

Some histological studies on the proventriculus of the quail during pre and post hatching periods

By

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Summary

This study was carried out on the histological structure of the proventriculus during pre and post hatching periods. The primordia of the proventriculus were appeared at three days post incubation as closed tube with star shaped lumen. The primordial epithelium was stratified columnar, and later on the numbers of the epithelial layers were decreased to become columnar epithelium at 8 days post incubation. Compound tubuloalveolar gland extends from the star shaped tube at 4 days post incubation which was lined with a mass of stratified epithelium representing the glands. The glands were developed, branched and occupied the propria submucosa of the gland by advanced age and were lined by mucous cells and cuboidal cells. The mesenchymal cells that surround the primordial tube were differentiated to be the future propria and submucosa of the proventriculus at 11 days post incubation periods. The myoblast cells in the surrounding mesenchymal cells were differentiated to inner circular and outer longitudinal smooth muscle fibers of the tunica musculosa. The tunica serosa appeared and clearly investigated at 9 days post incubation. The histological structure of the proventriculus post hatching had the same feature of the late pre hatching period except that, there was an increase in both the size and surface area of the glands.

Introduction

The proventriculus, a glandular organ, corresponds to the stomach of other animals as it produces a gastric juice containing acid and enzymes. It differs in that little mixing or holding of food occurs in it. The up to date mission of the food scientists was based on, saving high quality, palatable, cheap and environmental hygienic food of animal origin. Their target was the quail's meat (**Bader, 2005**). The quail proventriculus with its enzymatic activities played a major role in the turnover of the ingested food to give good quality meat. The proventriculus was studied by many authors (**El-Banhawy et al., 1993**) in

chicken (El-Zoghby, 2000) in turkey, (Prasad and Krishna, 1990) in duck and (Hassouna, 2001) in goose. The birds, to maintain their high metabolic level, utilize the most of their time for search of the food. Our interest was directed to throw some spotlights on the histological description of the proventriculus in the quail during the pre and post hatching periods, which may be useful in other investigations.

Materials and methods

The fertilized eggs of the quail were collected from the quail farms and were opened for the collection of the whole embryo chicks during the pre hatching periods at 1, 3, 4, 7, 11, 15, 18 days post incubation. While the proventriculus was collected from the post hatched chicks at 3,8,16,29,51 days post hatching. The specimens were dissected and immersed in Susa fluid, then dehydrated in alcohols , cleaned in xylene and embedded in soft paraffin and cut at 5 um and were stained with hematoxyline & eosin (Harris, 1898) for general character , Crossmon,s trichrome (Crossmon's, 1937) for identification of collagen fibers ,silver impregnation technique (Gomori, 1937) for identification of reticular fibers and combination of PAS and alcian blue for identification of neutral and acid mucopolysacharides (Mowry ,1956) .

Results

1-Prehatching periods

The primordia of the quail proventriculus were appeared at 3 days post incubation as a closed tube with star shaped lumen. It was lined with stratified columnar epithelium which rested on a definite basement membrane (Fig.1).

The primordial epithelium was surrounded with different shapes of mesenchymal cells (Fig.2). Both of the primordial epithelium and the mesenchymal cells were PAS positive reaction, while the cells apex was appeared strong PAS positive reaction (Fig.3).

Myoblast cells were arranged at the periphery of the mesenchymal cells with eosinophilic cytoplasm and positive PAS reaction. It was represented the future tunica musculosa (Fig.3).

Long tubular shaped glands were extending from the star shape lumen as out pouching into the mesenchymal cells at the age of 4 days post incubation. These out pouching ended with dilatations which were

formed from a mass of stratified cells with eosinophilic cytoplasm (Fig.4).

Both of the size and the amount of the glands were increased with the age advance at 8 days post incubation and were appeared as compound tubuleoalveolar gland. These glands still lined by stratified epithelium. The glands were arranged as lobules separated from each other by thick CT septa (Fig.5). The surface epithelium of the proventriculus was decreased in height and crowdedly covered the mucous membrane of the proventriculus. The epithelium was simple columnar epithelium with basely situated basophilic nuclei and eosinophilic cytoplasm, with no evidence of goblet cells among them. The proventricular glands were lined with stratified columnar epithelium with wide lumina, but some glands were still undifferentiated and appeared as a mass of stratified cells (Fig.5). The mesenchymal cells were differentiated to become loose CT which represented the lamina propria that enclosed the proventricular gland. The tunica muscularis was arranged into thin inner circular and thick outer longitudinal smooth muscle fibers layers (Fig.6). The tunica serosa was appeared and arranged clearly as loose CT enclosed by thin sheet of mesothelial cells at 9 days post incubation. Both of the glandular epithelium and the tunica muscularis were PAS positive while the CT fibers of the propria and submucosa and that of the smooth muscles were alcianophilic fibers (Fig.7).

The amount of the lobules of the gland was increased and completely occupied the propria submucosa. The duct of the gland appeared in the center of each lobule and lined by stratified epithelium. The CT septa were decreased in thickness at 13 days post incubation (Fig.8).

The proventricular glands were arranged in the form of branched and anastomosing units while the others were arranged in the form of short and long cords around wide central lumen in each lobule at 15 days post incubation. (Fig.8). The CT septa were represented by collagen fibers which also extend among the muscles of the tunica muscularis (Fig.8), and reticular fibers which were enclosed each unit of the gland and also extended in the CT septa (Fig.9) at 18 days post incubation.

2-Posthatching periods

The histological structure of the proventriculus at 3-8 days post hatching had the same histological structure of the proventriculus at late post incubation period, but the size and amount of the gland lobules was increased. The muscular wall was increased, while the septa were decreased in comparison to the late post incubation period (Fig.10).

The histological structure of the quail proventriculus at 16-51 days post hatching was characterized by arrangement of the glands into cords which lined by cuboidal epithelial cells with dark eosinophilic cytoplasm and centrally located basophilic nuclei (Fig.11). The glands increased in size and arranged as anastomosing cords lined by cuboidal epithelium (Fig.12).

Discussion

None of the previously mentioned authors gave an attention to the histological sequence of the development of the proventriculus as regularly steps. Although there were some trials in late stage of development in chicken (Martinez, Lopz and Sesma, 1993) and in turkey (El-Zoghby, 2000).

The present work was showed that the primordia of the quail's stomach appeared as a star shaped tube lined by stratified columnar epithelium at 3 days post incubation. The development of the embryonic proventriculus was done at 5th day post incubation in chicken (Martinez, et al, 1993). While it became prominent at 7th day post incubation in *Gallus domesticus* and begins to branch at 10th day, it increase more and more up to 13th day.

The epithelium lining the proventriculus was stratified columnar epithelium, and later it decreased in height at 9 days post incubation, and became simple columnar epithelium. This finding was supported by the finding of (Lim&low1977), which recorded that the surface epithelium of the chick was stratified columnar epithelium and then by the advance in development became simple columnar epithelium. While the epithelium of the stomach of the chick embryo was stratified columnar up to 11-16days post incubation and then differentiated to simple columnar epithelium between 17-20 days post incubation (Vanalten and Fennell, 1957). The epithelial lining was mucous secreting cells in the *Gallus domesticus* (Hibbard,1942).

The present data revealed that the proventricular glands were multilobular. Each lobule consisted of closely packed tubular alveoli that drained into a central cavity via tertiary duct. The proventricular gland alveoli were formed from one cell type, the oxynticopeptic cell, the proventriculus cells gave hydrochloric acid & proteolytic enzymes (Randall & Reece, 1996). The proventricular tubules in the chicken were composed of cuboidal cells (Calhoun, 1954 and Bragulla, et al., 2001).

In the present work, no L.m.m was recorded in the mucosa of the gland although most of the authors were mentioned it. The L.m.m was located above and beneath the gland (Bradley, 1951). However (Farner, 1960) and (Czarnecki, 1977) reported that the chicken proventriculus gland penetrate the L.m.m during their development and separate it into inner and outer part

The lining epithelium of the proventriculus is columnar epithelium while it is of prismatic type in other species (Singh, 1973; Hodges, 1974; Vial et al., 1977; Klem et al., 1982 and 1984; Bee De Speroni & Chikilian, 1983 and Salem, 1985).

In the present study, we noted that there is no change difference between the epithelium lining of the proventriculus in both pre and post hatching periods especially the simple columnar epithelium covered the mucous membrane. This finding was augmented by the finding of Deubner, 1995, in the chicken proventriculus.

The present data showed that the quail's proventriculus was compound tubular gland. It consists of numerous lobules separated by CT septa and forms the main bulk inside the mucosa. This finding was supported by the observation of Prasad and Krishna, 1992, in the duck.

Some authors have found the proventriculus simple tubular glands lined by simple columnar epithelium (Espinola & Galliussi, 1990).

The present results revealed positive PAS reaction in the surface epithelium and the cuboidal epithelium of the glands, while faint positive reaction in the muscle fibers of the tunica musculosa. These findings were augmented by the results of (Hinsch, 1967b) in chicken and (El-Zoghby 2000) in turkey. This positive PAS coat that covers the surface epithelium may have a protective role in avoiding the effect of HCL on the mucous membrane of the proventriculus (Windle, 1960 and Prasad and krishna 1990).

The tunica musculosa of the quail's proventriculus was consisted of thick inner circular and outer longitudinal layers of smooth muscle fibers. On the other hands most of the poultry species contain three layers of smooth muscles. (Espinola & Galliussi, 1990.) and (Hodges, 1974)

The description of the serosa of the proventriculus was constituted by connective tissue, containing many blood vessels and nerves, lined by mesothelium. This finding was augmented in most results of (Rocha,1991) and (Rocha, and Lima,1998)

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Fig.1: Photomicrograph of the quail embryo at 3 days post incubation showing; the primordia of the proventriculus which appear as a star shaped lined by a stratified columnar epithelium (E) and surrounded by mesenchymal cells (M). Notice the presence of hepatic primordia (L).

H&E.....X100

Fig.2: Photomicrograph of the quail embryo proventriculus at 3 days post incubation showing; the proventriculus epithelium (E), mesenchymal cells (M) and the myoblast (My).

H&E.....X400

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PAS& alcian blue combination.....X400

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H&E.....X100

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H&E.....X100

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H&E.....X100

Fig.7: Photomicrograph of the quail proventriculus at 8 days post incubation showing the PAS positive reaction and alcian blue positive reaction in the proventriculus (arrows).

PAS& alcian blue combinationX100

Fig.8: Photomicrograph of the quail proventriculus at 13 days post incubation showing; the lobules of the proventricular gland (L), the duct of the gland (D) and the tunica muscularis (M)

Crossman's trichrome.....X400

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Gomori's stain.....X400

Fig.10: Photomicrograph of the quail proventriculus at 3 days post hatching showing; the thin CT fibers between the secretory adenomeres of the gland (C) and the thick inner circular and outer longitudinal muscular wall (M).

H&E.....X400

Fig.11: Photomicrograph of the quail proventriculus at 16 days post hatching showing; the; arrangement of the secretory adenomeres of the proventricular glands into cords (C) and thick muscular wall (M).

H&E.....X400

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H&E.....X400

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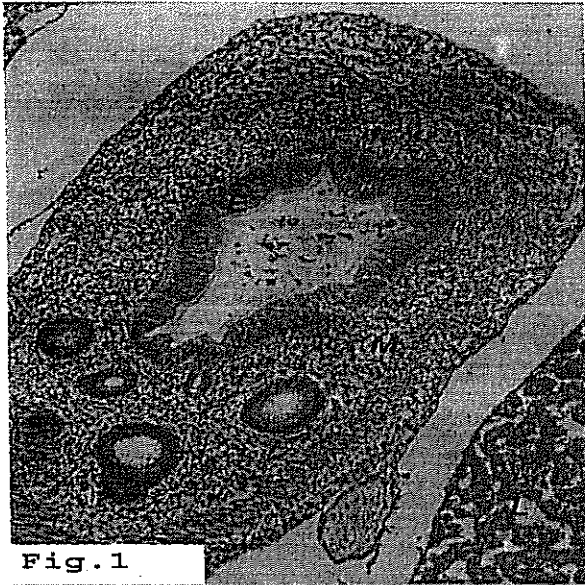


Fig.1

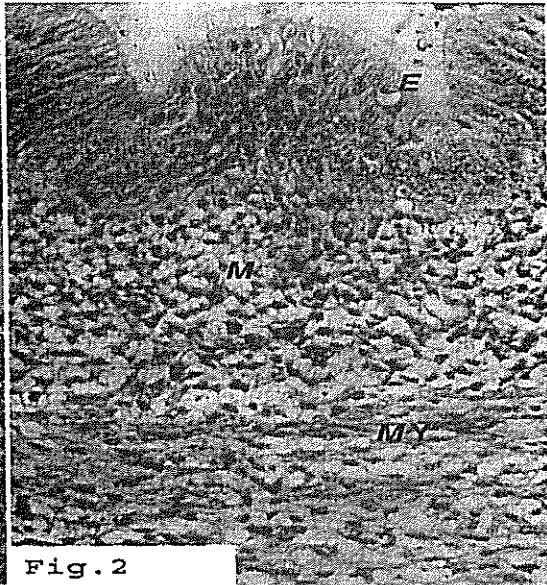


Fig.2

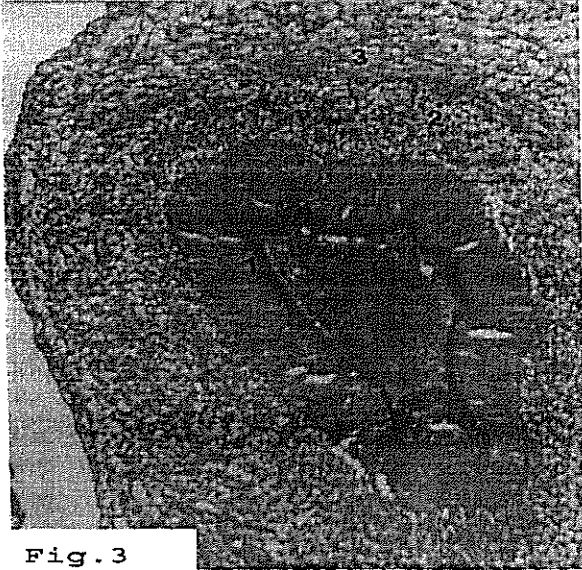


Fig.3

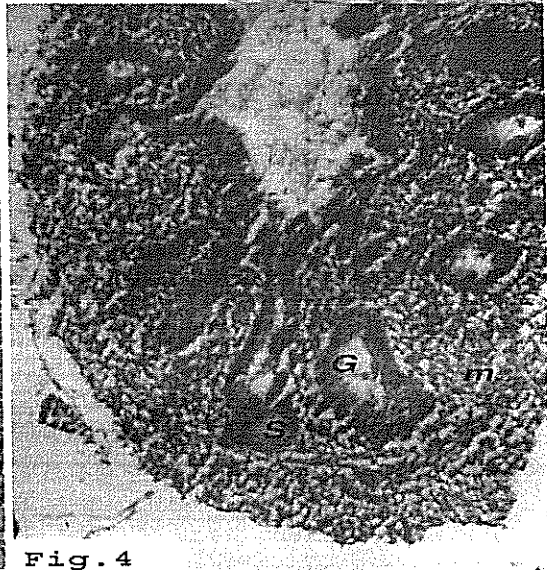


Fig.4

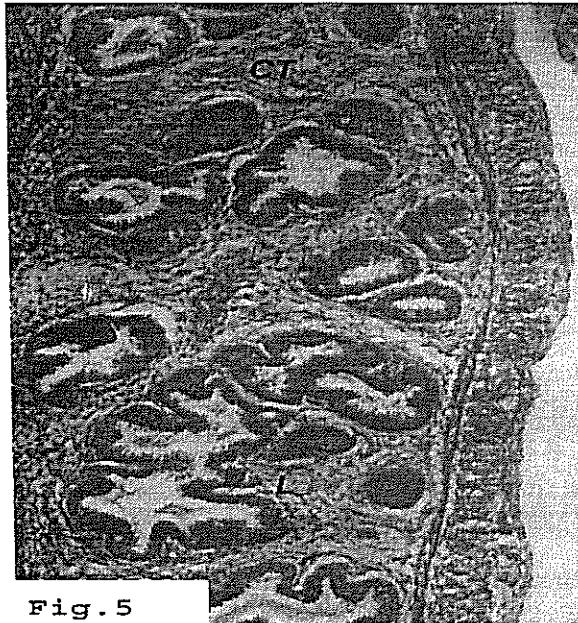


Fig.5

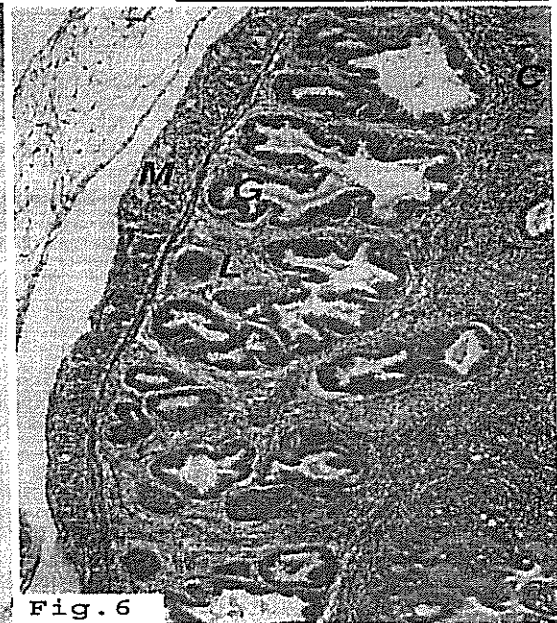


Fig.6



Fig. 7

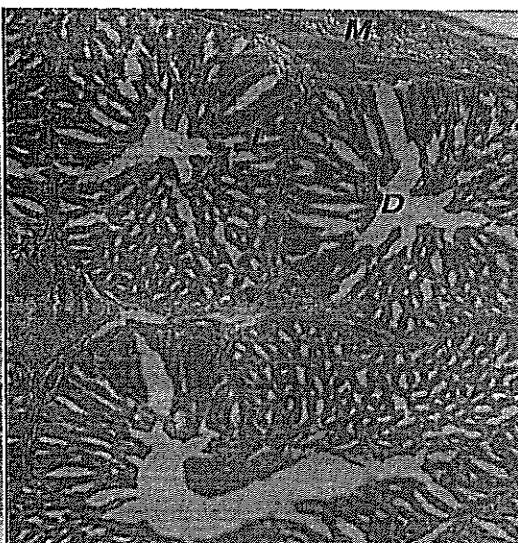


Fig. 8



Fig. 9



Fig. 10

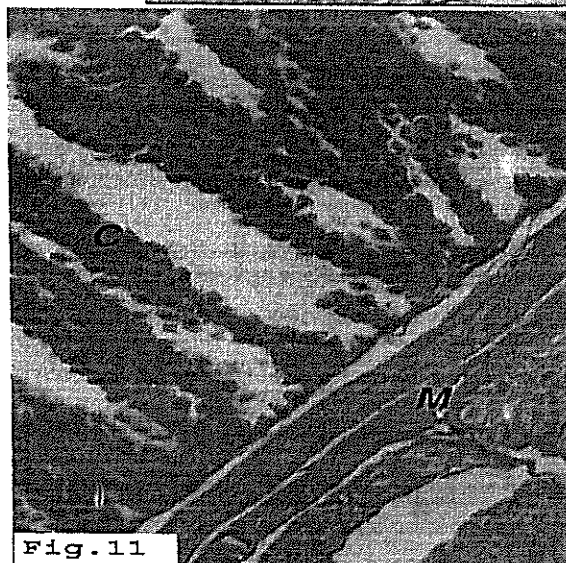


Fig. 11



Fig. 12

بعض الدراسات الهستولوجيه علي المعده في السمان قبل وبعد الفقس

حسام فؤاد عطية

قسم الانسجه والخلايا - كلية الطب البيطري

جامعة بنها

- اجريت هذه الدراسه علي عدد 25 معده سمان قبل وبعد الفقس لبيان التركيب الهستولوجي للمعده في السمان
- بدأ ظهور منشأ المعده كانبويه نجميه الشكل مبطنه بخلايا عديده اسطوانيه الشكل في عمر 3 أيام في مرحله قبل الفقس ثم اصبح النسيج الطلاني يتكون من طبقه واحده اسطوانيه الشكل في عمر 8 أيام
- بدأ ظهور الغدد الافرازيه في عمر 4 ايام كانبويه ممتده من المنشأ النجمي الشكل وكانت مبطنه بخلايا عديده والتي سرعان ما تميزت الي خلايا مكعبه الشكل وهذه الغدد تملأ البقعه المخاطيه وتحت المخاطيه علي شكل فصوص يفصل بينها فواصل غرويه
- بدأ تميز الطبقة المخاطيه وتحت المخاطيه في عمر 9 ايام بينما تميزت الطبقة العضليه في عمر 11 يوم بينما الطبقة المصليه تميزت في عمر 9 ايام
- المعده في مرحله بعد الفقس تتكون من نسيج طلاني من خلايا اسطوانيه يغطي المعده بينما توجد الغدد الافرازيه ذات فصوص كثيره العدد مبطنه بخلايا مكعبه وهذه الغدد مرتبه اما في شكل احبال أو خيوط متشابهه و تملأ البقعه المخاطيه وتحت المخاطيه علي شكل فصوص يفصل بينها فواصل غرويه
- تتميز المعده بازدياد حجم الجدار العضلي والذي يتكون من عضلات ملساء