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Histology of Extrahepatic Bile Ducts in the Iranian Chukar Partridge (*Alectoris Chukar*)

Behzad Mobini^{1*} Kaveh Shirani Faradonbeh²

Abstract

A study on the histology of the extrahepatic bile ducts was conducted in eight female and eight male twenty-week-old healthy Iranian partridges (*Alectoris chukar*). The extrahepatic bile ducts possessed tunica mucosa, muscularis and serosa. The tunica mucosa of the extrahepatic bile ducts was lined by non ciliated simple columnar epithelium. The apical cytoplasm of epithelial cells was covered by a continuous striated border of microvilli. The goblet cells were absent in epithelium. Tunica mucosa formed some simple folds lining with tall columnar epithelium. The lamina muscularis mucosa was absent. All epithelial cells of the bile ducts reacted with acid and neutral mucopolysaccharides. The lamina propria-submucosa contained numerous diffuse lymphatic tissues. The tunica muscularis of the extrahepatic bile ducts was composed of a thick circular layer of smooth muscle fibers. The tunica serosa presented no striking features. No significant sex-based differences were found. It is concluded that the histology of the bile ducts of the *Alectoris chukar* was similar to that in guinea fowl except for the tunica muscularis. In addition, histochemical properties of the extrahepatic bile ducts of chukar were similar to those of chukar gall bladder.

Keywords: *Alectoris chukar*, bile ducts, histology

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บทคัดย่อ

ลักษณะทางจุลกายวิภาคของท่อน้ำดีนอกตับในนกกระทาชุการ์อิหร่าน (*Alectoris Chukar*)

Behzad Mobini^{1*} Kaveh Shirani Faradonbeh²

การศึกษานี้ทำการศึกษาลักษณะทางจุลกายวิภาคของท่อน้ำดีนอกตับในนกกระทาชุการ์อิหร่าน (*Alectoris Chukar*) ที่มีสุขภาพแข็งแรง และมีอายุ 20 สัปดาห์ โดยประกอบด้วยเพศผู้และเพศเมีย เพศละ 8 ตัว โดยพบว่าชั้น tunica mucosa ของท่อน้ำดีนอกตับถูกปกคลุมด้วยเยื่อบุชนิดซิมเปิล คอลัมนาร์ แบบไม่มีซีเลีย และไม่พบเซลล์กอบเลท ทางด้านบนของเซลล์เยื่อบุถูกปกคลุมด้วยขอบไมโครวิลไลที่เรียงตัวแบบต่อเนื่อง ชั้น tunica mucosa มีการพับตัวและปกคลุมด้วยเซลล์เยื่อบุชนิดคอลัมนาร์ทรงสูง ที่ท่อน้ำดีนี้ไม่พบชั้นมัสคิวลาริส มีวโคซา นอกจากนี้พบว่ามีเซลล์เยื่อบุทั้งหมดของท่อน้ำดีทำปฏิกิริยากับสาร mucopolysaccharide ชนิดที่เป็นกรดและเป็นกลาง ในส่วนของชั้น lamina propria-submucosa พบการกระจายตัวโดยทั่วไปของเนื้อเยื่อน้ำเหลืองจำนวนมาก และในชั้น tunica muscularis ของท่อน้ำดีนอกตับประกอบด้วยชั้นกล้ามเนื้อเรียบที่เรียงตัวเป็นวงกลมหนา ส่วนชั้น tunica serosa ไม่มีลักษณะจำเพาะโดดเด่น และไม่พบว่ามี ความแตกต่างระหว่างเพศ สรุปได้ว่าลักษณะทางจุลกายวิภาคของท่อน้ำดีในนกกระทาชุการ์อิหร่าน (*Alectoris chukar*) คล้ายกับของไก่ต๊อก ยกเว้นชั้น tunica muscularis และพบว่าคุณลักษณะฮิสโตเคมีของท่อน้ำดีนอกตับเหมือนกับของงูน้ำดี

คำสำคัญ: *Alectoris chukar* ท่อน้ำดี ลักษณะทางจุลกายวิภาค

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Introduction

Chukar is a polytypic species, with about 14 recognized subspecies. *Alectoris chukar* is a central Eurasian species, inhabiting the dry highlands of Europe through the Himalayas. It has been introduced throughout North America and the Southeastern Hawaiian Islands. This partridge is also a valuable pet for some people. In recent years *Alectoris chukar* has been reared intensively in Iran. Regarding the large investments in this field, providing knowledge of the microscopic anatomy and biology of this species could be quite valuable. For the elucidation of histology and histochemistry of biliary ducts, some investigations have been carried out in different avian species such as chicken (Ghoddusi and Roger Kelly, 2004; Yoshida et al., 2010), ostrich (Stornelli et al., 2006), guinea fowl (Sivagnanam and Geetha, 2008), and duck (Yoshida et al., 2010). However, no insight has ever been gained into the histological and histochemical structures of the bile ducts in *Alectoris chukar*. Also, research on *Alectoris chukar* in Iran has started very recently, which makes this investigation even more important. The aim of this study was to describe normal histological and histochemical findings of extrahepatic bile ducts of Iranian chukar partridges and compare these features with other bird species.

Materials and Methods

A total of 16 healthy *Alectoris chukar* of both sexes (8 females and 8 males) were obtained from the Research Farm of Household Bird's Maintenance of College of Veterinary, Azad University of Shahrekord. The birds were deeply anesthetized by excess ether inhalation. The guidelines of the ethical committee of Shahrekord Azad University were strictly followed during the procedure. The gall bladders and extrahepatic bile ducts were removed and fixed in 10% buffered formalin solution for 24 to 48 hours, dehydrated and embedded in paraffin in routine manners. Tissue samples were stained by hematoxylin eosin for general observations and special stainings; Verhoeff's, Gomori's method for reticulum, Masson's trichrome, alcian blue (pH 1.0), Periodic acid-Schiff (PAS) and alcian blue/PAS (Kiernan, 1999). Sections were observed under light microscope.

Results and Discussion

The wall of extrahepatic bile duct in the *Alectoris chukar* was composed of tunica mucosa, muscularis and serosa in both sexes. The mucosa formed some simple folds lining with tall columnar

epithelium, which appeared to be irregularly distributed over the whole luminal surface of the bile ducts (Fig 1).

The mucosal folds were almost non-isometric. The tunica mucosa of the bile ducts was mainly lined by non-ciliated simple columnar epithelium. However, in some regions it varied from cuboidal to tall columnar. The apical cytoplasm of these cells was covered by a continuous striated border of microvilli (Fig 2). No goblet cells were observed in epithelium. The surface cells and those lining folds exhibited a light or a dark oval nucleus located in the basal cytoplasm. However, in some regions with cuboidal epithelium, the nucleus was more spherical. Deep invaginations of the surface epithelium were not observed in tunica mucosa. All epithelial cells reacted positively to periodic acid Schiff (Fig 2), and alcian blue stains (Fig 3).

The thin lamina propria-submucosa contained loose connective tissue which consisted of reticular (Fig 4), elastic (Fig 5) and collagenous fibres (Fig 4), and numerous diffuse lymphatic tissues, but no glands were found (Figs 2, 4). The lamina muscularis mucosa was absent. The tunica mucosa showed no significant differences by sex.

The tunica muscularis of the bile ducts was composed of a thick layer of circularly arranged muscle fibres (Figs 1, 2). In the present study, sexual differences in tunica mucosa were not observed. The outermost tunica of the free surface of the bile ducts was the serosa, which loose connective tissue invested by mesothelium (Figs 1, 2). The loose connective tissue was made up of reticular (Fig 4), elastic (Fig 5), collagenous fibres (Fig 6), parasympathetic ganglia with nerve bundles, nerve ganglion and blood vessels (Fig 1), but glands were absent in tunica serosa. The tunica serosa of bile ducts showed no significant sex differences.



Figure 1 The extrahepatic bile duct of twenty-week-old Iranian chukar partridges, lumen (L), epithelium (E), simple fold (F), lamina propria-submucosa (L-S), tunica muscularis (TM), tunica serosa (TS), artery (A), vein (V), nerve fiber (NF) and ganglion (G), Alcian blue/PAS x100

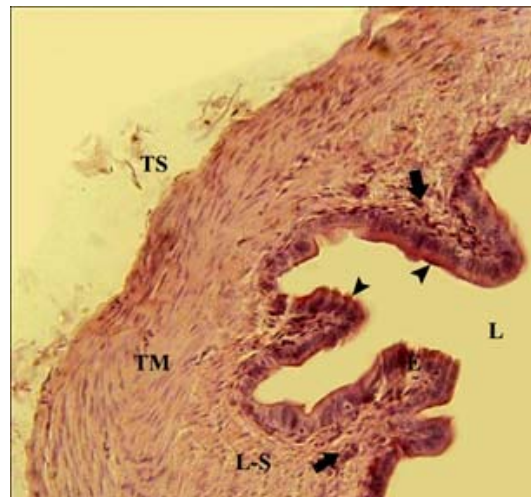


Figure 2 PAS-positive material is present in the apical part of the cytoplasm of the epithelial cells (arrowheads), lumen (L), epithelium (E), lamina propria-submucosa (L-S), diffuse lymphatic tissues (arrows), tunica muscularis (TM), tunica serosa (TS). PAS x400

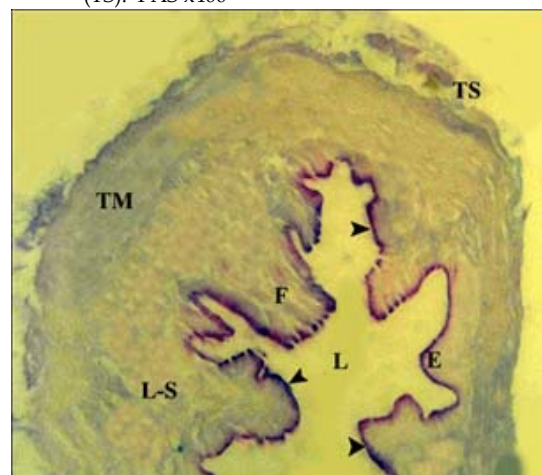


Figure 3 Acidophilic mucosubstances are present in the apical part of all epithelial cells (arrowheads), lumen (L), epithelium (E), simple fold (F), lamina propria-submucosa (L-S), tunica muscularis (TM), tunica serosa (TS). Alcian blue x400

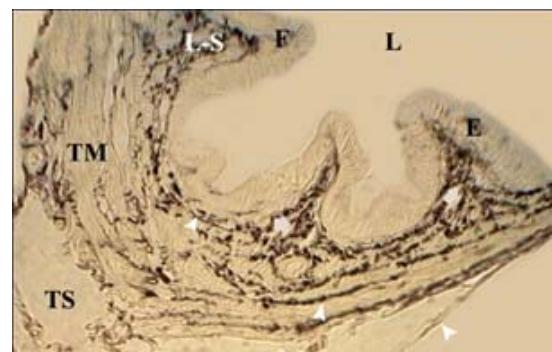


Figure 4 Reticular fibers (arrowheads) in lamina propria-submucosa (L-S), and tunica serosa (TS) of chukar bile duct, lumen (L), epithelium (E), simple fold (F), lymphatic tissues (arrows), tunica muscularis (TM). Gomori's method for reticulum x400

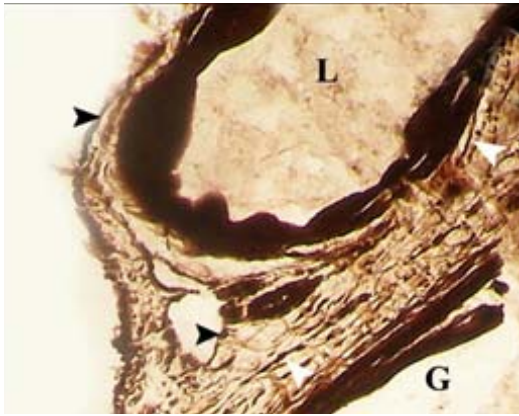


Figure 5 Elastic fibers (arrowheads) in lamina propria-submucosa (L-S) and tunica serosa (TS) of chukar bile duct, lumen (L), gall bladder (G). Verhoeff's x100

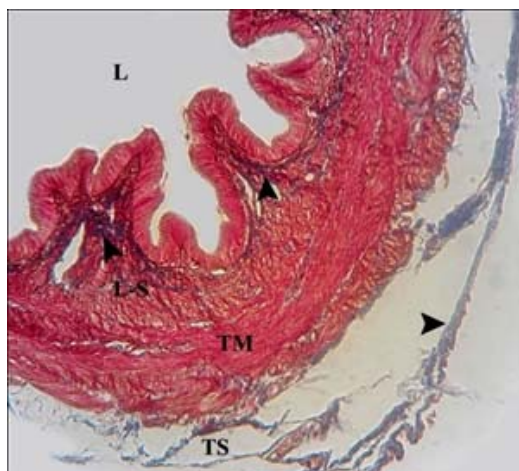


Figure 6 Collagenous fibers (arrowheads) in lamina propria-submucosa (L-S) and tunica serosa (TS) of chukar bile duct, lumen (L), tunica muscularis (TM). Masson's trichrome x400

Discussion

The extrahepatic bile duct in the *Alectoris chukar* possessed tunica mucosa, tunica muscularis and tunica serosa, which was similar to those of guinea fowl (Sivagnanam and Geetha, 2008). In the chukar partridges the mucous membrane of the bile duct was thrown into simple folds and covered with an epithelial tissue which consisted of a single layer of columnar cells. Similar results were also reported by Mobini (2012) in the chukar gall bladder.

Mobini (2012) reported that the mucosal folds of chukar gall bladder were regular and isometric, but in the present study, they were almost non-isometric and irregular. Although some variations were observed in the epithelium of tunica mucosa, it was mainly lined by non-ciliated simple columnar cells similarly to the findings of Stornelli et al. (2006) in ostrich and Sivagnanam and Geetha (2008) in guinea fowl. All epithelial cells containing a light or a dark oval nucleus were situated basally, which were similar to those of ostrich (Stornelli et al., 2006) and guinea fowl (Sivagnanam and Geetha, 2008).

The findings of luminal surfaces of epithelial cells covered by a continuous striated border of microvilli agree with the results obtained from Dellmann and Eurell (1998). Similar results were also reported by Mobini (2012) in the chukar gall bladder. Sivagnanam and Geetha (2008) reported that in guinea fowl, lamina muscularis was not observed in bile duct mucosa. This finding was in agreement with our results. Mobini (2012) described that the goblet cells, gland and lamina muscularis were not found in mucosa of chukar gall bladder. Similar findings were observed in this study. However, the epithelial downgrowths were not observed in tunica mucosa unlike those of gall bladder.

In the present study, the luminal surface of all epithelial cells reacted to the techniques used. These mucosal histochemical reactions of the chukar bile duct were similar to those of previous study, which indicated that the mucosubstances consisted of acid and neutral glycosaminoglycan complexes (Mobini, 2012). While some investigators have reported that the presence of mucous secretion might form a water-absorbing surface gel for the concentration of the bile (Bansil et al., 1995), other have noticed that they appeared to play significant roles for maintaining functionally important properties of membranes such as morphological configurations, structural rigidity and permeability (Thornton and Sheehan, 2004). These findings indicated that in the *Alectoris chukar*, the epithelium of the extrahepatic bile duct and gall bladder (Mobini, 2012) had a secretory function (Dellmann and Eurell, 1998) and suggested an association of neutral mucopolysaccharides with acid mucins (Mobini, 2012).

In the present study, numerous diffuse lymphatic tissues were found in lamina propria-submucosa connective tissue. Similar findings have been obtained in gall bladder of chickens (Ciobotaru and Militaru, 2002) and *Alectoris chukar* (Mobini, 2012). The tunica muscularis of extrahepatic bile duct in guinea fowl was composed of an outer and inner longitudinal layer and a middle circular layer of smooth muscle fibers (Sivagnanam and Geetha, 2008). In chukar partridges, however, there was a thick layer of circularly arranged muscle fibers. The findings of tunica serosa of bile duct in chukars agrees with the results obtained from Sivagnanam and Geetha (2008).

In conclusion, the histology of the bile ducts of the *Alectoris chukar* was generally similar to that in guinea fowl except for the tunica muscularis, which consisted of a thick layer of circularly arranged muscle fibers. Histochemical properties of the extrahepatic bile ducts were similar to those of chukar gall bladder.

References

- Bansil, R. Stanley, E. and Lamont, J.T. 1995. Mucin Biophysics. *Annu Rev Physiol.* 57: 635-657.
- Ciobotaru, E. and Militaru, M. 2002. Researches regarding the structure and reactivity of lymphoid formation associated to gall bladder in chicken. *Rev Rom Med Vet.* 12: 117-127.

- Dellmann, H. D. and Eurell, J. 1998. Textbook of Veterinary Histology. 5th ed., Baltimore, USA: Lippincott Williams & Wilkins. 316-318.
- Ghoddusi, M. and Roger-Kelly, W. 2004. Ultrastructure of *in situ* perfusion-fixed avian liver with special reference to structure of the sinusoids. Microsc. Res Tech Microscopy. 65: 101-111.
- Kiernan, J.A. 1999. Histological and Histochemical Methods: Theory and practice. 3rd ed. Oxford, Boston: Butterworth Heineman. 144-164, 213-243.
- Mobini, B. 2012. Microscopic study of the gall bladder of the chukar partridge (*Alectoris chukar*). Bulg J Vet Med. 15: 73-78.
- Sivgnanam, S. and Geetha, R. 2008. Histological studies on the gall bladder and biliary system in Guinea fowl. Indian J Vet Anat. 20: 60-61.
- Stornelli, M.R., Ricciardi, M.P., Giannesi, E. and Coli, A. 2006. Morphological and histological study of the ostrich (*Struthio Camelus L.*) liver and biliary system. Ital J Anat Embryol. 111: 1-7.
- Thornton, D.J. and Sheehan, J.K. 2004. From mucins to mucus: toward a more coherent understanding of this essential barrier. Proc Am Thorac Soc. 1: 54-61.
- Yoshida, K., Yasuda, M., Nasu, T. and Murakami, T. 2010. Scanning electron microscopic study of vascular and biliary casts in chicken and duck liver. J Vet Med Sci. 72: 925-928.