

Protection of Fish Liver with Liv.52 Against Cadmium Intoxication – A Histological Study

Rathore, H.S. and Naik, B.K.

School of Studies in Zoology, Vikram University Ujjain, Madhya Pradesh, India.

ABSTRACT

Heteropneustes fossilis were exposed to: A) Tap water fed on 2 gm shrimps control, B) 10 ppm Cadmium chloride solution in tap water fed on 2 gm shrimps daily and C) 10 ppm CdCl₂ solution in tap water fed on 2 gm of special food which consisted of 25 gm Liv.52 powder (made by The Himalaya Drug Company, Bombay) in 100 gm of powdered shrimps. In each case 2 gm food was mixed in drop of neutral paraffin.

Experiment was done for 30 days. On 31st day liver was processed for histology. Camera lucida drawings were made to record size of hepatocytes. Gall bladder was also measured for its size. Cd-Damages hepatocytes. Blood vessels and caused infiltration. In group 'C' liver shows healthy hyperactive liver cells. Cd-exposure caused enlargement of gall bladder while it's size is normal in group C.

Possible mode of action of this herbal hepatotonic drug is discussed.

INTRODUCTION

Cadmium accumulates (Nakamura, 1974) and affects fish life (Rosenthal and Sperling 1974). Recently Liv.52 a herbal hepatotonic drug has been found to protect liver and gut in *Mystus tengara* against Cd-intoxication (Reddy, 1987, Reddy and Kothari, 1989, Kothari *et al.* 1990). Aim of the present investigation was to confirm hepato-protective role of Liv.52 against Cd-toxicity.

MATERIAL AND METHODS

Thirty *Heteropneustes fossilis* 10-15 long, 25-30 gm wt of both sexes were divided into following three groups.

GROUP A: CONTROL: No treatment, exposed to tap water.

GROUP B: Cd-exposure: Fish exposed to 10 ppm CdCl₂ solution in tap water.

GROUP C: Cd-Exposure plus Liv.52 Administration. Fish exposed to 10 ppm CdCl₂ solution in tap water fed on special food.

For Group 'A' and 'B' food consisted of 2 gm dried shrimps mixed in a drop of liquid paraffin per day. Special food consisted of well mixed 25 gm of Liv.52 powder in 100 gms of powdered dried shrimps. 2 gms of this mixture was mixed with a drop of liquid paraffin and fed to fish of Group 'C' every day. Medium was changed twice a week. No mortality was recorded in any group.

Experiment was done for 30 days. On 31st day all fishes were killed. Sections Bouins fixed liver were stained in Delafield-Eosin. Carefully freed gall bladder was placed on graph paper to record its length and width. Camera-lucida drawings were made to record size of hepatocytes.

Each Liv.52 tablet contains:

<i>Capparis spinosa</i>	65 mg
<i>Cichorium intybus</i>	65 mg
<i>Solanum nigrum</i>	32 mg
<i>Cassia occidentalis</i>	16 mg
<i>Terminalia arjuna</i>	32 mg
<i>Achillea millefolium</i>	16 mg
<i>Tamarix gallica</i>	16 mg
Mandur Bhasma	33 mg

For details see Liv.52 A Monograph published by manufacturer, The Himalaya Drug Company, Bombay.

RESULTS

Appetite: Fish in Group 'B' did not consume given food fully while in Group 'A' and 'C' fish consumed given food in 3 hours.

Group C normal structure suggest protective role of drug.

Size of Gall Bladder: Cd exposure causes swelling of gall bladder while normal size is seen in Group 'C' Data are given in Table 2.

DISCUSSION

- I. **Appetite:** Results shows loss of appetite in Group 'B'. This is an expected finding as Cd does so in laboratory animals and fish (Nearthy 1980; Karson *et al.* 1985; Reddy and Kothari, 1989) Fish in group 'C' like those in Group 'A' consumed given food fully. Infact Liv.52 is known to promote appetite and causes better food utilization (Srinivas and Balwani, 1968).
- II. **Histopathology:** Results show Cd-induced liver damage. This finding also get support from previous reports Dubale and Shah, 1979, 81: Ravi and Ramamoorthy, 1989). Liver in Group 'C' shows better picture than controls. Single report on fish (Reddy, 1987) confirms this observation. However, this observation can be explained on the basis of known properties of this drug. It protects and regenerates mammalian liver against hepatotoxins: maintains normal activities of GOT, GPT, alkaline phosphatase, respiratory enzymes, drug metabolizing enzymes (Joglekar *et al.* 1963; Subbarao 1976; Prasad, 1980. Rathore and Varma, 1987). It has also been found that Liv.52 could protect blood vessels following irradiation (Saini *et al.* 1984). Possibility of similar action of Liv.52 in case of this fish can't be ruled out.
- III. **GALLBLADDER:** Cadmium affects lipid metabolizing enzymes and lowers lipid content in mammalian systems (Nakagawa *et al.* 1979; Waku *et al.* 1980; Rana *et al.* (1980, 1981). In case of catfish *Clarias batrachus*, Katti and Sathynesen (1984) have reported that Cd-exposure lowered lipid content. It appears that in the present case also Cd-exposure might have lowered lipid metabolism hence less bile was utilized and good amount was accumulated which

resulted in swollen gall bladder. In group 'C' gall bladder is of normal size i.e. like controls. Liv.52 also corrects lipid metabolism in mammalian system (Saxena *et al.* 1986) In fish Liv.52 protects gut and liver and if these organs can be protected against ill effects of cadmium lipid metabolism is expected to be normal. In such condition only gall bladder's size will be normal. A clear-cut explanation cannot be given until further work is done on this drug on fishes.

ACKNOWLEDGEMENT

Authors wish to thank the Himalaya drug company, Bombay for giving financial support for this work.

REFERENCES

1. Dubale, M.S. and Shah, P. 1979 Toxic effects of Cadmium nitrate on the liver of *Channa punctatus*. *Experientia* 35: 643-644.
2. Dubale, M.S. and Shah, P. 1981 Biochemical alternations induced by Cadmium in the liver of *Channa punctatus*. *Environ Res* 26: 101-118.
3. Joglekar, G.V., G.K. Chitale and J.H. Balwani, 1963. Protection by indigenous drugs against hepatotoxic effects of carbontetrachloride in mice. *Acta Pharmacol et toxicol.* 20: 73-79.
4. Karson, N.L. P. Runn, C.Hux and L. Fortin, 1985. Cadmium induced changes in gill morphology of Zebra-fish *Brachydanio rerio* and rainbow trout, *Salmogardeneri* *J. Fish Biol* 27: 81-95.
5. Katti, S.R. and A.G. Sathyanesan, 1984. Changes in tissue lipid and cholesterol content in the Cat-fish *Calrias batrachus*. *Bull. Environ. Contam. Toxicol* 32: 486-490
6. Kothari, S., B.P. Reddy and H.S. Rathore 1990. Protective role of Liv.52 against histological damage due to CdCl₂ toxicity in GAP the intestine of teleost fish. *Probe* 29: 220-228.
7. Nakamtra, M. 1974. Experimental studies on the accumulation of cadmium in fish body. *Jap. J. Pubnlc Hit.*, 21: 321-327.
8. Nakagawa, M.M. Takumura and S. Kojima 1979. Some heavy metals affecting the lecithin cholesterol acyl transferase reaction in human plasma, *J. Biochem.* 81: 1011-1016.
9. Nearthy W.M. 1980. Metabolism and toxicity of Cadmium in animals. In-Cd in the environment Pt II Hit effects Wiley Interscience Ny pp-571.
10. Prasad G.O. 1980. Electron microscopic study of the liver after prolong use of alcohol. *Probe XI* 179-186.
11. Rana S.V. A., Kumar and N.G. Bhardwag, 1980. Lipids in the liver and Kidney of rats fed on various heavy metals. *Acta Anat.* 108: 402-412.
12. Rana, S.V. V.P., Agarwal and N.G. Bhardwag, 1981. The effect of dietary Cadmium and zinc on lipids, protein and carbohydrate in rats. *Arch. Hyg. Rad. Tokiskol.* 32: 157-161.

13. Rathore, H.S. and Varma R., 1987, Protection of mice liver with Liv.52 against Cadmium intoxication. *Indian drugs* 25: 11-18.
14. Ravi, A.V. and R. Ramamoorthy, 1989. Histopathological alterations in the liver of fresh water teleost, *Tilapia mossambica* in response to Cd-toxicity. *Ecotoxicol. Environ Saft*, 17: 221-226.
15. Reddy, P.B. 1987. Studies on the protection of some target organs with Liv.52 against CdCl₂ toxicity in *Mystus tengara* M. Phil. Thesis Vikram Uni. UJJAIN.
16. Reddy, P.B. and S. Kothari, 1989. Effect of Liv.52 against cadmium chloride induced changes on the activity of enzymes and mucosubstances in the intestine of *Mystus tengara*. *Environ risk. Assesm.* 188-198.
17. Rosenthal H. and K.R. Sperling, 1974. Effect of Cadmium on development and survival of herrings in the early life history of fish Springer verlag pp 383-396.
18. Saini, M.R. S. Kumar and N. Saini, 1984. Survival of Mice protected from lethal radiation by liv.52 *Probe XXII* 209-211.
19. Saxena, A. S.K., Sharma and N.K. Garg 1986. Effect of Liv.52 on liver lipids. *Ind. J. exp. Biol* 11: 1330.
20. Srinivas S. and J.B. Balwani, 1968. Effect of Liv.52 in the growth and food consumption of laboratory animals. *Probe* 11: 4-6.
21. Subbarao, V.V. 1976. Changes in serum transaminases due to hepatotoxicity and the role of an indigenous hepatotonic Liv.52. *Yugslov. Physiol. Pharmacol. Acta* 12:
22. Waku, K.F. Hykawa and Y. Nakazawa, 1980. The effect of Cd ions and Cd Mt on the activities of P-450 synthesizing enzymes of rat live microsomes *in vitro*. *Arch. Biochem. Biophys.* 204: 288-293.