Original Research

Liver and Pancreas of Mizo Local Pig (Zovawk): A Histomorphological and Histochemical Analysis

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Rec. Date:	May 12, 2018 11:57
Accept Date:	Sep 10, 2018 15:52
DOI	10.5455/ijlr.20180512115737

Abstract

The present study was conducted on liver and pancreas of six apparently healthy Zovawk animal of either sex to elucidate its histological nature. Tissue samples were collected as such and were preserved in 10% NBF and Bouin's solution for light microscopic examination. Zovawk liver was characterized by the thick Glisson's capsule and thick connective tissue septa which divide liver into hexagonal hepatic lobules. Numerous hepatocytes with centrally placed large, rounded nucleus were presents inside the hepatic lobules. The sinusoids were formed between the hepatic cell cords and separated from the hepatocytes by a perisinusoidal space. Sinusoids were lined by stellate shaped Kupffer's cells. Histologically, in zovawk pancreas, exocrine and endocrine portion was visualized. The exocrine portion of the pancreas was made up of secretory units and duct system. The secretory units were tubulo-alveolar with more acinar portion. The islets of Langerhans which represented the endocrine portion of the zovawk pancreas appeared as pale areas among the acini. The cells of the islets were arranged as irregular cords surrounding the blood capillaries. Mainly two types of prominent cells were found in the pancreatic islets, i.e. A cells or alpha cells and B cells or beta cells. B cells were more numerous than the A cells in the islets of Langerhans which was characterized by the spherical nucleus and located almost all over the islets. Whereas A cells were characterized by the oval nucleus and distributed mainly in the center of the islets.

Key words: Histological, Hepatocytes, Liver, Pancreas, Zovawk

How to cite: Kalita, P., Kalita, A., Doley, P., Choudhary, O., Das, H., & Debroy, S. (2019). Liver and Pancreas of Mizo Local Pig (Zovawk): A Histomorphological and Histochemical Analysis. International Journal of Livestock Research, 9(1), 150-156. doi: 10.5455/ijlr.20180512115737

Introduction

Microscopically, each liver lobe is seen to be made up of hepatic lobules and portal canal. Portal canals are present at approximately three of the six angels of the lobules. Pigs have distinct interlobular connective tissue septa (Dellmann and Eurell, 1998). Whereas pancreas is an encapsulated, lobulated, compound

tubuloacinar gland. It has been reported that the islet cells are arranged in irregular anastomosing cords composed of different cell types: A(α), B(β), C, D(δ) and F cells (Dellmann and Eurell, 1998). The liver and pancreas of zovawk has record on histological studies, therefore this present study was undertaken to elucidate the histological characteristic of these two organs.

Materials and Methods

The present study was conducted on liver and pancreas of 6 apparently healthy zovawk animals of either sex. After incising the abdomen of these animals, livers and pancreas were removed and collected as small pieces in 10% NBF as well as in Bouin's solution. Tissue pieces were then routinely processed to obtain 6 µm thick paraffin sections. Sections from each sample were then stained with different stains for examination of different components of the tissue. Such as, haematoxylin and eosin stain for general tissue reaction and cytoarchitectural studies (Harris, 1900), Masson trichrome stain collagen fibers (Masson, 1929), Verhoeff stains for elastic fibers (Verhoeff, 1908), Gomori's silver stain for reticular fibers (Gomori, 1937), Best's carmine stain for glycogen (Best, 1996). The stained sections were examined under the Olympus microscope (BX41), Japan and photomicrography of selected slides were performed.

Result and Discussion

There were two distinct layers covering the liver, i.e. outer peritoneal layer and inner connective tissue layer (Fig. 1). The outer most covering of liver was peritoneal covering. Peritoneal covering was formed by mesothelial cells. Similar findings were reported by Bamaniya (2013) in Marwari goat. The inner most layer of capsule was made by thick connective tissue fibers mainly collagen fiber and reticular fiber. The connective tissue layer of liver is also known as Glisson's capsuleas described by Copenhaver *et al.* (1967) in pig. The connective tissue layer was formed by collagen fiber and some reticular fiber. Connective tissue layer of zovawk liver was thick and distinct (Fig. 1). Overlying connective tissue capsule extends inside the liver lobes as thick interlobular septa which covers each liver lobule (Fig. 2). Thick connective tissue layer divide liver lobes in many distinct hexagonal lobules. These hexagonal lobules are composed of centrally placed central vein and portal area present in the periphery as reported by Pareek (2000) in sheep and Bamaniya (2013) in Marwari goat. Whereas Pal *et al.* (1991) reported that lobules were not clearly demarcated because of scanty interlobular connective tissue in broiler chick liver. Sinusoids were covering from the periphery to the central vein of the liver lobules (Fig. 2). Numerous hepatocytes were presents inside the hepatic lobules. Hepatocytes were polygonal in shape with centrally placed large, rounded nucleus with one or more nucleoli. Hepatocytes were arranged in the form of one cell thick cord. These cords anastomosed with one another, enclosing spaces which contained the sinusoids (Fig. 4 & 5). These

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findings compares well with the reports of Copenhaver *et al.* (1964) in pig and camel and Adibmoradi (2007) in horse.

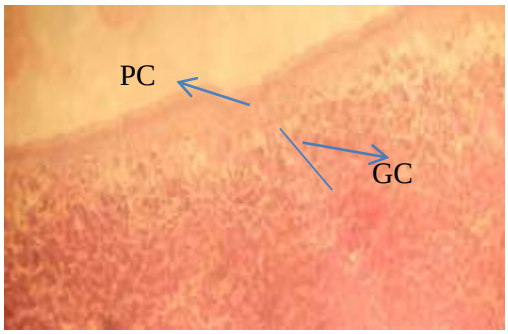

Fig. 1: Light microscopic examination of liver capsule. PC= Peritoneal capsule, GC= Glisson's capsule. H & E 10X.

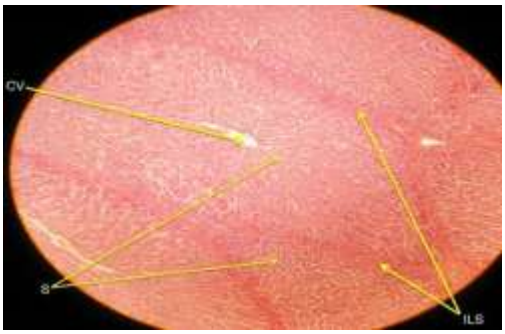

Fig. 2: Lobulation of liver. CV= Central vein, S= Sinusoid, ILS= Interlobularsepta. H & E 10 X.

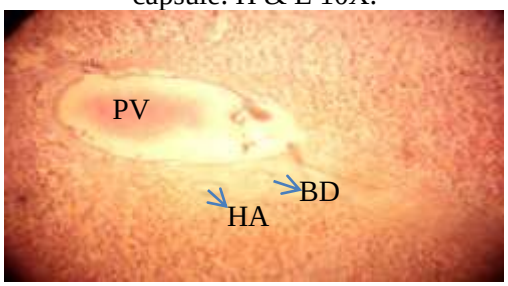

Fig. 3: Portal area of the liver showing PV= Portal vein, HA= Hepatic Artery, BD= Bile Duct. H&E 10X.

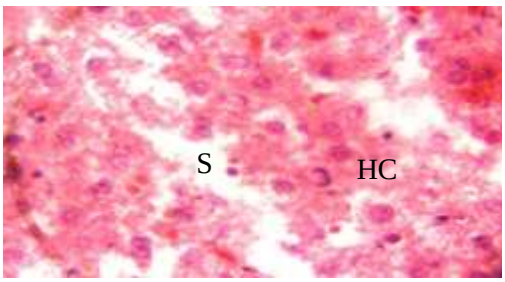

Fig. 4: Parenchyma of liver showing HC= Hepatocytes and S= Sinusoid. H&E 100X

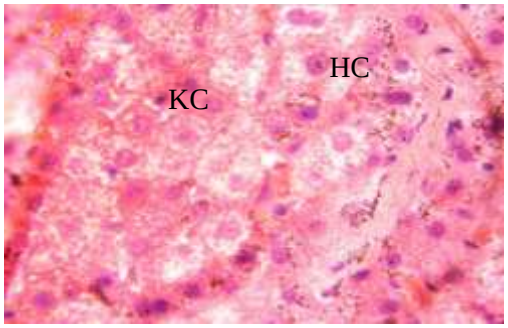

Fig. 5: Parenchyma of liver showing KC= Kupffer's cells and HC= Hepatocytes. H&E 100X.

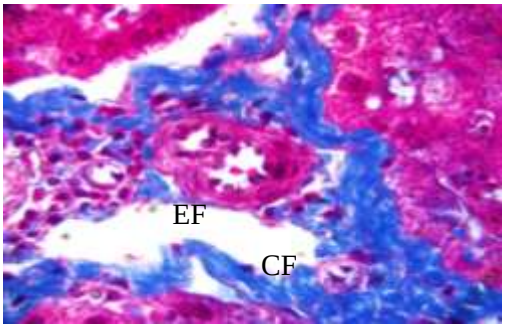

Fig. 6: Demonstration of CF = Collagen fiber and EF = Elastic fiber in the interlobular septa. Masson trichrome 100X.

Each hepatocyte was encircled by the reticular fibers (Fig. 9). Central vein was present in the central of each lobule. The central veins were connected with sub lobular veins, ran in the middle of the lobule and communicated directly, with sinusoidsas also reported by Copenhaver *et al.* (1967). They were encircled with collagenous and reticular fibers. The sinusoids were formed between the hepatic cell cords and separated from the hepatocytes by a perisinusoidal space (Fig. 2). Sinusoids were lined by stellate shaped cells known as Kupffer's cells. They appeared as inconspicuous flattened inactive cells or as prominent triangular active phagocytic cells, filled with foreign substance (Fig. 5) these cells were also observed by

DOI 10.5455/ijlr.20180512115737

Pareek (2000) in sheep (Mahata *et al.*, 2003) in spotted deer. Portal area was formed by the groups of vessels and ducts, i.e. portal vein, hepatic artery, and bile duct (Fig. 3). There was also presence of supportive connective tissue. Portal area was encircled by the collagen fiber and reticular fiber (Fig. 7). The elastic fibers and collagenous fibers encircled the hepatic arterioles and the portal veins (Fig. 6). The portal vein branched into interlobular portal vein which further gave distributing branches and finally ended into the sinusoids. Hepatic artery enters in to the liver as hepatic arterioles, gave branches to enter in to the hepatic lobules and then join with the sinusoids. Elastic connective tissue fiber enclosed the hepatic artery these findings compare well with by Pareek (2000) in sheep and Bamaniya (2013) in Marwari goat. The bile canaliculi were the extended intercellular spaces between hepatocytes. The hepatocytes absorbed bile pigment from the blood, which ran through sinusoids, conjugated and secreted it into the bile canaliculi and reached to the portal areas by way of the bile ductules. These ductules joined to form the large intra-hepatic ducts and finally left the glands via the main hepatic duct, at the hilus. The bile ductules were located in the portal area with variable size and shape. Glycogen was irregularly distributed in the cytoplasm of hepatocytes. Glycogen rich areas appear as irregular shaped empty spaces (Fig. 10).

The zovawk pancreas was made up of exocrine as well as endocrine portion which was covered by the connective tissue capsule. The pancreas of the zovawk was covered by connective tissue capsule which is consisted of collagen fibers mainly and a few elastic fibers. Connective tissue septa extended from the capsule into the parenchyma of the pancreas dividing it into complete and incomplete lobules, these observations were similar to report of Dhoolappa (2004) in Indian donkey. These septa contained collagen fibers, blood vessels and ducts. The exocrine portion of the pancreas was made up of secretory units and duct system (Fig. 11 to 13). The excretory units were tubulo-alveolar with more acinar portion (Fig. 11). They were consisted of pyramidal cells which were resting upon a basal lamina and were surrounded by delicate reticular fibers (Fig. 17). Each pancreatic lobule was supported by the collagen fibers (Fig. 12). Two types of acinar cells were identified depending upon shape and positions of their nucleus *i.e.* active acinar cells and resting acinar cells. The nuclei of resting acinar cells were spherical in shaped and they were located near the base of the cell whereas nucleus of the exhausted acinar cells were also in spherical shaped but were located on the center of the cells (Fig. 12). Similar findings were reported by Sultan (1999) in camel. This is slightly different from the exocrine portion of the ruminant pancreas reported by Stinson and Calhoun (1981) since the later showed dominance of the tubular portion. The apical region of the cell contains zymogen granules. The cells located in the lumen of the acini were identified as centroacinar cells. The centroacinar cells formed the beginning of the intercalated duct which constituted the first part of the duct system (Fig. 13). The intercalated duct started as centroacinar cells. The intralobular duct was lined by cuboidal cells supported by a basal lamina and collagen fibers (Fig. 12). The interlobular duct was found between the lobules in the connective tissue septa. It was supported by a thick layer of collagen fibers.

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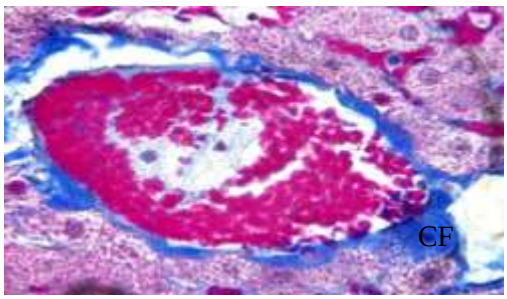

Fig. 7: Demonstration of CF = collagen fiber surrounding portal vein. Masson trichrome 100X.

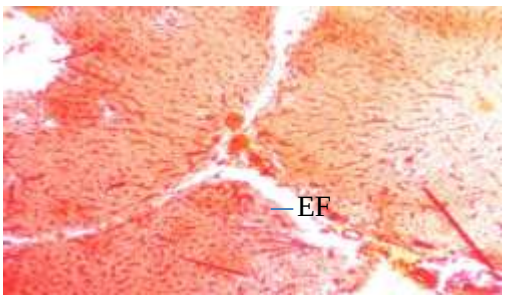

Fig. 8: Demonstration EF = Elastic fiber. Verhoeff staining procedure 10X.

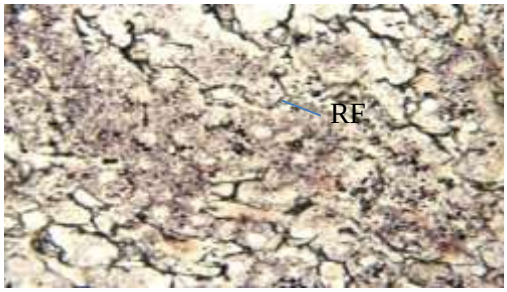

Fig. 9: Demonstration of RF= reticular fiber. Gomori's silver staining procedure 40X.

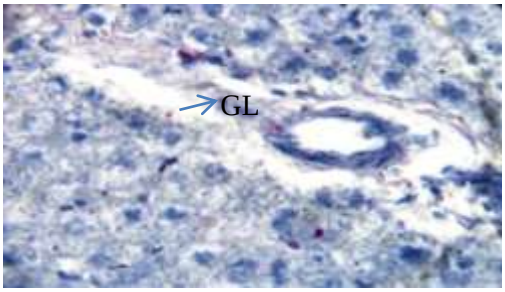

Fig. 10: Demonstration of GL= Glycogen by Best carmine staining procedure 100X.

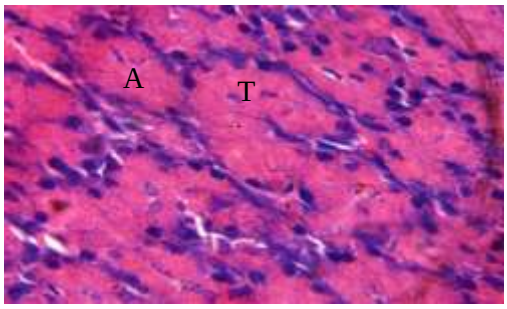

Fig. 11: Demonstration of T = Tubular and A =Acinar secretory units. H&E 40X.

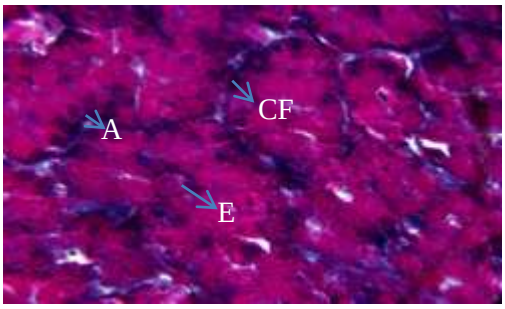

Fig. 12: Exocrine portion of pancreas showing A = Active acinar cells and E = Exhausted acinar cells CF= Collagen fiber. Masson trichrome 40X.

The main duct was supported by dense layer of elastic fibers. The islets of Langerhans which represented the endocrine portion of the zovawk pancreas appeared as pale areas among the acini. The islets varied in shape; they were round, oval or irregular. Some islets were small others were large (Fig. 14, 15 & 16). The islets were separated from the acini by a thin layer of reticular and elastic fiber which was seen extending into the interior of the islets (Fig. 15 & 16), but no distinct capsule encircling the islets was observed. The islets had a rich vascular supply; some blood capillaries were enlarged forming cyst-like structure. The cells of the islets were arranged as irregular cords surrounding the blood capillaries. This confirms the findings of McGeddy *et al.* (2006) in domestic pig. Mainly two types of prominent cells were found in the pancreatic islets, *i.e.* A cells or alpha cells and B cells or beta cells. B cells were found more in number than the A

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cells in the islets of Langerhans which is characterized by the spherical nucleus and located almost all over the islets. Whereas, A cells were characterized by the oval nucleus and distributed mainly in the centre of the islets of pancreas (Fig. 14 & 15).

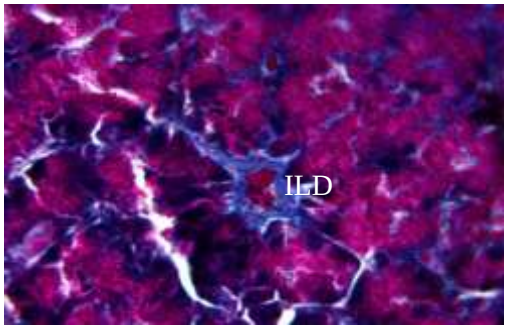

Fig. 13: Demonstration of interlobular duct. Masson trichrome staining procedure 100X.

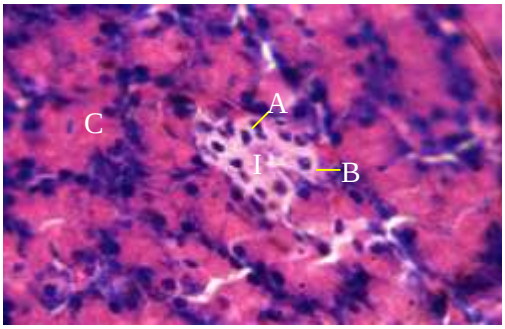

Fig. 14: Endocrine portion of pancreas showing A= A cells, B= B cells, C= Centro acinar cell. H&E 100X.

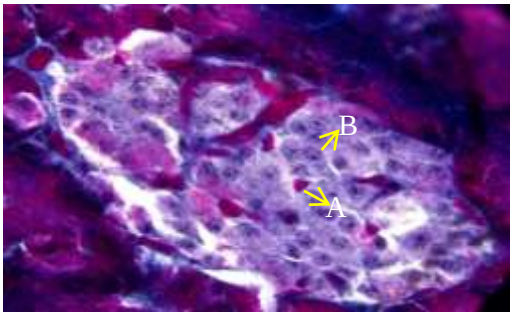

Fig. 15: Demonstration of A= A cells and B= B cells by Masson trichrome stain 100X.

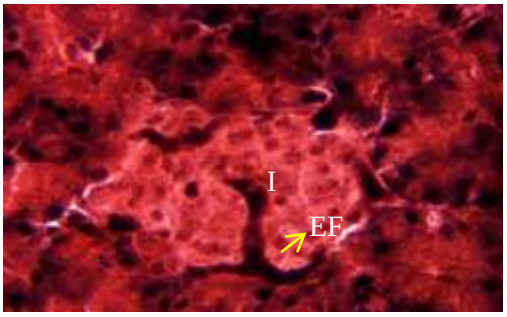

Fig. 16: Demonstration of EF = Elastic fiber by Verhoeff stain 100X.

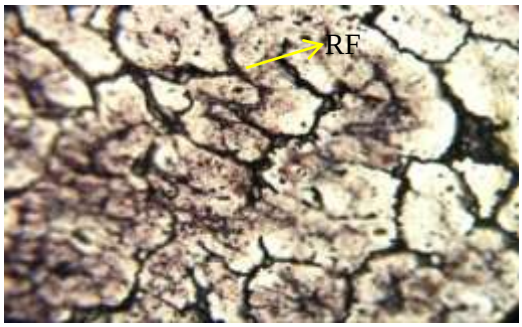

Fig. 17: Demonstration of RF= reticular fiber by Gomori's silver staining 100X.

Conclusion

After conducting histological studies on Zovawk liver and pancreas it was observed that zovawk liver was consists of stroma and parenchyma. There were two distinct layers covering the liver, i.e. outer peritoneal layer and inner connective tissue layer. Connective tissue capsule extends inside the liver lobes as thick interlobular septa which make very distinct classical liver lobules. Numerous hepatocytes are presents inside the hepatic lobules. Hepatocytes were polygonal in shape with centrally placed large, rounded

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nucleus with one or more nucleoli. Central vein was present in the central of each lobule. The sinusoids were formed between the hepatic cell cords and separated from the hepatocytes by a perisinusoidal space. Sinusoids were lined by stellate shaped cells known as Kupffer's cells. Whereas zovawk pancreas shows two portions, i.e. exocrine portion and endocrine portion which was covered by the connective tissue capsule. The exocrine portion of the pancreas was made up of secretory units and duct system. The secretory units were tubulo-alveolar with more acinar portion. Two types of acinar cells were identified, resting acinar cells and exhausted acinar cells. The islets of Langerhans which represented the endocrine portion of the zovawk pancreas appeared as pale areas among the acini. Mainly two types of prominent cells were found in the pancreatic islets, *i.e.* A cells or alpha cells and B cells or beta cells.

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DOI 10.5455/ijlr.20180512115737