



HISTOLOGICAL AND HISTOPATHOLOGICAL STUDIES IN *Catla catla* LIVER

*Bharti D. Shriniwas

PGT Department of Zoology, RTM Nagpur University, Nagpur-440033, Maharashtra, India

*Corresponding author: B.D .Shriniwas, 804, Trimurty Nagar, Bhandara Road, Nagpur-440008.

dr.bhartishriniwas@gmail.com

ABSTRACT

Fishes play a vital role in food and nutrition all over the world. Diseases in fishes occur due to interaction of pathogens and stressful environment. Histology and histopathological studies in *Catla catla* liver reflect the overall health of entire population in ecosystem. Histopathological biomarker in *Catla catla* liver is based on experimental data to support the infection induced changes in liver tissue and protein content. This research aims to observe the effect of infection on liver. Liver is a major site of many biotransformation reactions, it play major role in digestion of food, energy metabolism, storage and synthesis of proteins. It can therefore concluded that histopathological alterations: liver necrosis, oedema, damage to pancreatic cells, degeneration of hepatocytes, bile duct hyperplasia, parasitic cyst and degeneration, in present study are indicators of poor fish health deteriorating the metabolic activity there by affecting protein content in liver.

KEYWORDS: *Catla catla*; Histology; Histochemical; Histopathology; Liver.

INTRODUCTION

Liver is one of the most intensively investigated organs among vertebrates. Fish mortality from the different parts of the country in water bodies causing economic losses due to diseases. But, inadequate reporting and monitoring of information about fish diseases in fisheries management practices prevailing in the country (Das, 2002). The histological structures of liver in *Tilapia zilli* and *Solea vulgaris* by Mohamed (2009) reported vacuolar degeneration in the hepatocytes, focal areas of necrosis and fibrosis, aggregations of inflammatory cells between the hepatocytes, dilation and congestion in blood sinusoids and thrombosis formation in central veins.

Histology deals with the microscopic study of biological tissue in normal healthy fish. On the other hand histopathology deals with the study of pathological changes induced in microscopic structure of body tissue. Any peculiar type of alteration in tissue (liver) may indicate the effect of disease. Therefore study of liver histopathology is of utmost importance in the diagnosis of infectious diseases. In *Catla catla*, it is observed that the discoloration of liver, whirling movement, sloughing of scales, skin ulceration. Histopathological

study thus gives us useful data regarding significant damage to the internal organs as well as altered protein content of liver prior to external manifestation.

MATERIAL AND METHODS

Catla catla is fast growing common fish contributing about 87% of total freshwater production reported to be highly nutritive quality.

Screening of fishes: Screening of normal and infected fishes was done on the basis of following observation. Normal fishes show good color, gills reddish in color and fish body is without any gross lesions.

Gross Pathological Observations: *Catla catla* collected on every visit were carefully observed for external gross lesions and specific signs of disease by external and internal examination. The infected fishes were found to be weak and showed whirling movements, coming to surface, discoloration of skin and gills, slimy with small haemorrhages on body.

Sample Collection: The normal and moribund fishes (Fig 1&2) with typical sign and symptoms of infections were biopsied and sampled for histological as well as histopathological evaluation. The samples of liver of about 1cm³ were excised and fixed in aqueous Bouins fixative (18-24 hours). The fixed tissue was dehydrated in ascending grades of alcohol, cleared in xylene, embedded in paraffin wax, sectioned at 4-5 µm thickness, mounted on albuminized slide, stained with Haematoxyline Eosin and mount in DPX. Stained slide were then examined under microscope and photographed.



Fig1. *C.catla* showing silvery grayish black color. **Fig 2.** Infected *C.catla*. **Fig 3.** *C.catla* showing sloughing of scales. **Fig 4a, b.** *C.catla* showing haemorrhages and necrosis.

RESULTS

Clinical Signs and Symptoms: The moribund fishes kept in aquarium shows following signs and symptoms: Dullness of skin, (Fig.2) sloughing of scales (Fig 3), haemorrhages and necrosis (Fig 4). The distribution of lesions is variable and includes mouth and back trunk.

Liver Histology (Normal): Histologically, liver is made up of large no. of polyhedral hepatic cells, clear cellular border lines, homogenous cytoplasm, prominent nucleus and nucleolus. They appear in rows like column called hepatic cords. In between hepatic cells, branches of hepatic veins and hepatic ducts were observed (Fig 5).

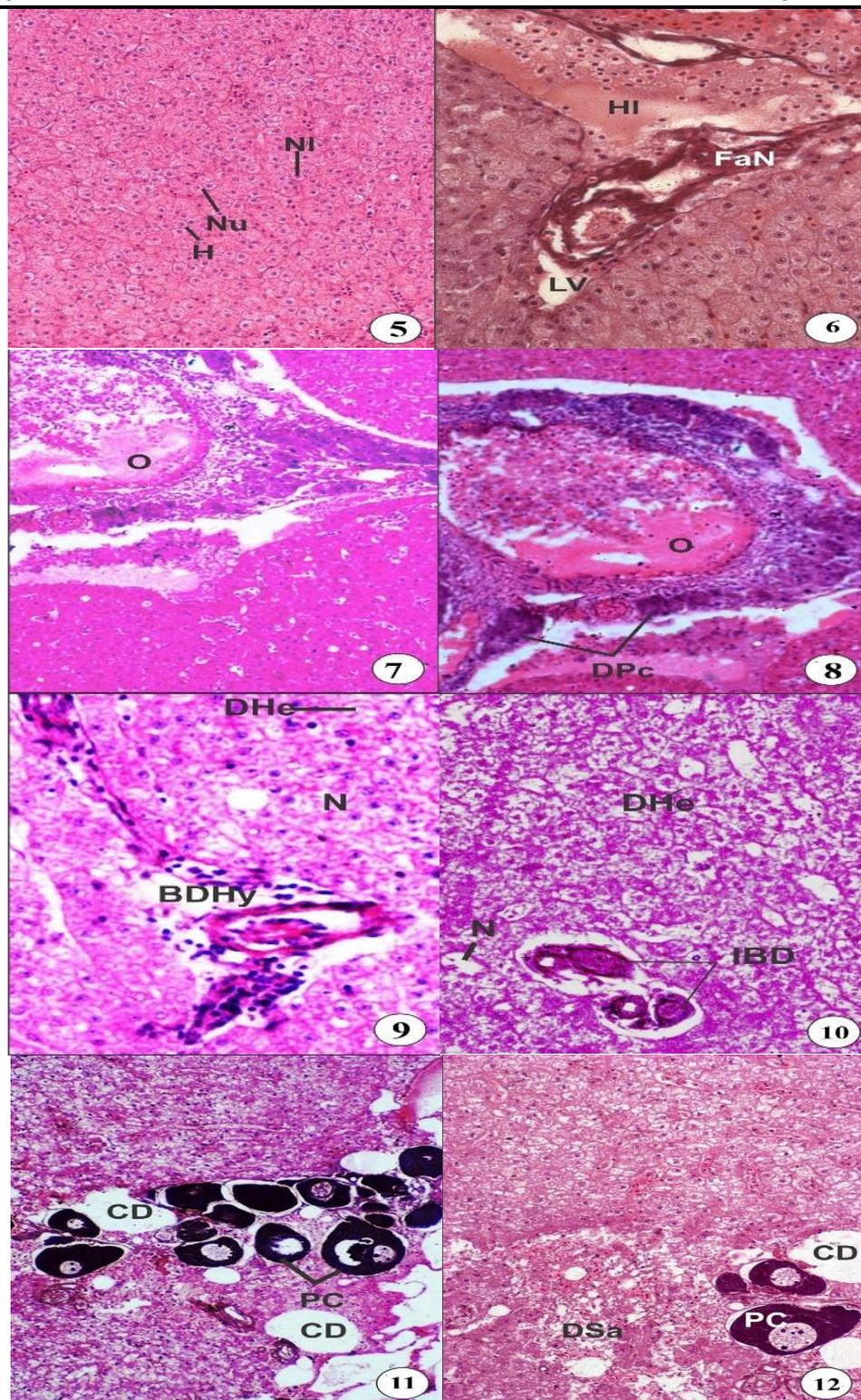


Fig 5. T.S. liver of normal *C. catla* (H.E. X200). **Fig 6.** T.S. liver showing focal area of necrosis (FaN) and haemolysis (HI) { *C. catla* (H.E. X400)}. **Fig 7.** T.S. liver showing oedema (O) { *C. catla* (H.E. X200)}. **Fig 8.** T.S. liver showing oedema (O) and damage to pancreatic cells (DPc) { *C. catla* (H.E. X200)}. **Fig.9.** T.S. liver showing degeneration of hepatocytes (DHe) and bile duct hyperplasia (BDHy) { *C. catla* (H.E.X400)}. **Fig.10.** T.S. liver showing necrosis (N) and increase in number of bile duct (IBD) { *C. catla* (H.E. X400)}. **Fig.11.** T.S. of *C. catla* liver showing Parasitic Cyst (PC) (H.E. X100). **Fig.12.** T.S. of *C. catla* liver showing degeneration of surrounding area (DSa) (H.E. X200).

Liver Histopathology

The Teleost liver is susceptible to numerous, both toxic and metabolic disturbances. The histopathological response was represented by focal area of necrosis (FaN) and haemolysis (fig.6), oedema (O), and damage to pancreatic cells (DPc) (fig.7,8), degeneration of hepatocytes (DHe) and bile duct hyperplasia (BDHy) (fig.9) and increase in number of bile duct (IBD) (fig.10). The major histopathological difference between normal and infected liver was showing Parasitic Cyst (PC) (fig.11) and degeneration of surrounding area (DSa) (fig.12).

DISCUSSION

Teleost fish liver is susceptible to numerous, both toxic and metabolic disturbances. Liver produces many enzymes that are stored in the gall bladder. These enzymes assist in the breakdown of food. Liver functions to store food energy (Tayel *et al.*, 2008). Histopathological observations of infected liver in *C.catla* reveals necrosis, bile duct hyperplasia, odema and damage to pancreatic cells, haemolysis and presence of parasitic cysts. In fishes diseases develop as a result of complex interaction between pathogen, fish and environmental stress which affect the susceptibility of host to diseases. In the present study fishes shows external signs of infection like excess mucus, dullness of skin, skin ulceration on body, ulcer in anal and caudal region, tail and fin rot, black patches over body. Udomkusonsri, (2003) reported external signs of bacterial and fungal infections on the body of the channel catfish, rainbow trout, striped bass, gold fish, salmon and American eel.

Liver plays a key role in the metabolism and biochemical transformations of pollutants from the environment, which inevitably reflects on its integrity by creating lesions and other histopathological alterations of the liver parenchyma or the bile duct (Roberts, 1978). Bile duct hyperplasia and increase in number of bile ducts is also observed in the present study. It is associated with chronic inflammatory reaction to bacterial infection (Reyad and Salah, 2008; Marzouk *et al.*, 2009). According to Wolf and Wolfe, (2005) changes in bile duct profiles appeared to be a regenerative response.

Ferguson, (1995) found presence of bacilli in the necrotic region of liver of Brown bulhead caused by metazoan parasites. In present study also parasitic cyst was observed from liver of *C.catla* resulting in the degeneration of surrounding areas. This might be due to stress factors like temperature and secondary bacterial infection alongwith skin lesions causing persistent inflammatory conditions. Khan *et al.*, (2003) reported a direct relation of increased temperature and parasitic infection in fresh water fishes.

Tripathi and Verma (2004) reported significant decrease in liver protein contents of *Clarias batrachus*. Reduction in protein content in the liver of infected *C.catla* might be due to either arrested metabolism in the liver or to use it to build up new cells or enzymes to reduce the stress. The depletion in the metabolites indicates that the whole metabolic pool of the fish gets disturbed and altered under toxic/pathogenic stress.

CONCLUSION

Metabolism of food items and their storage is important functions of the liver. Hence liver is susceptible to infections which cause metabolic disturbances. The liver of normal fish showed regularly arranged hepatocytes with hepatic veins and hepatic ducts around the vascular system (sinusoids). A variety of histopathological changes in liver are focal area of necrosis, and hemolysis, oedema and damage to pancreatic cells, degeneration of hepatocytes, bile duct hyperplasia, increase in number of bile duct, Parasitic Cyst, degeneration to surrounding area (DSa). Based on the result of this research it is concluded that infection damages fish liver.

ACKNOWLEDGEMENT: Author was grateful to RTM Nagpur University Nagpur for providing lab facility to carry out her research work.

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