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HISTOLOGICAL FEATURES & STUDIES OF FISH *Channa punctatus* TREATED WITH DETERGENT

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ABSTRACT:
Anthropogenic activities do, however cause an increased discharge of the industrial effluents into the natural aquatic ecosystems. Due to this, the native aquatic organisms are exposed to extraordinarily high level of industrial pollutants. The pollutants can affect the animals directly by causing acute to chronic diseases or they could affect the animals indirectly by stressing them and thus allowing them to be vulnerable to parasites or other disease causing agents. Many attempts have been made to elucidate the relationships between pollution and disease. Prevalence of integument lesions, skeletal anomalies and chromosomal anomalies has been found to be in good association with environmental contamination. There is an emerging relationship between particular categories of diseases and pollution. Fishes are relatively sensitive to the changes in their surrounding environment. Hence, fish health may reflect the health status of a specific aquatic ecosystem. An early toxic effect of pollution is only evident on cellular or tissue level before significant changes can be identified in fish behaviour or external appearance.

KEY WORDS: Pollutants, Fishes

INTRODUCTION:

Chemically, cadmium is very similar to zinc and these two metals frequently undergo geochemical processes together. Both metals are found in water in the +2 oxidative states. The effects of acute cadmium poisoning in humans are very serious. Acute symptoms include severe abdominal pain associated with nausea, vomiting, diarrhea, headache and vertigo. Chronic symptoms include high blood pressure, kidney damage, destruction of testicular tissue, and destruction of red blood cells. It is believed that much of the physiological action of cadmium arises from its chemical similarity to zinc. Specifically, cadmium may replace zinc in some enzymes, thereby altering the stereo structure of the enzyme and impairing its catalytic activity. Thus cadmium is certainly a dangerous water pollutant, causing major water quality problems.

Ever since man adopted agriculture as a profession, he has put in lot of efforts to protect his crops-discovering, innovating, experimenting with means and methods. *Pesticides* occupy a special place in his armory, possibly being the most effective. But today so wide spread and so great is the worked by pesticides in large parts of the country that their entry and presence in the food chain is now an admonished fact.

In the present study treatment with cadmium endosulfan and detergent mentioned during exposure of all three toxicants and its combination has demonstrated to induce toxicity in various biochemical, hematological and enzymological parameters of teleost fish *Channa punctatus*. Further the objective was to examine cadmium, endosulfan and detergent toxicity is due to oxidative stress.

REVIEW OF LITERATURE

Changes in organs/tissues have been widely used as biomarkers in the evaluation of the good commodity of fish exposed to contaminants, both in the laboratory (Wester & Canton, 1991; Thophon et al., 2003) and field studies (Hinton et al., 1992; Schwaiger et al., 1997; Teh et al., 1997). One of the great advantages of environmental monitoring is that this category of examining specific target organs, including gills, kidney and liver, which are responsible for vital functions, such as respiration, excretion and the accumulation and

biotransformation of xenobiotics in the fish (Gernhofer et al., 2001) and all can be revealed only by such study. Furthermore, the alterations found in these organs are normally easier to identify than the functional ones (Fanta et al., 2003), and serve as warning signs of damage to animal health (Hinton & Laurén, 1990).

Tissue changes in test organisms exposed to a sub-lethal concentration of toxicant are a functional response of organisms which provides information on the nature of the toxicant. Numerous reports are available to understand the biochemical physiological and metabolic alterations that are created by the chronic effects of pesticides on animals and fishes (Sornaraj et al., 2005; Aruna et al., 2000; Geetha et al., 1999; Ranjitsingh et al., 1996; Sambasiva Rao, 1999). Although major advances have been made in recent years in science, the histology and histopathology of fish and other aquatic invertebrates are still to be studied when compared with mammals (Rand and Petrocelli, 1985). Regarding histopathological effects of pesticides on various organs of fish are scanty (Dwivedi, 2000; Inbamani and Srinivasan, 1998; Banerjee and Shelley, 1997; Usha, 1997; Adhikari, 1996).

Effect of cadmium, endosulfan, detergent and other toxicants on fish blood has been examined by a number of workers. Cadmium has been demonstrated to induce a broad spectrum of pathophysiological conditions that are either directly or indirectly associated with erythropoiesis (Berlin and Friberg 1960., Berlin and Piscator, 1961., Fox *et al*. 2010). Cadmium has been reported to increase ALAD activity depending upon substrate availability (Wilson *et al*. 1972) and to inhibit the level of ALAD's activity (Abdulla and Haeger-Aronsen 1971). It has been observed that cadmium can decrease the circulating time of erythrocytes (Berlin and Friberg, 1960) and can cause an anemia presumably of the microcytic type (Fox *et al*. 1971). Srivastava and Mishra (1979) reported significant decrease in thrombocyte count and coagulation time in *Colisa fasciatus* after treatment with cadmium.

Decrease in erythrocyte and nuclear detergentace area in *Anabas testudineus* on exposure to sublethal concentrations of $ZnCl_2$ (300 mg/l), $HgCl_2$ (0.2 mg/l) and $CdCl_2$ (350 mg/l) has been reported by Krishna Kumari and Banerjee (1986). Ruparelia *et al*. (1986) have reported cadmium to produce the normocytic anaemia and elevated blood glucose level in *Sarotherodon mossambica.* Haematological abnormalities in *Cyprinus carpio* exposed to sublethal concentration of cadmium nitrate and mercuric chloride (0.30 ppm) for 90 hours has been reported by Beena and Viswaranjan (1987). Significant decrease in erythrocyte count and other haematologic parameters was reported in *Anabas testudineus* by Banerjee and Kumari (1988) on exposure to LC_{so} concentration of Zn, Hg and CdCh for 24 houjrs. Tort and Pascual (2014) reported that cadmium did not induce any significant change in majority of blood characteristics of dogfish *Scyliorhinus canicula.* Haematological parameters were examined in five Gangetic fishes with special reference to sex and pollution harbouring between Kalakankar and Phaphaman by Shrivastava *et al*. (1991). In their study they observed higher total erythrocyte count and packed cell volume and lower mean cell haemoglobin in males than in females. Lower total erythrocyte count, haemoglobin content and higher mean cell haemoglobin values were observed in these Gangetic species than in fishes of other freshwater bodies. Exposure of *Anabas testudineus* to a sublethal concentration of cadmium for 30, 45 and 60 days resulted in significant increase in RBC count, WBC count and haemoglobin concentration (Saravanam and Natarajan, 2012). Thallium nitrate induced anemia and decrease in RBC count, Haemoglobin and PCV and increase in the MCHC, WBC count and MCH values have been reported by Garg *et al*. (2015). Ahmad and Datta Munshi (1992) have observed that red blood cell morphology of *Catla catla* exposed to 96 hours showed shrinkage and crenation in their configuration alongwith slight erythronisocytosis and degeneration of cell membrane. Ravindra Kumar and Agarwal (1993) have reported significant decrease in RBC, Hb, ESR and MCHC and increase in WBC count after 15 and 30 days of exposure to sublethal concentration of mercuric chloride in *Clarias batrachus.*

HEMATOLOGICAL STUDIES

The circulating blood is intricately intertwined with many facets of normal physiology and pathophysiologic mechanisms. Blood is a transport medium, a defense system, and an acid/base buffer system. Circulating blood is the common denominator of health and illness and alterations in its chemical or cellular illness and alterations in its chemical or cellular composition can indicate haematologic and non-haematologic disease.
The erythrocytes occupy the largest fraction of the formed elements of the blood. In normal functioning of the body, the blood counts remain stable, but environmental as well as pathologic conditions can alter the RBC count. Variations in either direction outside the designated range of normal counts usually indicate an erythropoietic dysfunction.

Haemoglobin is the respiratory protein contained within the erythrocytes. It has a multitude of functions in the circulatory system i.e. transport of oxygen to body tissue; removal of CO_2 from body tissue; acting as the most important buffer in the blood. It is a representative of the globular proteins. Any examination of the haemoglobin molecular necessarily includes the synthesis of the materials that makes up this important molecular. The body has a great capacity for conservation; it relinquishes very little of those respurces that may be reused. The destruction and reutilization of haemoglobin is a good example of this conservation. Lysis of erythrocytes when occurs in the bloodstream, is called *intravascular hemolysis* and when occurs by phagocytosis or sequestration by the reticuloendothelial system is called *extravascular haemolysis.*

The haematocrit (packed cell volume) is the volume of red blood cells in a given unit of blood. Normally, there is a direct relationship between the red blood cell count and haematocrit value-an increase in one produces an increase in the other; the converse is also true. In certain pathologic conditions, however, this relationship does not exist.

HEMATOLOGICAL METHODS

Blood from caudal vessel of control and experimental fish was drawn with the help of heparinized needles. Haemoglobin, haematocrit, erythrocyte and leukocyte count were made in whole blood. Protein was determined in plasma and the activities of glutamate-oxalacetate transaminase and glutamate-pyruvate transaminase were determined in serum.

RESULTS

TEC (Million/mm^3)- Total erythrocyte count were observed to be 2.10 million/mm^3 after 15 days post exposure. This value found to be significantly declined ($p<0.05$) in comparison to control group. The table shows as alteration in hematological parameters in *Channa punctatus* exposed to cadmium, detergent and endosulfan after 15 days post exposure.

Parameters	Control	Cadmium	Detergent	Endosulfan	Cadmium + Detergent	Cadmium + Endosulfan	Detergent + Endosulfan	Cadmium + Endo. + Detergent
Hb (mg/dl)	7.0 ± 0.38	5.6±0.37	6.75±0.37	6.5±0.23	5.5±0.32	6.0±0.17	5.9±0.17	5.0±0.29
TEC (Million/mm^3)	3.5 ±0.09	3.2±0.16	2.1±0.13	3.2±0.07	3.8±0.15	2.90±0.08	3.5±0.07	2.9±0.19
TLC (x10^4 m^3)	6500 ± 0.17	10000±0.73	5900±0.36	5850±0.20	3800±0.23	6600±0.19	8000±0.17	4500±0.16
PCV (%)	34.12 ± 1.01	22.30±1.0	23.50±2.06	27.50±1.52	24.30±3.0	22.0±2.08	24±2.08	18.50±1.52

MCV (fl)	97.49 ±1.61	69.69±6.06	111.980±6.67	85.93±0.34	63.94±9.73	75.86±2.60	68.57±2.84	63.79±7.87
MCH (pg)	20.0 ±0.30	17.50±2.26	32.14±0.34	20.31±0.32	14.47±0.46	20.68±2.02	16.85±0.43	17.24±0.65
MCHC (mg/dl)	20.51 ± 0.28	25.11±0.37	28.72±0.17	23.63±0.15	22.63±0.27	27.27±0.08	24.58±0.11	27.00±0.19

Values are mean ± SD; n= 6

*Significant, $p<0.05$, $p<0.01$, $p<0.001$

CONCLUSIONS

Hematological studies showed that exposure of *Channa punctatus* to cadmium, detergent, endosulfan and their combinations caused marked alteration in hematological parameters, emphasizing anemic and leucotoxic effect of heavy metals, pesticide and detergent on blood.

REFERENCES

1. Anees, M.A. (1978): Haematological abnormalities in a freshwater teleost, *Channa punciaius* exposed to sublethal and chronic levels of three organophosphorus insecticides. lnt. J. Ecol. Environ. 4, 53 pp.
2. Banerjee, V. and K. Kumari (1988) : Effect of zinc, mercury and cadmium on erythrocytes and related parameters in the fish Anabas *testudineus* Env. and Ecol. 6, 737-739.
3. Dange, A.D. (1986a): Changes in carbohydrate rnetabolisn1 in Tilapia, *Oreochromis (Sarotherodon) mossambicus*, during short tern1 exposure to different types of pollutants. Environ. Pollut. 41, 165-177.
4. Das, S.K. and A. Kamraj (2012): Accumulation of cadmium in Heteropneustes jossilis and change:- in haelnatological parameters J. NATCON. 2, 25-30.
5. Denton, G.R.W. and C. Burdon-Jones (1981): Influence of ternperature and salinity on the uptake, distribution and depuration of Illereury, cadluiulll and lead by the black-lip oyster .S(1ccoslrea echinata. Mar. BioI., 64, 317-326.
6. Eller, L.L. (2015): Histological lesions in cut throat trout (Salrno clarki) exposed chronically to the insecticide endrin. Am. J. Patho!. 64, 321-336.
7. Garg. V.K.. Singh, D.V.. Garg.. S.R.. and S.K. Tyagi (2003): Haematological alteralin in lead exposed fish Clarias hatrachus. Ad. Bios. 9(1). 79-84.
8. Gill, T.S., Tewari, M. and J. Pande (200l): In vivo and in vitro efTecls of cadmium on selected enzymes in diffennt organs of the fish Barbus conchonius. Ham (Rosy barb). COlnp. Biochenl. Physiol. 100C, 501-505.
9. Godin, P. (2014): Les sources de pollution des sols: Essai de quantification des risques dus aux elements traces. Sci. duo Sol. 5,73-87.
10. Goel, K.A and Maya (1986): Haematological anamolies in Clarias batrachus under the stress ofrogor. Ad. Bios. 5(11), 187-192.
11. Khan. N.A .. Alullcd. 1\.. NomClni. 1\.1\. and M. 1\J lila I (1981): Atomic absorption spectrophotornetric studies or cadnliurn and zinc in commercial fertilizers, soils, and river W;"1ters. Environ. Pollut. 2, 259-264.
12. Roy, D. (2014):, Detergent-induced changes in the mapping of certain enzymes in various cell types of Rita rita. Ecotoxicology and Environmental safety 17, 59-66.
13. Sadhu, A.K., Chowdhary, D.K. and P.K. Mukhopadhyaya (l985): Relationship between serum enzymes histological features and enzymes in the hepatopancreas after sublethal exposure to malathion and phosphamidon in the murrel Channa striatus. Bl. Intern. J. Environ. Studies, 24, 35.
14. Yatim, S., Surtipanti, S., Suwinna S. and E. Lubis (1979): The heavy metals distributions in sea water of Jakarta Bay. Majalals Batan. 12, 1-19.