Int J Biol Med Res.2019 ;10(2):6730-6734

Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Histopathology Changes In Indian Catfish Clarias batrachus Exposed To Zinc Chloride

A.Palanivel, N.Arunpandiyan

Department of Zoology (UGC-SAP & DST-FIST Sponsored), Annamalai University,

ARTICLE INFO

Keywords:
Histopathology
Zinc chloride
necrosis
Liver
Gills
Clarius batrachus

ABSTRACT

Heavy metal pollution poses a great threat to fishes. When fishes are exposed to elevated levels of metal in the polluted aquatic ecosystem, they tend to take these metals up from their direct environment. The fish constitutes a valuable commodity from the standpoint of human consumption. Heavy metal toxicants are accumulated in the fish through the general body surface which affects their life support system at molecular and biochemical levels. Once this toxic substance enters the body of fish, they damage and weaken the mechanism concerned leading to physiological, pathological and biochemical disorders. Most trace metals are important for the customary functioning of the physiological processes in fish. The abnormally high concentration of metals can, however, cause cellular and histological changes. An investigation of the effect of heavy metals like zinc chloride on Freshwater fish Clarias batrachus carried out in the lab. Fishes deliberation 10 ± 0.5 g and 10 ± 1 cm length were exposed to sublethal concentrations (derived, supported acute toxicity tests) of zinc chloride 0.19, 0.09, 0.05 and 0.03 ppm for 30 days. throughout this catfishes were fed with unnaturally ready food. On the 10th, 20th, 30th-day fishes were taken out, sacrificed and also the tissues of gill and liver were excised out. the full autopsy was completed in but 4 minutes. The result showed that the degree of distortion of the gill, the liver was proportional to the exposure amount and concentration of the metals was found to be dose and time-dependent.

©Copyright 2010 BioMedSciDirect Publications IJBMR - ISSN: 0976:6685. All rights reserved.

1. Introduction

More and additional of our habitats ar being deteriorated day by day because of increased environmental pollution by means that of assorted anthropogenetic activities. The industrial effluents that contain cyanogenetic substances like serious metals, pesticides, and different chemicals square measure discharged into the water bodies. Any pollutant which is discharged into water will change the surface tension, thermal properties, conductivity, density and pH value along with biodegradable (proteins, fats, pesticides, fungicides etc), and non- biodegradable pollutants. The acidic and alkalescent pollutants destroy most of the invertebrates and microorganisms (Barber and Sharma, 1998. As a result, the aquatic fauna and flora square measure adversely affected, that cause bioaccumulation in aquatic organisms and bioconcentration in higher vertebrates (Ackerman, 2001). The eco-friendly environment is a necessary condition for the well being of the human race. The degree contamination in the aquatic environment is frequently assessed by comparing containment concentration in associated biota. Since bioconcentration of compounds has been determined in the environment, it has been observed that there are many quantitative relationships between structure and biological activity of chemicals established in the aquatic system. However, the most sites of those significant metal uptake and accumulation ar the gills and duct tracts. Lead is a common heavy metal found in the environment and is derivable from urban wastewaters, industrial discharges, and agriculture runoff. Its inclusion in gas as anti-knock contribute to its incidence within the air, that is transported to the streams and rivers be runoffs where fish and completely different aquatic organism take it up and incorporate it into their body. As Associate in Nursing indicator of surroundings livability, fish appears to be important since it's laid low with the living home ground (namely water), that is these days impure by effluents from industries, pesticides washed out from agricultural lands and detergents from house drains etc. This paper is aimed at determining the gills, liver, of the Clarias batrachus to sublethal concentration of zinc chloride.

Materials And Methods

Healthy living specimens of C.batrachus weighing 10 ± 0.5 gm and 10 ± 1 cm in length have been brought from Annamalai Nagar Chidambaram, Cuddalore District. They were dropped at the laboratory in well-aerated containers, to avoid disorder, physical injuries, and stress to the fish. The fishes were screened for any pathological symptoms and washedwith1% KMnO4 resolution.

* Corresponding Author : **A.Palanivel,**
Department of Zoology (UGC-SAP & DST-FIST Sponsored),
Annamalai University,
Palanivel.a.mphil@gmail.com, arunpandiyanzoology@gmail.com

© Copyright 2011. CurrentSciDirect Publications. IJBMR - All rights reserved.

The healthy specimen was then transferred to glass aquaria (50 x 25 x 25 cm) containing H2O. The fishes were acclimatized to the laboratory conditions for 15 - 20 days before experimentation. Fishes were nourished with fake pellet diet; water was supplanted with clean water at whatever point essential. The chemical science characteristics of the water were analyzed as per the procedure of (APHA, 1995), Yankee public health association. The check fish was known to the species level. Size and weight were taken the fishes were ready to uncontaminated water for 20 Days.

Preparation of Stock resolution

Zinc Chloride was of chemical agent grade. focused stock solutions were ready by deliberation the right quantity of the salts and dissolved in water (1g/l). The aliquot volume of calculated stock resolution to yield needed} concentration was extra to the tank to grant the precise required concentration of the significant metal. within the gift study 1/10, 1/20, and 1/30 of the 96h LC50 were hand-picked as sublethal concentration and also the fishes were exposed to every concentration for an amount of ten, twenty and thirty days. a sway batch similar to every take a look at cluster was at the same time maintained. The experiments were recurrent 5 times and concentrations provided daily to take care of a continuing toxic media. Fishes were taken out, blotted dry with soft absorbent paper and compound to get rid of liver and gill tissue. The organ was preserved in labeled sample bottles containing formal saline, sectional and slide preparations were created for histologic investigation beneath the microscope.

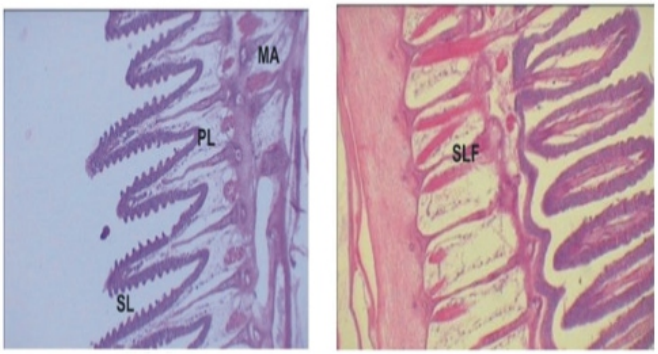
Result

Histological Study

Impact of Zinc Chloride on Gill

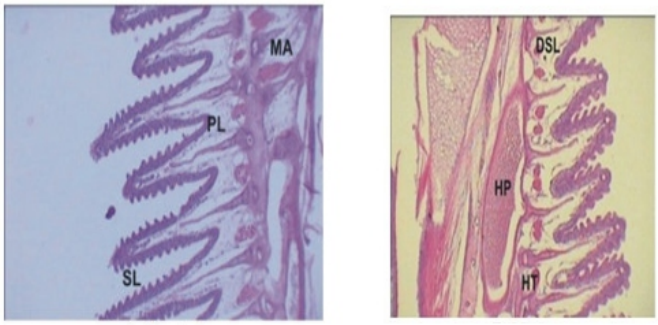
The histopathological studies indicated that the gill of C.batrachus was treated by sublethal concentrations of Zn Chloride. when ten days (Plate 1A), minimum changes were ascertained. Not several changes were ascertained in Primary lamellae however the secondary lamellae were consolidated along to most of their length with the terminal 1/3 portion free (Plate 1B). The infused secondary lamellae were diluent compared to their controls. The animal tissue cells were seen between the consolidated secondary lamellae. In some case, secondary lamellae gave the impression to be sinuate. In twenty days treated fish, pronounced changes just like the distortion of secondary lamellae, hypertrophy of gill filament and dysplasia of animal tissue surface, detachment of animal tissue from underlying pillar system, the fusion of secondary lamellae ensuing may be a reduction within the area of the animal tissue was detected (Plate 2B).In fish treated up to thirty days, the changes ascertained within the gill of C. batrachus were severe erosion and degeneration of gill animal tissue and aggregation of blood corpuscles. Fusion of the Boundary of the secondary lamellae multiplied with exposure periods (Plate 3B)

Plate 1 Histological lesion in Clarius batrachus (Cat fish) exposed to Zinc chloride, Gill - 10 days



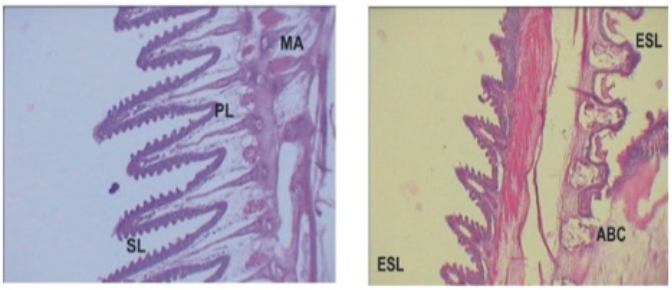
A. Control **B. Zinc chloride**

Plate 2 Histological lesion in Clarius batrachus (Cat fish) exposed to Zinc chloride, Gill - 20 days



A. Control **B. Zinc chloride**

Plate 3 Histological lesion in Clarius batrachus (Cat fish) exposed to Zinc chloride, Gill - 30 days

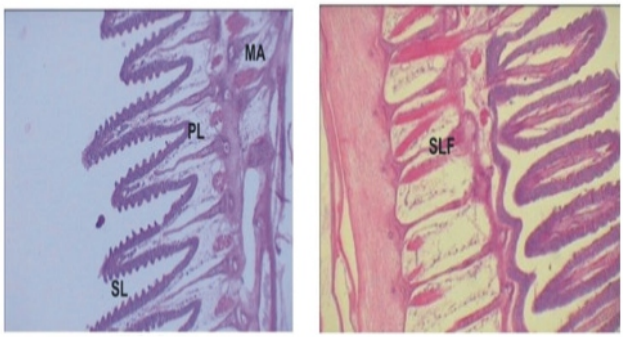


Impact of Zinc Chloride on Liver

In Clarias batrachus treated for 10, 20, 30 days, a substantial zone of liver tissue demonstrated upset hepatocytes with loss of ordinary palisade game plan. Following 10 days of introduction, degeneration of veins, vacuolization, and hypertrophy was watched (Plate 4A, B). The hepatocytes seemed swollen after treatment for 20days (Plate 5A, B). The liver demonstrated intense irritation including breaking of hepatocytes and expanded collection of pyknotic cores, corruption, vacuolization of tissue and degeneration of veins.

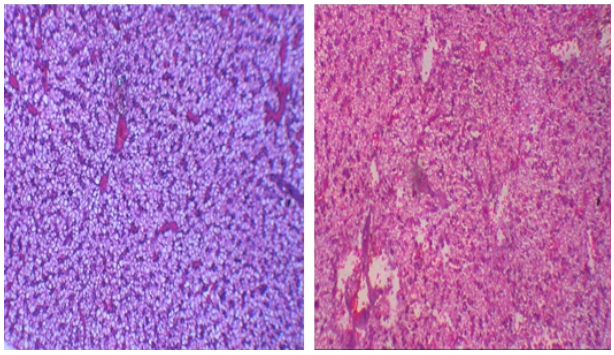
Toward the finish of 30 days presentation, the liver tissue had lost their cytoplasmic thickness and seemed obscure in numerous territories. Degeneration of hepatocytes indicating unmistakable vacuoles, putrefaction with sinusoidal injuries were the most extreme modifications watched.

Plate 4 Histological lesion in Clarius batrachus (Cat fish) exposed to Zinc chloride, Liver - 10 Days



A. Control **B. Zinc chloride**

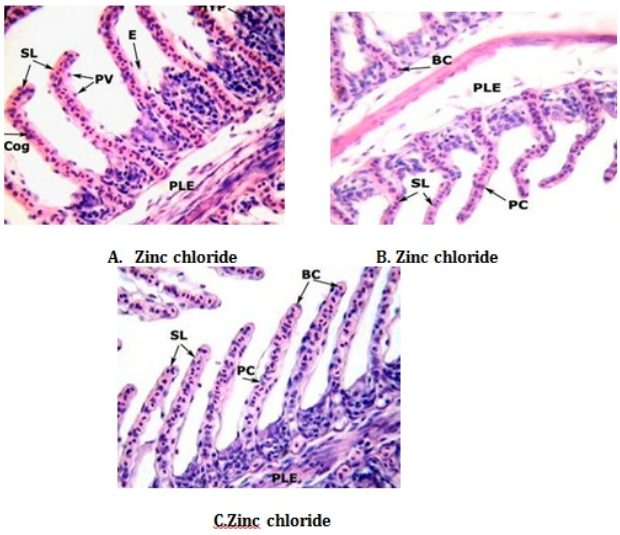
Plate 5. Histological lesion in Clarius batrachus (Cat fish) exposed to Zinc chloride, Liver - 20 Days



A. Control **B. Zinc chloride**

Impact of Zinc Chloride on Gill

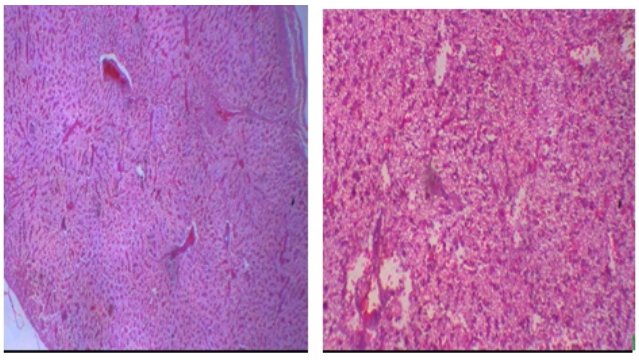
In fish presented to sublethal convergence of Zinc Chloride different histopathological adjustments are seen following 10 days of presentation (Plate 1C). The optional lamellae are thin and are intertwined. The shape was adjusted. The disintegration of hypertrophy of mucous cells, epithelial cells, degeneration of pilaster cells and epidermal cells were taken note. The combination of auxiliary lamellae may have been because of intemperate discharge of Mucous. In 20 days treated fish, changes like the bending of epithelial cells, hypertrophy of gill fibers, hyperplasia of the epithelial surface was clear. The decrease in the surface region of the epithelium and separation of epithelium from the column framework was. taken note. (Plate 2C).At the finish of 30 days, as the span of treatment expanded, mucous cells expanded alongside twisting of gill fibers and lamellar locales. Serious edema, the division of respiratory epithelium and vacuolization changes were watched (Plate 3C).



Impact of Zinc Chloride on Liver

In fish at 10 days of treatment, swollen hepatocytes were taken note. Degeneration of hepatocytes, vacuolation space arrangement was obvious, all through the tissue (Plate 4C). At 20 days of presentation and high fixation aggregation of veins, blockage of hepatic tissue was likewise watched (Plate 6.A.B). Following 30 days of treatment, the liver was exceedingly harmed subcapsular vacuolization, corruption, undefined cell limits in numerous spots and pyknotic cores were additionally watched. As the length expanded, serious debasement of the liver cells or hepatocytes and hypertrophy of hepatic cores and bunching was apparent in numerous spots.

Plate 6 Histological lesion in Clarius batrachus (Cat fish) exposed to Zinc chloride, Liver - 30 Days



A. Control **B. Zinc chloride**

Discussion

The histological changes on fish is a critical and promising field to comprehend the degree to which changes in the auxiliary association are happening in the organs because of natural contamination. Singh et al. (1990) examined natural contamination and its consequences for amphibian creatures. Heavymetal toxicant prompts numerous neurotic changes in

various tissues of fish and has been accounted for Labeo rohita presented to mercuric chloride and Chana punctatus presented to phenylmercuric acetic acid derivation (Karuppasamy,2000). Srivastava et al. (1982) have watched the histopathological changes and gathering potential in the fish tissues under chromium stretch. Cadmium presentation prompts the presence of granular stores in the liver, the decay of the proximal renal tubules, and increments in chloride cell turnover at the gills (Pratap and wendelaar Bonga, 1993). Gill hyperplasia, putrefaction of the intestinal mucosa, fat invasion of liver parenchyma cells, pulverization tubes were seen because of smelling salts harming in the intestinal tract, kidney, and gills of adolescents Sparus auratus (Zaki et al., 1987). Gill is a vital tissue in light of its immediate contact with water and any impact of the organization need to experience it to come into the fish body (Jana and Bandopadhyaya, 1987). It has been proposed that waterborne offices harm angle gills, probably by causing the breakdown by the gas-trade instruments with the subsequent tissue hypoxic conditions (Natarajan, 1985a). The microphotographs of the gill of C. batrachus have been watched. In control angle, the structure of gills is like that of other new water feline fish as portrayed by Laurent,(1989) whereas the gills of the exploratory fish presented to cadmium and mercury (10, 20 and 30 days) indicate dynamic emission of mucous. All the more explicitly, in the mercury-treated gill, the epithelial layer was upset. In a couple of locales, deterioration and combination of essential lamella were watched. In cadmium treated gill, stamped hyperplasia of the branchial arch, pilaster cell vacuolization and clog of veins were all around checked. Comparative outcomes have likewise been seen by Skidmore,(1972) in rainbow trout when presented to zinc sulfate. Histological experimentations of the gills of rainbow trout by Lloyd, (1965) when presented to zinc, lead and copper demonstrated division of the epithelium from the gill lamellae and cells sloughed off into the spaces between the fibers. These progressions are in concurrence with the present perception when the fish is inebriated with the substantial metals mercury and cadmium. The outcomes are additionally in plan with crafted by Kapilamanoj and Ragothaman, (1999) who have detailed for Boleopthalmus dimeric presented to the sublethal grouping of cadmium. In the present examination vacuolization, spacer arrangement, and coming about discharge, hypertrophy of hepatocytes and amassing were seen in mercury-treated tissues and broad corruption, pyknotic cores in the cadmium-treated liver. Kabir and Begum (1978) announced cytoplasmic degeneration, pyknotic cores in liver tissues, vacuolation in hepatic cells and crack of veins; degenerate hepatic cells and necrotic nucleic when Heteropneustes fossils were presented to C. punctatus to a sublethal centralization of endocrine and watched hypertrophy of hepatic cells and liver rope chaos, vacuolation of cytoplasm and corruption, burst of hepatic cell layers and necrotic centrilobular region. These kinds of histological modifications were likewise seen in the live tissue of Labeo rohita presented to tannery gushing (Rana and Sudhir, 1999). The liver tissues of L. rohita demonstrated histological changes because of aflatoxin was given to angle intraperitoneally (Sahoo et al., 2001). Definitively, metals are put away in various destinations in creatures relying upon the metals and on the creature species. To check the nonstop acquaintance of these metals in with the evolved way of life, a more careful utilization of bug sprays and pesticides ought to be utilized and effluents from businesses must be treated before transfer.

References

1. Ackerman PA, Iwama GK (2001). Physiological and Cellular Stress Responses of Juvenile Rainbow Trout to Vibriosis, J. Aquat. Anim. Prosperity., 13: 173-180.
2. Barber D, Shrma MS (1998). Tentatively Induced Bioaccumulation and Elimination of Cadmium in Freshwater Fishes. Survey. Res., 17: 99 - 104.
3. Jagadish CG, Sahai S (1989). Impact of an Organophosphorus and Carbamate Pesticide on the Pituitary Gland of Anabas Tesfudineus-A Comparative Study. Proc. Environ. Hazard Assess., AEB, India.
4. Karuppasamy R (2000). Tissue Histopathology of Channa punctatus (Bloch) under Phenyl Mercuric Acetate Toxicity. Notice of unadulterated and related science., 19: 109-116.
5. Lloyd RH (1965). Components that Effect the Tolerance of Fish to Heavy Metal Poisoning. Natural Problems in the Water Pollution, third Seminar, U.S. Dept., Health Education and Welfare., pp. 181.
6. Pratap HB, Wendelaar Bonga SE (1993). Impact of Ambient and Dietary Cadmium on Pavement Ceils, Chloride Cells, and Na+/K+ ATPase Activity in the Gills of the Freshwater Teleost Oreochromis Mossombicus at Normal and High Calcium Levels in the Ambient Water. Aquat. Toxicol., 26: 133-150.
7. Fingerman M, Devi M, Reddy PS, Katyayani R. Effect of substantial metal presentation on the sensory system and endocrine interceded forms in Crustaceans. Zool Stud 1996;35:1–8.
8. Iqbal F, Quershi IZ, Ali M. Histopathological changes in liver of cultivated Cyprinid fish, Cyprinus carpio, following nitrate presentation. Pakistan J Zool 2005;37:297-300. Brunk U, Brun A, Skold G. Histochemical show of substantial metals with sulfide silver technique. A methodological report. Acta Histochem 1968;31:345-7
9. Benson WH, Baer KN, Stackhouse RA, Watson CF. Impact of cadmium presentation on chose hematological parameters in crisp water teleost, Notemigous chrysoleucas. Ecotoxicol. Environ Saf 1987;13:92-6.
10. Kumar S. what's more, Pant S.C. 1981.Histopathological impacts of intensely poisonous dimensions of copper and zinc on gills, liver, and kidney of punctius conchonius (Ham). Indian J.Exp.Biol.19:191-194.
11. Kumar, P; Y. Prasad, A.K.Patra, Ranjan, R.C. Patra, D.Swarup and A.K. Pattanaik. 2008.Accumulation Pattern of Cadmium in tissues of Indian Catfish Clarias batrachus. Creature Nutrition. What's more, feed Technol;8(1)115-119.
12. Ramalingam, K.1988.Effect of DDT Malathion and mercury on the liver histomorphology of the fish Sartherodon mossambicus. Environ.Ecol.6(3):761-762.
13. Loganathan KB, Velmurugan J, Hongray Howrelia M, Selvanayagam BB, Patnaik. Zinc instigated histological changes in cerebrum and liver of Labeo rohita (Ham.). Journal of Environmental Biology. 2006; 27(1):107 - 110.
14. S Madhusudan, L. Fatma, L, and C. Nadim, Bioaccumulation of Zn and Cd in new water angles, Indian Journal Of Fisheries, 50 (1), 2003, 53-65.
15. AM Farag, T. May, GD. Marty, M. Easton, DD. Harper, EE. Little, and L. Cleveland, (2006) The impact of endless chromium presentation on the strength of Chinook salmon (Oncorhynchus mykiss). Sea-going Toxicology, 76(3– 4), 2006, 246– 257.
16. KL. Crump, and VL. Trudeau, Mercury-initiated conceptive impedance in fish. Ecological Toxicology and Chemistry, 28, 2009, 895– 907.
17. Hemalatha, S., Banerjee, T.K., 1997b. Histopathological investigation of intense poisonous quality of zinc chloride to the respiratory organs of the air-breathing catfish, Heteropneustes fossilis (Bloch). Vet. Arhiv 67,1-24.

18. Sharipudin, N.N.M., Abdul Razak, I.S., Daud, H.H.M., Matori M.F., 2012. Histopathological changes of skin and gills of catfish (Clarias gariepinus) presented to organophosphate toxicant. In: seventh Proceed-ings of the Seminar in Veterinary Sciences, 27th February–second March 2012. Universiti Putra Malaysia, Malaysia
19. Susithra, N., Jothivel, N., Jayakumar, P., Paul, V.I., 2007. Toxico-neurotic effect of cadmium chloride on the adornment respiratory organ of the air-breathing catfish,Heteropneustes fossilis. Iran. J. Environ. Wellbeing Sci. Eng. 4 (1), 1– 8.
20. Dwivedi S, Chezhian A, Kabilan N, Kumar TS. Synergistic impact of mercury and chromium on the histology and physiology of Fish, Tilapia mossambica (Peters, 1852) and Lates calcarifer (Bloch, 1790). Toxicol Int 2012;19:235-40.

© Copyright 2019 BioMedSciDirect Publications IJBMR - ISSN: 0976:6685.
All rights reserved.