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Histomorphological and histochemical studies on the common hepatic duct in guinea fowl (*Numida meleagris*)

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Abstract
The histomorphological and histochemical study were conduct on common hepatic duct in Guinea Fowl (*Numida meleagris*). Three tunics i.e. tunica mucosa, tunica muscularis and tunica adventitia were noticed in the microscopic study of common hepatic duct. The tunica adventitia was observed as the passage providing entity of blood vessels. With Weigert's method the collagen fibers has shown intense activity at lamina propria and tunica adventitia but rest of the components was observed with mild activity of collagen and elastic fibers. In the histochemical studies of common hepatic duct, Periodic Acid Schiff (PAS) for glycogen has shown the mild activity at the mucus of mucosal layer. The weak acid and alkaline phosphatase activity were shown by lamina propria and tunica muscularis.

Keywords: Common hepatic duct, billiary apparatus, guinea fowl, histochemical, histomorphology

Introduction
Common hepatic duct is a component of extra hepatic biliary apparatus. It forms by the unification of right and left hepatic ducts. It may be called as ductus hepaticus communis or Hepato-enteric duct in guinea fowl. (Purushottam *et al.* 2020) [20]. The extrahepatic biliary apparatus comprises the common hepatic duct and the accessory biliary apparatus which contains cystic duct and gallbladder. The common hepatic duct joins cystic duct to form the common bile duct that drains bile into duodenum (Toouli and Bhandari, 2006) [9]. Throughout the course of common hepatic duct (CHD) towards duodenal opening, the cystic duct joins it and runs parallel up to the duodenum. Common hepatic duct drains mainly the some part of right lobe and left lobe of liver directly into the ascending duodenum that is why is called as hepato-enteric duct (Purushottam *et al.* 2020) [20]. The literature reveals insufficient information on this duct in guinea fowl birds and hence histomorphological and histochemical studies of the common hepatic duct is undertaken on Guinea Fowl (*Numida meleagris*).

Materials and Methods
The extra hepatic biliary ducts were acquired from 12 Guinea Fowl birds (*Numida meleagris)* from local meat shops in Udaipur. The collected twelve samples of various age groups of guinea fowl were transferred on ice to the laboratory for routine investigations. The same sample were used for histological and histochemical studies. The samples were fixed in 10% Neutral Buffered formalin as per the requirement of histological and histochemical studies (Singh and Sulochana, 1996) [7]. Routine Haematoxyline and eosin and Weigert's method were used for histomorphological studies. The histochemical studies of were studied after PAS, acid and alkaline phosphatases methods (Singh and Sulochana, 1996) [7].

Results and Discussion
The common hepatic duct which formed after union of left and right hepatic duct has been studied with its serial sections. No major differential histological features were observed in its extra-hepatic course except the lumen, which was constricted towards caudal duodenum rather it was larger at cranial towards liver (Fig. 1 and 2).
Mucosal layer was discovered with simple columnar epithelium and considerable lamina propria, wherein lymphoid aggregations with vessels were encountered. The lamina muscularis and submucosal layer were not observed. Inner longitudinal and outer circular muscle fibers were seen in approximately equal proportion, however, outer layer of muscle fibers were observed less extensive in comparison with cystic duct.

The tunica adventitia was also observed as the passage providing entity of blood vessels (Fig. 3). Collagen fibers has shown intense activity at lamina propria and tunica adventitia but the intermingling collagen and elastic fibers were observed with mild activity in rest of the components. Blood vessels which shown their presence at the periphery of tunica adventitia has shown the intense activity of elastic fibers (Fig. 4).

The histological observations recorded in present studies were not different than Rahko and Nikander (1990a) [5] who has revealed the histological findings in reindeer, Stornelli *et al.* (2006) [8] in Ostrich, Mobini and Faradonbeh (2012) [2] in the Iranian Chukar Partridge and Mobini (2013) [3] in the male and female common quails. Their structural findings were corroborating the agreements with present revelations and thereby the functional performance of common hepatic duct.

The mild activity against PAS for glycogen has been seen at the mucus of mucosal layer (Fig. 5). It was showing the similar but agreeing views towards reactivity shown as the most functional component of CHD and thereby the energy requisition observed located in the form of glycogen there.

Weak acid and alkaline phosphatase activity were shown by lamina propria and tunica muscularis (Fig. 6 and 7) which was also shown its continuance ability to perform with vigour. It was contradictory with the findings of Rahko and Nikander (1990b) [6] who has not demonstrated Glycogen in reindeer (*Rangifer tarandus tarandus* L.) but he had demonstrated in carnivores. At the same time it was in consensus with the observation put on record by Faccioli *et al.* (2014) [1] in carnivorous fish (*Hemisorubim platyrhynchos*).

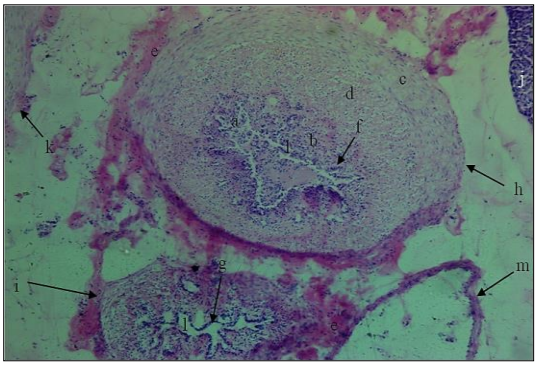

Fig 1: Photomicrograph is showing wall of common hepatic duct at the caudal end of biliary apparatus. a. Tunica mucosa, b. Lamina propria, c. Outer circular, d. Inner longitudinal, e. Tunica adventitia, f. Columnar cells, g. Cuboidal cells, h. Common hepatic duct, i. Pancreatic duct, j. Pancreas, k. Cystic duct, l. Lumen and m. Blood vessel. Haematoxylin and Eosin 100X.

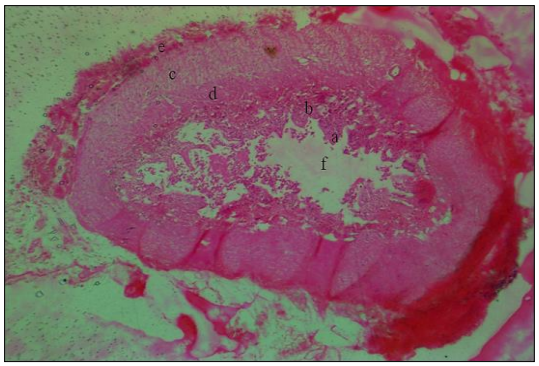

Fig 2: Photomicrograph is showing wall of common hepatic duct at the middle part of biliary apparatus. a. Tunica mucosa, b. Lamina propria, c. Outer circular, d. Inner longitudinal, e. Tunica adventitia and f. Lumen. Haematoxylin and Eosin 100X.

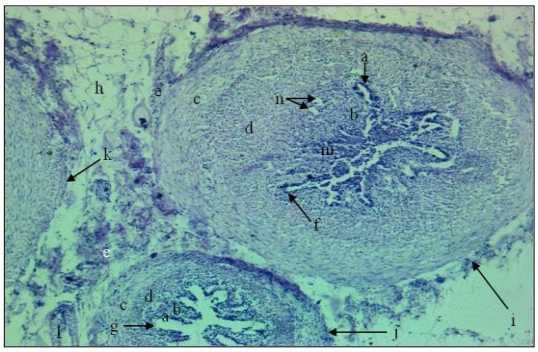

Fig 3: Photomicrograph is showing wall of common hepatic duct at the caudal end of biliary apparatus. a. Tunica mucosa, b. Lamina propria, c. Outer circular, d. Inner longitudinal, e. Tunica adventitia, f. Columnar cells, g. Cuboidal cells, h. Adipose tissue, i. Common hepatic duct, j. Pancreatic duct, k. Cystic duct, l. Blood vessel, m. Lymphoid aggregation and n. Lymphatic vessels. Haematoxylin and Eosin 100X.

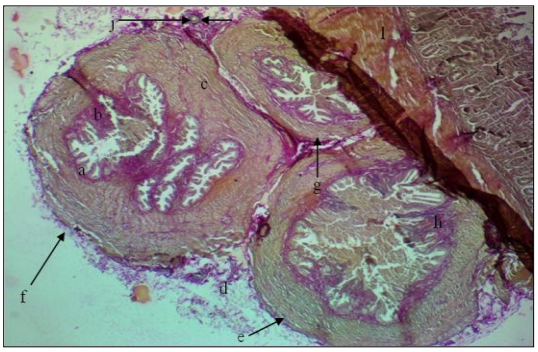

Fig 4: Photomicrograph is showing caudal end of biliary apparatus with elastic and collagen fibers. a. Tunica mucosa, b. Lamina propria, c. Tunica muscularis, d. Tunica adventitia, e. Cystic duct, f. Common hepatic duct, g. Pancreatic duct, h. Collagen and Elastic fiber, i. Capillary, j. Elastic fiber, k. Villi and l. Duodenum. Weigert's Method 40X.

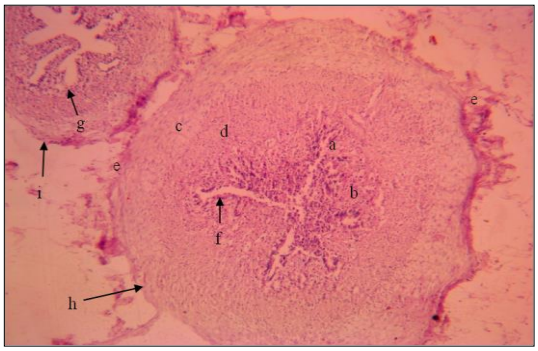

Fig 5: Photomicrograph is showing the PAS activity in the wall of common hepatic duct at caudal end. a. Tunica mucosa, b. Lamina propria, c. Outer circular, d. Inner longitudinal, e. Tunica adventitia, f. Columnar cells, g. Cuboidal cells, h. Common hepatic duct and i. Pancreatic duct. Periodic Acid Schiff 100X.

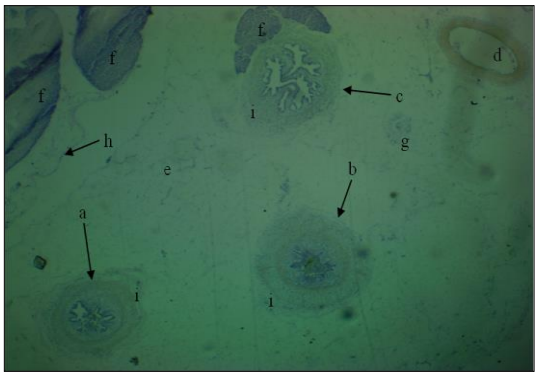

Fig 6: Photomicrograph is showing acid phosphates activity at caudal end of the biliary apparatus. a. Cystic duct, b. Common hepatic duct, c. Pancreatic duct, d. Artery, e. Adipose tissue, f. Pancreas, g. Connective tissue, h. Tunica serosa and i. Tunica adventitia. Acid Phosphates 40X.

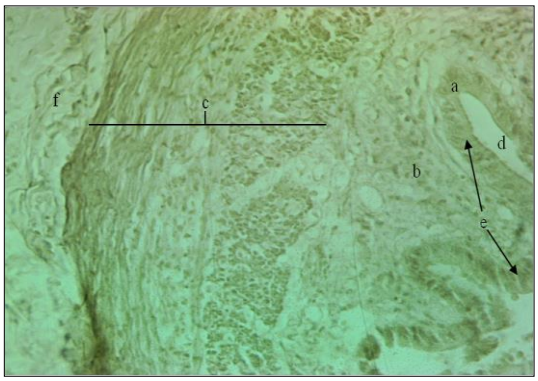

Fig 7: Photomicrograph is showing alkaline phosphates activity at the caudal end of the wall of common hepatic duct. a. Tunica mucosa, b. Lamina propria, c. Tunica muscularis, d. Lumen, e. Columnar cells and f. Tunica adventitia. Alkaline Phosphates 400X.

Conclusion

The lumen of common hepatic duct was constricted caudally towards duodenum rather it was larger lumen at cranial towards liver. Mucosal layer was discovered with simple columnar epithelium and considerable lamina propria, wherein lymphoid aggregations with vessels were encountered. The lamina muscularis and submucosal layer were not observed. Inner longitudinal and outer circular muscle fibers were seen in about equal proportion. Outer layer of muscle fibers were observed less extensive in comparison with cystic duct. Collagen fibers has shown intense activity at lamina propria and tunica adventitia. Rest of the components was observed mild activity of collagen and elastic fibers. Mucus of mucosal layer was seen with mild activity of PAS for glycogen. Lamina propria and tunica muscularis were shown weak acid and alkaline phosphatase activity.

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