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Histological Study of Hepatopancreas in Iridescent Shark Catfish (*Pangasius hypophthalmus*)

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Abstract: The aim of this study was to determine the histological structures of the hepatopancreas in Iridescent Shark Catfish (*Pangasius hypophthalmus*). Microscopic results showed that the hepatopancrease was covered by a thin serosa and thin capsule. The lobulation was not seen in the liver clearly. Parenchyma of the liver was primarily composed of polyhedral hepatocytes typically with central nuclei. Hepatocytes had many eosinophilic vacuoles. Amongst them many sinusoids were present. Pancreas tissue was penetrated into the liver along with portal vein. The exocrine pancreatic tissue was located in the liver and consisted of serous acini with centroacinar cells and their ducts. Thin septa of connective tissue separated parenchyma of the liver from the exocrine pancreatic cells. Microscopic structure of hepatopancreas in these species was more similar to the other fishes, but it had also structural differences.

Key words: Hepatopancreas, histology, *Pangasius hypophthalmus*, shark, catfish, structural differences

INTRODUCTION

The liver and pancreas are characterized by multiple and complex functions, secretion (bile, enzymes), storage (vitamins, lipids, glycogen), synthesis (plasma proteins), metabolism (proteins, lipids, carbohydrates) and etc. An understanding of the structure of the hepatopancreas is vital to interpret these processes (Eurell and Frappier, 2006). In some fish species, pancreas grows along with liver tissue and pancreatic tissue is located in the liver. The combined hepatic and pancreatic tissue are collectively called the hepatopancreas (Alboghobeish and Khaksar-Mahabady, 2005; Pousty and Seddigh-Marvasti, 2000). In vertebrates, the liver has a primary array based on hepatocytes, bile canaliculi and sinusoida. Structural differences occur among species in stroma and parenchyma 3-dimensional organization. Although, this structure differs among different species of fish, it is not often distinctive. As in other vertebrates, the pancreas in fish is an organ that consists of endocrine (i.e., islets of Longer Hans) and exocrine parts. Though, endocrine and exocrine portions of pancreatic tissue are distinct from each other in some fish species (Geyer *et al*., 1999; Sheybani, 2006). The exocrine cells are arranged in acini. Acinar cells have many large eosinophilic zymogen granules. These granules contain zymogens, enzymes responsible for digestion of proteins, carbohydrates, fats and nucleotides. The endocrine components of the pancreas, consist of poorly stained cords with large distinct nuclei interspersed with blood sinuses. In some fish species, the pancreatic tissue gradually invades the liver along the branches of the portal vein (Alboghobeish and Khaksar-Mahabady, 2005). In this study, we aimed to determine the histological characters of the hepatopancreas of *Pangasius hypophthalmus*.

MATERIALS AND METHODS

Ten, 5-months-old Iridescent shark catfish (*Pangasius hypophthalmus*) of either sex has been included in the study. The fishes were deeply anaesthetized by immersion 5 mL L^{-1} aqueous solution of ethylene glycol monophenyl ether. Then the hepatopancreases were taken out. Tissue samples were fixated in 10% buffered formalin solution during for 72 h. Fixed tissue were dehydrated in aggraded series of alcohols, cleared in xylene, embedded in paraffin and cut with microtome at 6-7 μm. Sections were mounted on glass slides, deparaffinized and stained by Haematoxylin and Eosin (H and E) and Periodic Acid-Schiff (PAS) (Pousty and Adibmoradi, 2007). The studies were observed under light microscope.

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RESULTS AND DISCUSSION

The liver of *Pangasius hypophthalmus* is composed of a parenchyma covered by a typical serosa overling a thin connective tissue capsule. Interlobular connective tissue is scant and difficult to see and the lobulation is not seen in the liver clearly. The parenchyma consists of branching sheets of tissue, each 1 or 2 cells thicks, radiating out from central veins. The sheets are separated by sinusoids. Sinusoids are covered by endothelial cells with flatten nucleus. Hepatocytes vary from polyhedral to round shape. Some of the hepatocytes surface lines the sinusoidal channel (sinusoidal surface), while other surfaces are in contact with a djacent hepatocyte (intercellular surfaces), some of the adjacent hepatocyte surfaces having bile canaliculi running between them. Hepatocytes are further characterized by a centrally located spherical nucleus with a prominent dark nucleolus. The cytoplasm of hepatic cells showed considerable variation based on functional activity, particularly in glycogen and fat storage. The H and E staining method showed the appearance of vacuolar structures in the hepatic cells, probably due to the presence of lipids (Fig. 1). With PAS reactions, large glycogen deposits were identified through out the cellular parenchyma (Fig. 2). Kupffer cells were found among the sinusoidal endothelium. These cells were small and few in number.

The pancreatic exocrine tissue consisted of acini with centroacinar cells and differentiated from hepatic tissue by this arrangement and its characteristic stain. Acinar cells had a euchoromatic nucleus in base and their cytoplasm was basophilic, but the apex of each cell contained eosinophilic zymogen granules. Thin septa of connective tissue separated exocrine pancreatic cells from the hepatocytes. The exocrine pancreas was arranged around a branch of the portal vein, separated by a basal membrane and reticular fibers (Fig. 2).

The results showed that although the hepatopancreas structure in this species was more similar to the other fishes (Alboghobeish and Khaksar-Mahabady, 2005; Sheybani and Adibmoradi, 2002) and even mammals (Eurell and Frappier, 2006), there were also considerable structural differences.

As described in most fish species, lobular organization of hepatic tissue was not conspicuous in the liver of *Pangasius hypophthalmus* (Marina and Claudia, 2007; Rocha *et al*., 2008). The hepatic parenchyma of fish is very homogeneous and the hepatocytes are polygonal-shaped cells, appearing hexagonal (Petcoff *et al*., 2006; Rocha *et al*., 1998), often weakly basophilic compared to

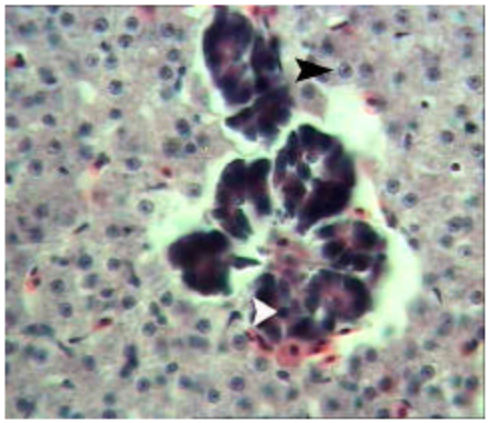

Fig. 1: Histological picture of the hepatopancreas of *Pangasius hypophthalmus* (H and E). Black arrow: Hepatocyte and White arrow: Centroacinar cell

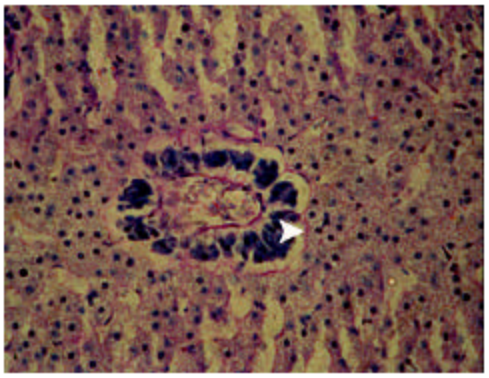

Fig. 2: Histological picture of the hepatopancreas of *Pangasius hypophthalmus* (PAS). Arrow: Septa of connective tissue

those in mammals. The nucleus of fish hepatocytes is generally a single, centerally located, spherical nucleus with a clear, dark nucleus.

The organization of the biliary tree in this species was not different from that of the other fishes and higher vertebrates. The portal vessels were clearly distinguishable due to the pancreatic acini that surrounded it. The lobules built up cords of hepatocytes radiated out from a centrally located central vein.

In *Pangasius hypophthalmus*, like in many other species including *Ctenopharyngodon idella* and *Oligosarcus jenynsii*, pancreatic tissue occurs around the major portal vessels. This is exocrine pancreatic tissue located in the liver (Alboghobeish and Khaksar-Mahabady, 2005; Petcoff *et al*., 2006). In contrast with *Ctenopharyngodon idella* that the exocrine pancreas consists of serous cells elusters

(Alboghobeish and Khaksar-Mahabady, 2005), in this species the pancreatic exocrine tissue consisted of acini with centroacinar cells.

REFERENCES

Alboghobeish, N. and M. Khaksar-Mahabady, 2005. Histological study of liver and pancreas in *Cetonopharingodon idella*. J. Sch. Vet. Med., Shahid. Cham. Univ. Ahvaz, 9th year, 11: 25-34. cau.ac.ir/veterinary/journal.htm.

Eurell, J. and B.L. Frappier, 2006. Dellmann's Text Book of Veterinary Histology. 6th Edn. Blackwell Publishing, Iowa, USA, pp: 201-208. ISBN: 13:978-0-7817-4148-4. www.blackwellprofessional.com.

Geyer, H.G., M.M. Nel and J.H. Swanepoel, 1999. Histology and ultrastructure of the hepatopancreas of the tiger fish (*Hydrocynus forskahlii*). J. Mor., 227 (1): 93-100. DOI: 10.1002/(SICI)1097-4687(199601)227:1<93::AID-JMOR8>3.0.CO;2-Q.

Marina, M.P. and B.R. Claudia, 2007. Histopathology of gill, kidney and liver of Neotropical fish caged in an arban stream. Neotropical Ichthyol., 5 (3): 327-336. DOI: 10.1590/S1679-62252007000300013.

Petcoff, G.M., A.O. Diaz, A.H. Escalante and A.L. Goldemberg, 2006. Histology of the liver oligosarcus jenynsii (ostariophsi, characidae) from Los Pades Lake, Argentina. Ser. Zool., 96 (2): 205-208. DOI: 10.1590/S0073-47212006000200010.

Pousty, I. and M. Adibmoradi, 2007. Histotechnique. 1st Edn. University of Tehran Press, Tehran, Iran, pp: 34-61, 110-111 and 264. ISBN: 964-03-5449-X. www.press.ut.ac.ir.

Pousty, I. and S.A.H. Seddigh-Marvasti, 2000. An Atlas of Fish Histology. 2nd Edn. University of Tehran Press, Tehran, Iran, pp: 149-165. ISBN: 964-03-4169-X. www.press.ut.ac.ir.

Rocha, E., M.J. Rocha, M.H. Galante, M.W. Silva and R.A.F. Monteiro, 2008. The hepatocytes of the brown trout (*Salmo trutta fario*): A stereological study of their number and size during the breeding cycle. Ichthyol. Res., 5 (5): 415-419. DOI: 10.1007/s10228-008-0066-x.

Rocha, E., R.A.F. Monteiro and C.A. Pereira, 1998. Liver of the brown trout (*Salmo trutta*) (Teleostei, Salmonidae): A stereological study at light and electron microscopic levels. The Anatomical Record, 3: 317-328. DOI: 10.1002/(SICI)1097-0185(199703)247:3<317::AID-AR3>3.0.CO;2-R.

Sheybani, M.T., 2006. Microscopic structures of the liver and pancreas associated with their ducts Persian Sturgeon. Vet. J. Isla. Azad Univ. Garm. Branch, 1 (1): 33-38.

Sheybani, M.T. and M. Adibmoradi, 2002. Histological study of the liver and pancreas and their ducts in *Acipenser stellatus*. J. Fac. Vet. Med. Univ. Tehran, 57: 19-23.