

Histological study of the gall bladder of the common quail (*Coturnix coturnix*)

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ABSTRACT: The objective of this investigation was to study the histological structure of the gall bladder in the common quail (*Coturnix coturnix*). Samples were obtained from six male and six female healthy adult common quail. Tissue sections were stained with haematoxylin and eosin. Histological results showed that the overall histology of the gall bladder of the common quail is similar to that in the chukar partridge except for the goblet cells. No significant sex-based differences were found. The gall bladder was composed of tunica mucosa, tunica muscularis and tunica serosa or tunica adventitia. The tunica mucosa was mainly lined with simple columnar epithelium which was covered by a continuous striated border of microvilli. Goblet cells were observed among the epithelial cells. The tunica mucosa formed some folds which appeared to be regularly distributed over the whole gall bladder luminal surface and were mostly isometric. Deep invaginations of the surface epithelium were observed to have grown down into the underlying mesenchyme, showing a tubular gland-like appearance. The muscularis mucosa was absent. The thin lamina propria-submucosa contained loose connective tissue which consisted of numerous diffuse lymphatic tissues, but no glands were observed. The tunica muscularis consisted of a thin circular layer of smooth muscle fibres. The loose connective tissue of the tunica serosa or adventitia was made up of adipose tissues and blood vessels. It is concluded that the histological structures of the gall bladder of the common quail are similar to those of the chukar partridge except for the presence of goblet cells among the epithelial cells of the tunica mucosa.

Keywords: histology; gall bladder; sex; quail (*Coturnix coturnix*)

The tissues that supply secretions to the gut lumen include the intestine itself as well as the liver, gall bladder, and pancreas. As in other vertebrates, the avian liver provides exocrine secretions to the digestive tract. Its exocrine secretion is bile, which is synthesised in the hepatocytes and secreted into bile canaliculi. These canaliculi drain into interlobular ducts, which unite to form the right and left hepatic ducts, which in turn drain into the gall bladder (Hill 1979).

For elucidation of the histology of the gall bladder, investigations have been carried out in different adult avian species, such as chukar partridge (Mobini 2012), ostrich (Abidu-Figueiredo et al. 2006; Stornelli et al. 2006), guinea fowl (Sivgnanam and Geetha 2008) and chicken (Yamada and Hoshino 1972; Gheri et al. 1988; Ciobotaru and Militaru 2002). However, there is a lack of knowledge regarding the histology of the gall bladder in

common quail. This study was aimed at investigating detailed features of the gall bladder in the common quail (*Coturnix coturnix*) to reveal potential gender differences, and to compare the findings with those made in other birds.

MATERIAL AND METHODS

Six male and six female clinically healthy adult common quail (*Coturnix coturnix*) were used to determine the histological structures of the gall bladder. The birds were deeply anaesthetised using excess ether inhalation. The gall bladders were removed from the donors, placed in physiological saline and cut open therein to expel intravesical bile which is injurious to the epithelial tissues. The gall bladders were fixed in 10% buffered formalin solution for 12 to 24 h and processed for em-

bedding in paraffin. Tissue sections (6 μm) were stained with haematoxylin and eosin (Kiernan 1999). Histological studies on these sections were carried out using light microscopy.

RESULTS

No evident difference between the male and female common quails was observed in the histology of the gall bladder.

Light microscopic examination revealed that the gall bladder in the common quail is composed of tunica mucosa, tunica muscularis and tunica serosa (for the free surface) and tunica adventitia (for the attached surface) in both sexes (Figure 1). The tunica mucosa of the gall bladder was mainly lined with non-ciliated simple columnar epithelium. However, in some regions it varied from tall columnar to stratified columnar. These cells were covered by a continuous striated border of microvilli. Goblet cells were observed among epithelial cells (Figure 1).

The tunica mucosa formed some folds lined with tall columnar epithelium, which appeared to be regularly distributed over the whole luminal surface

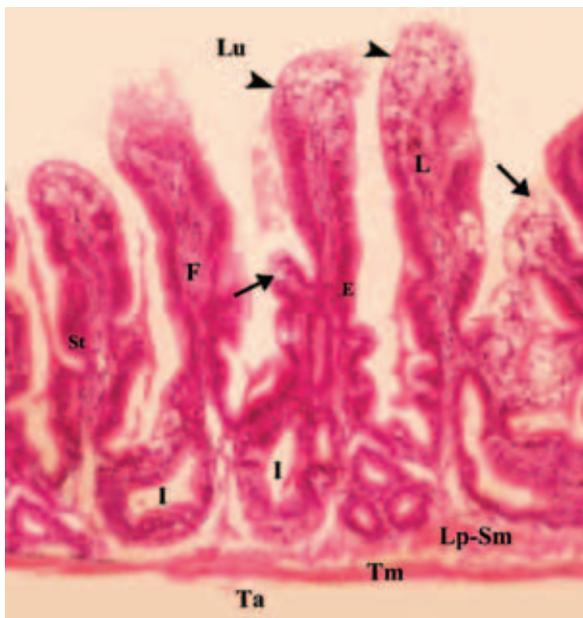


Figure 1. The gall bladder of the adult common quail; goblet cells (arrows) among simple columnar (E) to stratified columnar epithelial cells (St), isometric fold (F), striated border (arrowheads), diffuse lymphatic tissues (L), epithelial invaginations (I), lumen (Lu), lamina propria-submucosa (Lp-Sm), tunica muscularis (Tm), tunica adventitia (Ta); haematoxylin eosin, 400 \times

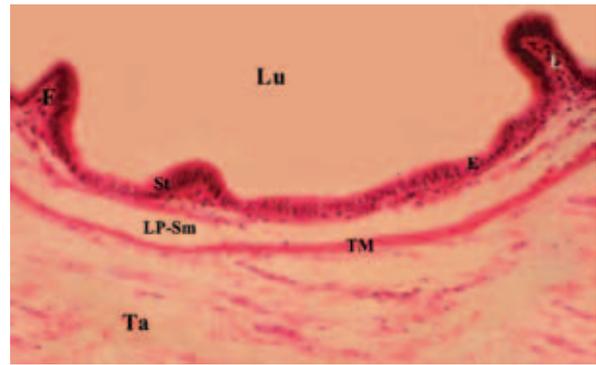


Figure 2. The gall bladder of adult common quail is composed of tunica mucosa, tunica muscularis (TM), and tunica adventitia (Ta); simple columnar (E) to stratified columnar epithelial cells (St), fold (F), diffuse lymphatic tissues (L), lamina propria-submucosa (Lp-Sm), lumen (Lu); haematoxylin eosin, 400 \times

of the gall bladder. The mucosal folds were mostly isometric. Deep invaginations of the surface epithelium were observed to have grown down into the underlying mesenchyme, showing a tubular gland-like appearance (Figure 1). No lamina muscularis mucosa was observed in the tunica mucosa. The thin lamina propria-submucosa contained loose connective tissue which consisted of numerous diffuse lymphatic tissues and blood vessels, but glands were not observed (Figure 1).

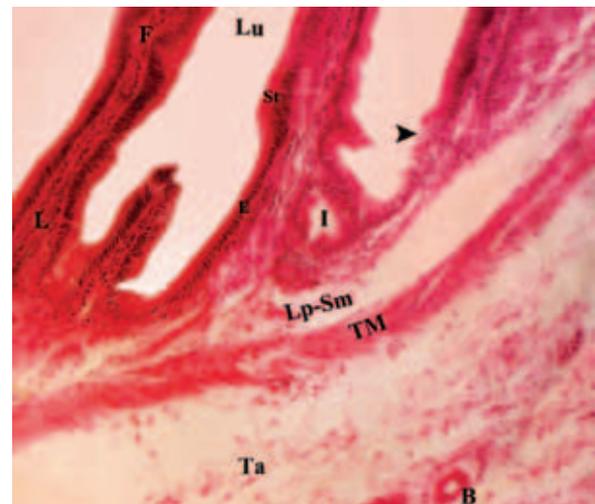


Figure 3. The simple columnar (E) to stratified columnar epithelial cells (St) are covered by a continuous striated border of microvilli (arrowheads), fold (F), diffuse lymphatic tissues (L), epithelial invaginations (I), lumen (Lu), lamina propria-submucosa (Lp-Sm), tunica muscularis (TM), tunica adventitia (Ta), blood vessels (B); haematoxylin eosin, 400 \times

The tunica muscularis of the gall bladder of the common quail was composed of a thin layer of circularly arranged muscle fibres (Figure 2).

On the outermost tunica on the free surface of the gall bladder was found serosa, in which loose connective tissue was coated with mesothelium, whereas on the attached surface adventitia was present and mesothelium was absent. The loose connective tissue was made up of adipose tissues and blood vessels, but glands were absent in tunica serosa (Figure 3).

DISCUSSION

In the present study, the histology of the gall bladder showed no significant differences according to gender which is in agreement with the results reported by Mobini (2012).

The wall of the gall bladder in the common quail was composed of tunica mucosa, lamina propria-submucosa, tunica muscularis and tunica serosa or adventitia, similarly to findings in the chukar partridge (Mobini 2012) and guinea fowl (Sivagnanam and Geetha 2008). Although some variation was observed in the epithelium of the tunica mucosa, this structure was mainly lined by non-ciliated simple columnar, which is similar to the findings of Mobini in the chukar partridge (Mobini 2012), Sivagnanam and Geetha (2008) in the guinea fowl and Yamada and Hoshino in the chicken (Yamada and Hoshino 1972).

The apical cytoplasm of epithelial cells, which was covered by a continuous striated border of microvilli is similar to the results reported by Yamada (1974), Dellmann (1993) and Mobini (2012). The isometric folds were regularly distributed over the whole gall bladder luminal surface, similarly to previous findings (Yamada and Hoshino 1972; Gheri et al. 1988; Mobini 2012). In the tunica mucosa, downgrowths of the surface epithelium which exhibited a tubular gland-like appearance mirrored previously reported findings (Yamada and Hoshino 1972; Gheri et al. 1988; Mobini 2012).

In the present study, no lamina muscularis nor glands were observed in the gall bladder mucosa of the common quail, which is in agreement with the results from previous studies (Sivagnanam and Geetha 2008; Mobini 2012).

Unlike other birds (Sivagnanam and Geetha 2008; Mobini 2012), goblet cells were observed among the epithelial cells of the gall bladder in the com-

mon quail. The lamina propria-submucosa of the quail gall bladder contained loose connective tissue with numerous diffuse lymphatic tissues which is in agreement with the findings of Mobini in the chukar partridge (Mobini 2012) and Ciobotaru and Militaru in chickens (Ciobotaru and Militaru 2002).

The tunica muscularis of the gall bladder in guinea fowl was composed of an outer longitudinal layer and an inner layer that consisted of outer circular and inner longitudinal muscle fibres (Sivagnanam and Geetha 2008). In common quails, however, there was a layer of circularly arranged muscle fibres which is again in agreement with the findings of Mobini in the chukar partridge (Mobini 2012).

The appearance of the tunica serosa and adventitia of the gall bladder in common quail are in agreement with the results obtained by Sivagnanam and Geetha (2008) and Mobini (2012).

In conclusion, the histological features of the gall bladder of the common quail (*Coturnix coturnix*) are similar to those in the chukar partridge except for the presence of goblet cells among the epithelial cells of the tunica mucosa. There were no significant effects of sex on the histology of the gall bladder.

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