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Histological Study of Liver on Channel Catfish, Ictalurus punctatus

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ABSTRACT

Histologically the liver of the channel catfish, *Ictalurus punctatus*, was found to consist of many lobules. Though not surrounded by a connective tissue sheath as they are in some animals, the lobules were discernable because all the hepatic cells in a particular area radiated from a central vein. Portal triads were scattered throughout the liver. The lobule tissue consisted of radiating cords of cells alternating with sinusoids. Glycogen was condensed into large vacuoles within these cells. Pancreatic tissue was found in the liver, always surrounding a capillary or venule. Morphologically the pancreatic cells were exocrine. Functionally, however, they may be endocrine cells because no ducts were found leading away from them. Connective tissue in the liver was scanty.

INTRODUCTION

The histological appearance of the mammalian liver has been studied for many years with particular emphasis on the histology of the human liver. However, as Patt and Patt (1969) pointed out, very little work has been done on the histology of the liver of other vertebrate types. A few good papers have been written concerning this topic. For example, Ells (1954) described the microscopic anatomy of the liver and gallbladder of the lizard *Sceloporus occidentalis biseralis.* Heider (1966) investigated the histology of the liver of the crucian carp and tench. Finally, Simon et al. (1967) described the histology of the trout liver.

The purpose of the writer's study was to describe the histology of the liver of the channel catfish, *Ictalurus punctatus.*

MATERIALS AND METHODS

All of the tissues used to study the histology of the catfish liver were collected from the warm-water fish cultural research laboratories at Stuttgart, Arkansas. These tissues were rinsed in saline and sliced into sections approximately 2 mm thick. The slices of liver were distributed evenly among three fixatives: AFA, Zenker's, and a solution consisting of nine parts absolute ethyl alcohol and one part formalin (Humason, 1967).

After the tissues had been fixed for 72 hours, they were dehydrated with alcohol, cleared in xylene, and embedded in paraplast. Sections were cut by a rotary microtome to 12 micron thickness. The sections were affixed to slides and stained with hematoxylin and eosin, or Mallory's or Schiff's reagent (Humason, 1967).

RESULTS AND DISCUSSION

Histologically the catfish liver was found to consist of many lobules. These lobules were poorly defined because they were not surrounded by a connective tissue sheath as they are in some animals, such as the pig (Bevelander, 1970). The lobules were discernable only because all of the liver cells in a particular area radiated from central vein (Fig. 1).

Scattered throughout the liver were portal triads (Fig. 2), which consisted of a branch of the hepatic artery (A), a branch of the portal vein (B), and a branch of the bile and/or pancreatic duct (C) as will be explained. The vessels were lined by squamous endothelium and the ducts were lined by simple columnar epithelium. Some of the larger ducts contained a few goblet cells scattered among the columnar cells.

The tissue of the lobule contained radiating cords of hepatic cells alternating with sinusoids (Fig. 3). Each cord seemed to be

Figure 1. Lobule of liver outlined by hash marks. Central vein (A) is shown. 450x.

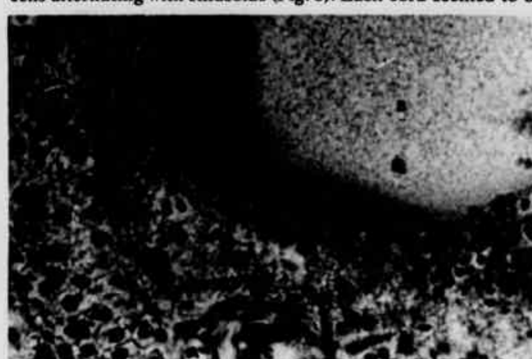

Figure 2. Portal triad consisting of branch of hepatic artery (A), portal vein (B), and bile duct (C). 450x.

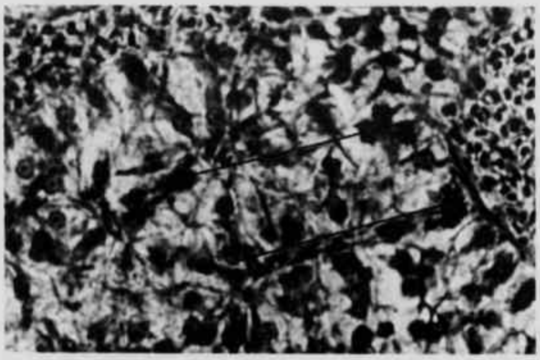

Figure 3. Parenchymal tissue within lobule. One hepatic cord is outlined. 450x.

two cells thick, although on many slides it was hard to tell because of the plane of section. The hepatic cells were cuboidal and showed an eosinophilic cytoplasm and prominent nucleoli. Within the cytoplasm of the hepatic cells glycogen was concentrated into one or two large vacuoles, as was demonstrated by the periodic acid-Schiff (PAS) reaction (Fig. 4).

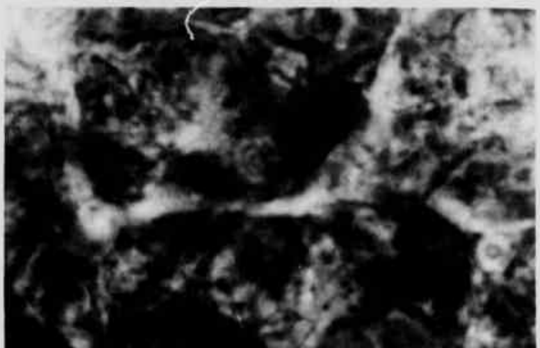

Figure 4. Glycogen deposition within hepatic cells (A). 1000x.

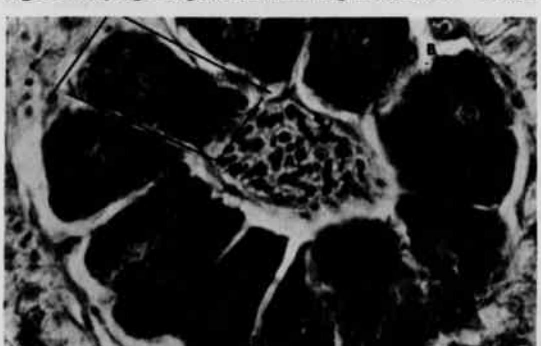

Figure 5. Exocrine pancreatic tissue surrounding capillary (A). An acinus is outlined. Centroacinar cells (B) are present. 450x.

One of the most interesting features of the catfish liver was the presence of exocrine pancreatic tissue (Fig. 5). These pancreatic cells always surrounded a large capillary or venule (A) and collected together in the form of an acinus. Centroacinar cells were present (B). The cytoplasm of the pancreatic cells was much more basophilic than the cytoplasm of the hepatic cord cells. The pancreatic cells were of the serous variety. The cells were more columnar than any other shape, although some tended to be pyramidal. The basal part of the cytoplasm of the exocrine cells appeared to be much darker than the apical part, possibly because of the accumulation of zymogen granules.

Though the pancreatic cells were exocrine in appearance, they may be endocrine cells in function. One of the basic differences between exocrine and endocrine tissues is that exocrine cells secrete their products into some type of duct system, whereas endocrine cells secrete their products directly into the blood stream. The author could not observe any ducts leading away from the pancreatic tissue. However, it is possible that intercalary ducts were present. Intercalary ducts have been known to show squamous epithelium, which would make them look very much like the sinusoids that were prevalent in the liver. Also, the pancreatic cells could use the same biliary ducts that the hepatic cells use. Nevertheless, the fact remains that the pancreatic tissue always surrounded a capillary or venule. The author, therefore, believes that the pancreatic cells may pour their products directly into the blood stream. Thus, morphologically the pancreatic cells were of an exocrine nature but functionally they may be of an endocrine nature.

By using Mallory's triple connective tissue stain, the author was able to determine the various locations of connective tissue in the liver (Fig. 6). As in other vertebrates, there was an abundance of connective tissue in the walls of the vessels (A). A small amount of connective tissue also was present surrounding the sinusoids. Very little connective tissue appeared to be present intercellularly between the hepatic and pancreatic cells.

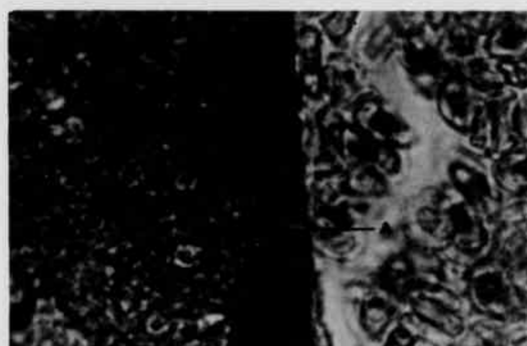

Figure 6. Connective tissue (A) within walls of vessel. 1000x.

SUMMARY AND CONCLUSIONS

The basic morphological unit of the catfish liver was the lobule. These lobules were poorly defined because they were not surrounded by a connective tissue sheath as they are in some animals. Nevertheless, the lobules could be discerned because all of the hepatic cells in a particular area radiated from a central vein.

The tissue of the lobule was made up of radiating cords of cells alternating with sinusoids. Within these cells, the glycogen was condensed into large vacuoles.

Pancreatic tissue was found in the liver. The pancreatic cells always surrounded a capillary or venule. Morphologically the cells were exocrine in nature. Functionally, however, the cells may be of an endocrine nature because no ducts could be seen leading away from them and they may secrete their products directly into the blood stream.

Connective tissue in the liver was scanty.

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