaving strong affinity for ligands like phosphate and the cysteinyal and histidyl side chains of proteins, can bind with carrier protein molecules resulting inhibition of sugar and amino transport. Miller *et al.* (1980)[15] have shown that transport of glucose from 2 day and 21 day old is markedly reduced by mercuric chloride. Further, evidence for inhibition of glucose transport by heavy metals comes from the work of Wapnir *et al.* (1979)[16]. Who demonstrated inhibition of intestinal glucose transport in rats that received 20mg of lead acetate per kg body weight. In contrast to cadmium, all five concentrations of chromium increased the rate of glucose absorption by the intestine of *Channa punctatus* (Table 2).

The rate of glucose transport was highest at 0.001mM of chromium increases in concentrations of chromium in the medium gradually decreased the rate of absorption, this indicated that lower concentrations of chromium are more effective in producing elevated glucose absorption rates. Contrary to present findings Stokes and Fromon (1965) reported inhibition of glucose uptake by intestinal epithelial cells of rainbow trout exposed to chromium. The mechanism of increased intestinal glucose transport in *Channa punctatus* exposed to chromium is not clear from the present study further study may give more clear result and conclusion regarding this study.

Table 1- Effect of cadmium (Cd) on the rate of transport of glucose by the intestine of *Channa punctatus*

Concentration of Cadmium(mm)mM	(n)	Rate of Transport (µ mol glucose absorbed/g/dry wt/h) Control	Experimental result
10	18	14.10± 1.33	10.80 ±10.45[b]
1	18	12.19±0.20	10.05±0.26[b]
01	14	11.65 ±0.35	9.70 ±0.17[a]
0.01	14	12.91 ±0.17	11.33±0.40[a]
0.001	18	10.28± 0.10	9.60 ±0.10[b]

Values are mean + S. E., a $p<0.01$, bp< 0.001

Table 2- Effect of chromium (Cr) on the rate of transport of glucose by the intestine of *Channa punctatus*

Concentration of Cadmium(mm)mM	(n)	Rate of Transport (μ mol glucose absorbed/g dry wt/h) Control	Experimental result
10	22	10.07 ± 0.24	11.09 ± 0.26[a]
1	22	9.24 ± 0.30	10.36 ± 0.28[a]
01	19	8.07 ± 0.24	9.62 ± 0.22[b]
0.01	18	8.75 ± 0.20	10.85 ± 0.45[a]
0.001	20	7.66 ± 0.14	11.22 ± 0.10[b]

Values are mean + S. E., ap<0.01, bp< 0.001

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REFERENCES

1. **Dixit, R.Malviya, D.Pandiyan, K,Singh U.B. Sahu, A. 2015.** Bioremadion of heavy metals from soil and aquatic environment and overview of principles and criteria of fundamental process sustainability. **7:**2189-2212.
2. **Stenmark, A. Belleza, E.L. 2017.** Hazarclous substances in plastics. Nordic council of Ministers, Copen Hagen Po.119.
3. **Zhang, Y.N. Huang, D. Jand Wang.Y. Q. 2005.** Heavy metal accumulations and tissue damage in gold fish *Carassius auratus*. *Bull. Environ. Contm. Toxicol*. **75:**1191-1199.
4. **Rathi, S. 2006.** Alternative approaches for better municipal solid waste management in Mumbai India. *J.of waste Manag.* **26:**1192-1200.
5. **Handa, N, Kohli, S.K.Sharma, A. 2019.** Selinium modulates dynamics of antioxidative defense expression, photosynthetic attributes and secometabolites to mitigate chromium toxicity in *Brassica juncea. J.Plants.Environ.Ex.Bot.* **161:**180-192.
6. **Mc Carty, L.S. J.A. C.Heney and A. H. Houston, 1978.** Toxicity of cadmium to gold fish, *Carassius auratus* in hard and soft water. *J.Fish research board Can.* 35.
7. **Merlini, M. 1978.** Hepatic storage alteration of vitamin B12 by cadmium in fresh water fish. *Bull. Environ contam.Toxicology.* 19767.
8. **Roch, Mand E.J. Maly. 1979.** Relationship of cadmium induced hypocalcemia with mortality in rainbow trout (*Salmo gairdneri*) and influence of temperature on toxicity. *J.Fish.Res. Board Can.* **36:**1297.
9. **Pickering, Q.H. 1980.** Chronic toxicity of hexavalent chromium to the *Pimephalus oromelas, Arch.environ contain Toxical.* **9:**405
10. **Park, J.T. and M.J. Johnson, 1963.** Colorimetric analysis of sugars:methods in enzymology vol III Academic press New York.86-87.
11. **Fisher, R.A. 1950.** Statistical methods for research workers, Med. Oliver and Boyd, London.
12. **Newcomer, A.D. 1973.** Digestion and absorption of protein. *Mayo Clin. Proc.* **48:**624
13. **Csaky, T.Z.1965.** Transport through biological membrane. *Annu. Rev.Physiol.* **27:**624.
14. **Alvarado, F. 1966.** Tronsport of sugars and amino acids in the intestine, evidence for a common carrier. *Science*. **151:**1010.
15. **Miller, D.A., Shehata, A.T. and J.Lerner. 1980.** Mercury chloride inhibition of DS. Glucose transport in juvenile tissue. *J.P harmacol. Exp.Ther.*214-101
16. **Wapnir, R.S. Moak and S.Teichberg. 1979.** Alterations of intestinal and renal functions in rats after intra peritoneal injections of lead acetate. *J.Lab.Clin.***94:**144.

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