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Some histological, histochemical and ultrastructural studies on the proventriculus mucosa of adult male Japanese quail (Coturnixcoturnix)

El Sayed, M.M. Mosallam, Abdel Aleem A. El Saba, Shaymaa Husseinand Yasmine Helal

Abstract

The current study aimed to maximize the information on the histology of proventricular mucosa of adult male Japanese quail. The present work carried on ten apparenthealthy adult male Japanese quail (Coturnixcoturnix)of average age ranged from (8 9) weeks and average weight ranged from (250 300gm). The birds were euthanized. Specimens from the proventriculus were fixed in 10% neutral buffered formalinand processed for light microscopic examination, another specimens were processed for electron microscope. The present study revealed that the mucosa was thrown into plicae and sulci which lined by simple columnar epithelium. This epithelium showed positive reaction to Periodic acid-Schiff (PAS), Alcian blue, Adehydefuchsin and Best's carminetechniques. With TEM, the cytoplasm of these cells contained rough endoplasmic reticulum, Golgi apparatus, mitochondria and electron dense granules. The lamina propria contained lymphocytic infiltration and lymphatic nodules. Compound tubuloalveolar glandular lobules were located in the submucosa. These glands lined by cuboidal or pyramidal cells which drained into primary duct via secondary and tertiary ducts. With TEM, their cytoplasm contained numerous mitochondria, smooth endoplasmic reticulum, rough endoplasmic reticulum, Golgi apparatus, few electron dense granules and few lipid droplets. Four closed typesofendocrine cells were recognized in the glandular epithelium. The muscularis mucosa was formed of longitudinally arranged smooth muscle fibers.

Key words: Quail, Proventriculus, Histology, Histochemistry, Ultrastructure.

Introduction

Food is necessary to maintain life. Food stuffs provide the specific mass and energy of living beings. Poultry production, especially of chicken, turkeys, ducks, geese and certain other birds, is big business throughout the world; it has become the standard form of mass produced protein **(King and Mclelland, 1975).** The Japanese quail belongs to the order Galliformes, family phasidae, genuscoturnix and species japonica.The scientific designation for Japanese quail is coturnix japonica **(Mizutani, 2003).**

The mucosal lining of the proventriculus lumen is thrown into folds or plicae of varying heights with sulci. The plicae and sulci of the proventriculus are lined by simple columnar epithelium containing mucin**(Bradley and Grahame, 1960; Bell and Freeman, 1971; Aughey and Frye, 2001** and **Rahman et al., 2003)** in domestic fowl; **(Das and Biswal, 1967; Ahmed, 1977and Salem, 1982)** in duck; **(El-Bahay, 1979** and **Mohamed, 1989)** in pigeon; **(El-Zoghby,2000)** in turkey; **(Selvan et al., 2008)** in guinea fowl and **(Ahmed et al., 2011andZaher et al., 2012)** in quail. On the other hand, **Aitken (1958); Hodges (1974)** and **Salem (1985 and 1997)** in domestic fowl; **Bezuidenhout and Van Aswegen (1990)** and **Mina et al. (2011)** in ostrich; **Rocha and De Lima(1998)** in burrowing owl; **Kadhim et al. (2010)** in red jungle fowl and **Hassan and Moussa (2012)** in duck found that the surface epithelium of the mucosa consists of simple columnar epithelium,the cells of which tend to diminish in height toward the bases of the sulci until the basal regions, these cells are almost cuboidal in shape. However **Bank (1993)** in fowl and **Rossi et al.(2005)** in partridge mentioned that the mucosal epithelium is formed of simple cuboidal epithelium.**Bezuidenhout and Van Aswegen (1990)** in ostrich added that small pyramidal cells with fine argyrophilic granules are scattered between the epithelial cells and showed also granular leukocyticinfilteration within the epithelium.

The proventricularglandsare the principle component of the proventriculus and constitute the greater part of the proventricular wall. They are composed of numerous lobules as reported by **Calhoun (1954); Aitken (1958); Bell and Freeman (1971); Salem (1985)** and **Imai et al. (1991)** in fowl; **Das and Biswal (1967); Ahmed (1977); Okamato and Yamada (1981); Salem (1982); Prasad and Kakade (1990) and Hassan and Moussa (2012)** in duck; **Mohamed (1989)** in pigeon;

BeziudenhoutandVan Aswegen (1990) in ostrich; **Kadhim et al.(2010)** in red jungle fowland**Ahmed et al. (2011)** and **Zaher et al. (2012)** in quail. The glandular epithelium is of one type, in fowl **(Hodges, 1974** and **Randall and Reece,1996);** in duck **(Prasad and Kakade,1990** and **Hasssan and Moussa, 2012);** in quail **(Liman et al., 2010** and **Zaher et al., 2012)** and in red jungle fowl **(Kadhim et al.,2010).** On the other hand **Okamato and Yamada (1981)** in duck; **El-Zoghby (2000)** in turkey; **Langlois (2003)** in avian and **Ahmed et al. (2011)** in quail mentioned that there are two cell types (oxyntico peptic cell and endocrine cell).

Althoughthe histological structure of the proventriculus in different avian species has been studied by several authors **(Aitken, 1958; Hodges, 1974; Ahmed, 1977; Salem, 1982; Turk, 1982; Randall and Reece, 1996** and **El-Zoghby, 2000)** the available literatures on the histological structure of the proventriculus of quail are scanty. The aim of this research is to investigate the histological structure and some histochemical activities of the proventriculus of adult male Japanese quail, also to investigate the ultrastructural characteristics of the main cell types of the proventriculus.

Materials and methods

I- Histological study: Ten apparenthealthy adult male Japanese quail (Coturnixcoturnix) of average age ranged from (8- 9) weeks and average weight ranged from (250 - 300gm) were raised and obtained from the quail farm of the Faculty of Agriculture, Cairo University. This study adhered to ethical requirement to animal welfare in Egypt. Aftereuthanization,thebirds were slaughtered in the laboratory, then stomach were dissected out and small pieces from proventriculus were fixed immediately in 10% neutral buffered formalin solutionfor (48hours) followed bydehydration of the specimens in ascending grades of ethyl alcohol, cleared in xylol and embedded in paraffin wax. Sections of (3-5μ) thick were obtained and mounted on clean glass slides and stained with Delafield's iron haematoxylin and eosin (H&E), Masson'strichrome, Periodic acid- Schiff (PAS), alcian blue pH 2.5, aldehyde fuchsin and Best's carmine

Tissue sections were examined under light microscope. These histological methods were conducted as outlined by **Drury and Wallington (1980) and Bancroft & Gamble (2008).**

II- Transmission Electron Microscopy (TEM):

Specimens of (1mm) of proventriculus were fixed in paraformaldehyde-gluteraldehyde in phosphate buffer **(karnovsky, 1965).** Specimens were post fixed in 1 % osmium tetraoxide for one hour, washed in 0.1 M phosphate buffer (pH 7.3), then dehydrated in graded ethanol and embedded in open araldite mixture **(Mollenhauer, 1964).** Semithin sections (1μm) were cut, stained with Toluidine blue **(Richardson et al., 1960)** and examined with light microscope. Ultrathin sections were cut and stained with Uranyl acetate and Lead citrate. The sections were examined with a JEOL 1010 transmission electron microscope at Regional Center for the Mycology and Biotechnology (RCMB) Al-AzharUniveristy,Cario, Egypt.

Results

The mucosa of the proventriculus of adult male Japanese quail was invaginated at regular intervals forming finger like mucosal folds (plicae) of variable heights and sulci in between (fig.1). It was lined by simple columnar epithelium with vacuolated cytoplasm and large, oval, darkly stained and basally situated nuclei (fig. 2). These cells were reacted apically strong with PAS (fig. 3), Alcian blue pH 2.5 (fig. 4), Aldehyde fuchsin (fig.5) and Best's carmine (fig.6). By electron microscope these cells showed apical electron dense granules, Golgi apparatus, well developed rough endoplasmic reticulum (fig. 7). Cylindrical mitochondria were assembled in the distal region in close association with the rough endoplasmic reticulum (fig. 8).The lamina propria was formed of widely meshed loose connective tissue rich in blood and lymphatic vessels,their fibrous elements were made up of collagenous fibers (fig.9), reticular fibers and elastic fibers. Also lymphocytic infiltration and some solitary lymphatic nodules were found. These lymphatic nodules were localized in area adjacent to the excretory duct of the proventricular glands (fig. 1).

Lamina muscularis mucosa was formed of longitudinally arranged smooth muscle fibers (fig. 9).

The Proventricular glands were located in the submucosa and constituted the greater part of the whole thickness of the proventriculus. They arranged in the form of lobules which had different shapes (fig.10). These lobules were formed of numerous alveolar or tubular glands and surrounded by thin perilobular connective tissue sheath. Groups of these alveoli were joined together and elaborated their content in a tertiary duct, this duct opened in a secondary duct (fig. 10). Many secondary ducts collected together forming one primary duct that penetrated the lamina muscularis mucosa to open into the lumen (fig. 1). The secretory cells of these glands formed of two cell types (oxyntico-peptic cells and endocrine cells) (fig.11). The oxyntico-peptic cells were varied in shape. They appeared cuboidal shape with centrally located nuclei in the tubular part (fig. 12) and pyramidal or flask shaped with large, spherical, vesicular, basally located nuclei and distinct nucleoli in the alveolar part, the free surface of each cell extended into the lumen forming bleb like projections (fig.13). Oxyntico-peptic cells showed a negative reaction with PAS, alcian blue,aldehyde fuchsin and Best's carmine.

Ultrastructurally, the oxyntico-peptic cells were truncated pyramidal with large round and basally situated nuclei. The cytoplasm of these cells showed abundant small vesicular smooth endoplasmic reticulum (fig.14). Prominent cisternae of granular endoplasmic reticulum were present in the perinuclear and basal parts of cytoplasm (fig. 15).Mitochondria of rounded or oval in shape were numerous in the cytoplasm. The apical mitochondria were present among the vesicular smooth endoplasmic reticulum (fig.14) while, the basal mitochondria were closely related to the cisternae of rough endoplasmic reticulum (fig. 15). Few electron dense granules and lipid droplets were found in the basal part of the cells (fig. 16). The lateral cell membranes of the adjacent cellswere attached together by desmosomes(fig. 17). In proventricular glands, the endocrine cells appeared lightly stained between the basement membrane and the secretory cells of the proventricular glands (fig. 11). By electron microscope four types of endocrine cells were detected between the oxyntico-peptic cells. These cells were situated close to the basal lamina but didn't contact with the lumen.

Endocrine cells type I appeared round in shape with large oval lightly stained nuclei. Their Cytoplasm showed large round electron dense granules,filamentous mitochondria, few cisternae of rough endoplasmic reticulum and numerous ribosomes (fig. 18). Endocrine cells type II appearedelongated or slender in shaped with large ovoid nuclei. Their cytoplasm contained round secretory granules which showed variable size and electron density Most of these secretory granules were observed in the infranuclear cytoplasm (fig. 19). Endocrine cellstype III wereovoid in shape with large spherical lightly stained nucleus. Their cytoplasm contained numerous round granules of different electron density. Also filamentous mitochondria and free ribosomes were found (fig. 20). Endocrine cells type IV were spindle in shape with large ovoid nuclei and the cytoplasm contained small spherical electron dense granules (fig. 21).

Discussion

The present study showed that the mucosa of the proventriculus of adult male Japanese quail is thrown into mucosal plicae (folds) of variable height and sulci. These results are in agreement with **Calhoun (1954); Hodges (1974); King and McLelland (1975); Salem (1985); Randall and Reece (1996); Salem (1997)** and**Aughey and Frye (2001)** in domestic fowl; **Salem (1982); Prasad and Kakade (1990)** and **Hassan and Moussa (2012)** in duck;**Mohamed** (1989) in pigeon; **El-Zoghby(2000)** in turkey; **Mahdy (2009)** and **Mina et al. (2011)** in ostrich; **Kadhium et al. (2010)** in red jungle fowl and **Ahmed et al. (2011)** and **Zaher et al. (2012)** in quail. These folds are finger like projection, similar to that observed by **Liman et al. (2010)** in quail; which may increase the surface area of the proventriculus **(Hamdi et al, 2013)**.

The lining epithelium of the proventricular mucosa is simple columnar epithelium with vacuolated cytoplasm These findings were in accordance with **Bradley and Grahame**

(1960); Bell and Freeman (1971); Aughey and Frye (2001) and Rahman et al. (2003) in domestic fowl; Das and Biswal (1967); Ahmed (1977) and Salem (1982) in duck; El-Bahay (1979) and Mohamed (1989) in pigeon;El-Zoghby (2000) in turkey; Selvan et al. (2008) in guinea fowl and Ahmed et al. (2011) andZaher et al. (2012) in quail. Meanwhile, Aitken (1958); Hodges (1974) and Salem (1985 and 1997) in domestic fowl; Bezuidenhout andVanAswegen (1990) and Mina et al. (2011) in ostrich; Rocha and De Lima(1998) in burrowing owl; Kadhim et al. (2010) in red jungle fowl and Hassan and Moussa (2012) in duck found that the surface epithelium of the mucosa consists of simple columnar epithelium which tend to diminish in height toward the bases of the sulci until the basal regions the cells are almost cuboidal in shape. However Bank (1993) in fowl and Rossi et al.(2005) in partridge mentioned that the mucosal epithelium is formed of simple cuboidal epithelium. The surface epithelial cells revealed positive reaction to PAS, Alcian blue PH 2.5 and Aldehyde fuchsinthat indicate the presence of both neutral and acidic mucoplysaccharides (sulphomucin and sialomucin).This difference in the distribution of the mucosubstances within the lining epithelial cells of the glandular stomach might be due to functional and maturation stage of this epithelium (Suprasert and Fujioka, 1990). These results are in agreement with Salem (1985) in fowl; Prasad and Kakade (1990) in duck; Selvan et al. (2008) in guinea fowl and Ahmed et al.(2011) in quail. In contrastHodges (1974) in domestic fowl; Kadhium et al. (2010) in red jungle fowl;Hassan and Moussa (2012) in duck and Zaher et al. (2012) in quaildetected neutral mucin reaction in the cells lining the mucosal folds. While Mohamed (1989) in pigeon mentioned that the supranuclear mucin granules of these cells are alcianophilic. This mucus plays a significant role in the defense of the mucosa against injury and ulceration (king and Mclelland, 1975 andSuprasert and Fujioka, 1990). It also formed a gelatinous layer together with the exfoliated surface epithelium to prevent further damage of the epithelium (lacy, 1985).The high content of neutral mucopolysaccharides in the lining epithelium of the stomach can bind to the site of alkaline phosphatase and assist in digestion and emulsifying the food (Moog and Wenger, 1952 and Ham and Lesson, 1965). Moreover, the luminal surface of the columnar cells of the proventriculus showed Best's carmine positive staining, that agreed with Mohamed (1989) in pigeon who revealed that the apical cytoplasm of these cells contained glycogen.

Ultrastructurally, the cytoplasm of these cells characterized by the presence of well developed secretory system represented by Golgi apparatus well developed rough endoplasmic reticulum and electron dense membrane bound granules. These structures explained the nature of granules as mucin in nature (Shackleford and Wilborn, 1970). The histochemical findings may give evidence that these cells are mucous secretory cells as mentioned by Hodges (1974); Suprasert and Fukjioka (1990); Salem (1997)andSallam (2001).

Lymphocytes and lymph nodules were observed in the lamina propria of the proventricular mucosa of adult male Japanese quail.This observation are in agreement with that of Hodges (1974); Salem (1985) and Matsumotor and Hashimoto (2000) in fowl; Das and Biswal (1967); Ahmed (1977); Prasad and Kakade (1990) and Hassan and Moussa (2012) in duck and Ahmed et al. (2011) in quail. The occurrence of these lymph nodules indicated adirect participation of the proventriculus in the immune response (Ahmed et al., 2011).

The muscularis mucosa of the proventriculus is made up of smooth muscle fibers arranged longitudinallythat agreed with Das and Biswal (1967); Ahmed(1977) and Salem (1982) in duck; Salem (1985) in fowlandMohamed(1989) in pigeon. However, kadhim et al. (2010) in red jungle fowl and Hassan and Moussa (2012) in duck stated that, it consists of two layers;an inner layer which lying along the inner surface of the lobules of the proventricular glands and an external layer which appeared thicker especially opposite the areas between lobules. While

BezuidenhoutandVan Aswegen (1990) in ostrichand Ahmed et al. (2011) and Zaher et al. (2012) in quail observed an additional circularly arranged one.

The present work revealed the presence of compoundtubuloalveolar glands in the submucosa similar to that stated by Menzies and Fisk (1963); Bell and Freeman (1971); Salem (1985) in fowl; Ahmed (1977) and Salem (1982) in duck; Selvan et al.(2008) in guinea fowl and Mina et al. (2011) in ostrich. Meanwhile Mohamed (1989) in pigeon; Bezuidenhout and VanAswegen(1990) in ostrich; Kadhium et al. (2010) in red jungle fowl; Ahmed et al. (2011) and Zaher et al. (2012) in quail and Hassan and Moussa (2012) in duck mentioned that these glands located between the inner and outer layers of muscularis mucosa.Whereas Calhoun (1954) and Romanoff (1960) in fowl reported that these glands are located in the lamina propria. These glands appeared as polymorphic lobules formed of numerous alveolar or tubular glands. Groups of alveoli were joined together and elaborate their contents in a tertiary duct, which inturn opened in a secondary duct. The secondary duct of several lobules joined togetherforming one primary duct which connected to the apex of the raised mucosal papillae and open into the narrow lumen of the proventriculus. The same organization was recorded by Calhoun (1954); Aitken (1958); Bell and Freeman (1971) and Salem (1985); in fowl; Das and Biswal (1967); Ahmed (1977); Okamato and Yamada (1981); Salem (1982) and Prasad and Kakade (1990)in duck; Mohamed (1989) in pigeon; Beziudenhout and Van Aswegen (1990) in ostrich and Ahmed et al. (2011) and Zaher et al. (2012) in quail. In contrast Kadhim et al. (2010) in red jungle fowl and Hassan and Moussa (2012) in duck reported that each glandular cell group drains into the main proventricular lumen through single mucosal papilla. The secretory cells of these glands contained two cell types (oxyntico-peptic cell and endocrine cell) similar to that mentioned by Okamato and Yamada (1981) in duck; El-Zoghby (2000) in turkey; Langlois (2003) in avian and Ahmed et al. (2011) in quail. In contrast Hodges (1974) and Randall and Reece (1996) in fowl; Prasad and Kakade (1990) and Hasssan and Moussa (2012) in duck; Liman et al. (2010) and Zaher et al.(2012) in quail andKadhim et al. (2010) in red jungle fowl mentioned that these glands are formed only of one type of cells (oxyntico-peptic cells). Theseoxyntico-peptic cells are cuboidal, pyramidal or flask shaped similar to that stated by El-Zoghby (2000) in turkey and Ahmed et al. (2011) in quail. However, Hodges (1974) in fowl; Salem (1982) and Hassan and Moussa(2012) in duck andKadhim et al. (2010) in red jungle fowl found that these cells are cuboidal to low columnar epithelium. On the other hand Calhoun (1954) and Salem (1985) in fowl; Catroxo et al. (1997) in red capped cardinal;Rocha and Delima (1998) in burrowing owl reported that they are made of single layer of cuboidal epithelial cells. The proventricular glandular cells showed a negative reaction against PAS and Alcian blue stains. This result similar to that reported by Salem (1982) in duck; Salem (1985) in fowl; El-Zoghby (2000) in turkey; Selvan et al. (2008) in guinea fowl and Ahmed et al.(2011) and Zaher et al. (2012) in quail. However, Mohamed (1989) in pigeon claimed that these cells react weakly with PAS.

Ultrastructurally, the oxyntico-peptic cells were pyramidal in shape; their cytoplasm contained well developed rough endoplasmic reticulum, Golgi apparatus and many rounded mitochondria. These mitochondria could be correlated with the special metabolic activity which needs active energy for the transport of inorganic ions through the process of secretion (Buggs, 1985). Cytoplasm also contained few vesicular smooth endoplasmic reticulum, few electron dense granules and lipid droplets. The fine structure of such cells was typical for both the zymogenic and acid secretory cells (Selander,1963 and Toner, 1963) in fowl, (Horvath, 1974 and Salem and El-Dligan, 1993) in chicken and Sallam (2001) in falcon. These cells were attached near the base by desmosomes. The latter was called terminal bar by (Toner, 1963 and Hodges,1974) in fowl. The terminal bars allowed the use of

the lateral surface as well as the apical surface for secretion. In that case, they considered as analogous to the intracellular canaliculi of mammalian parietal cell (**Toner, 1963**) in fowl. On the other hand **Salem andEl-Dligan (1993)** in chicken demonstrated junctional complexes were (tight junctions of Zonulaoccludens followed by Zonulaadherens). .

Four types of endocrine cells were recognized in the glandular epithelium of the proventriculus.Their shapes varied from rounded, elongated, ovoid and selander, while in duck two forms of these cells were recognized as elongated and rounded(**Okamato and Yamada, 1981**). These cells receive and transducer mechanical stimuli such as tension and pressure caused by food intake (**Fujita and Kobayashi, 1971**).

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List of figures:

Fig (1): A photomicrograph of a cross section of the proventricular mucosa of adult male Japanese quail showing mucosal folds (large arrow), large glandular lobule open into the lumen through the primary duct (small arrow) and the lymph nodule (star) close to the excretory duct. **H&EstainX100.**

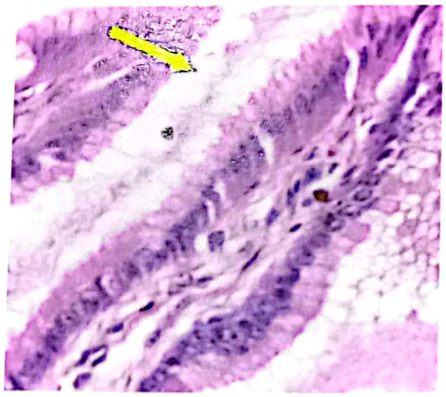

Fig (2): A photomicrograph of the proventricular mucosal folds of adult male Japanese quail showing simple columnar surface epithelial cells with large, oval and basally situated nuclei (arrow). **H&Estain X1000.**

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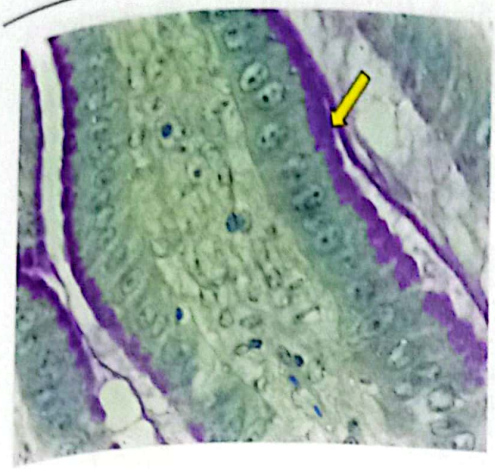


Fig (3): A photomicrograph of the proventricular mucosal folds of adult male Japanese quail showing apically strong positive PAS reaction in the surface epithelium (arrow). **PAS X1000.**

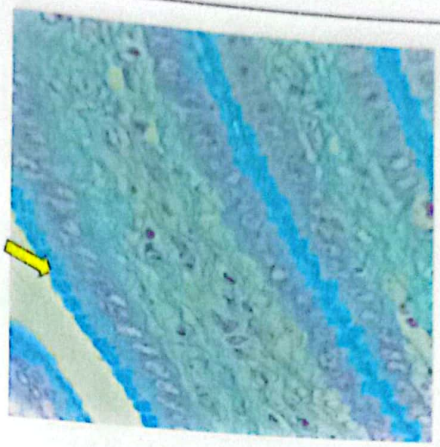


Fig (4): A photomicrograph of the proventricular mucosal folds of adult male Japanese quail showing apically strong positive alcian blue pH 2.5 (arrow)in the surface epithelium. **Alcian blue pH 2.5 X1000.**

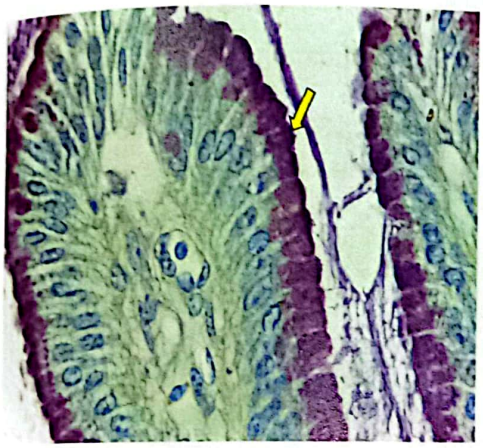
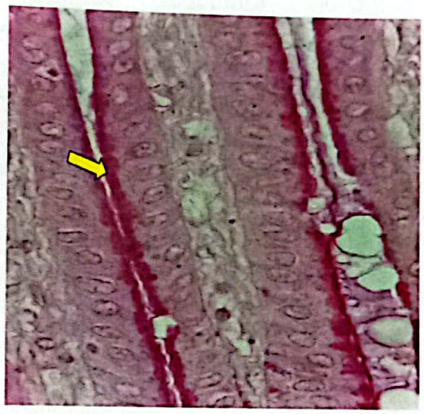
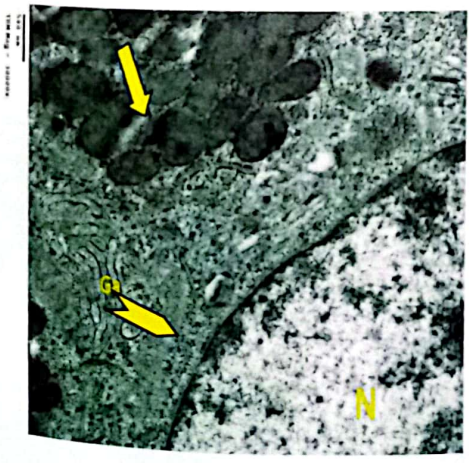


Fig (5): A photomicrograph of the proventricular mucosal folds of adult male Japanese quail showing apically strong reaction to aldehyde fuchsin of the surface epithelium (arrow).Aldehyde fuchsin X1000.



Fig(6):A photomicrograph of the proventricular mucosal folds of adult male Japanese quail showing apically strong Best's carmine reaction in the surface epithelial cells (arrow).Best's carmine X1000.



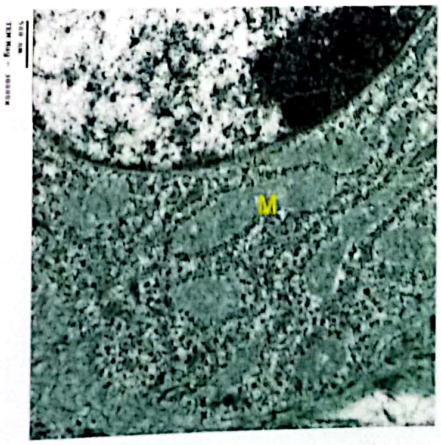


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Fig (7): A transmission electron micrograph of a high magnified part of the proventricular surface epithelial cell showing nucleus (N), supranuclear Golgi apparatus (Ga), secretory granules (arrow) and rough endoplasmic reticulum(arrow head).**Uranyl acetate & Lead citrate X 30000**

Fig (8): A transmission electron micrograph of the proventricular surface epithelial cell showing cylindrical mitochondria (M) closely related to the cisternae of rough endoplasmic reticulum in the basal cytoplasm. **Uranyl acetate & Lead citrate X30000.**

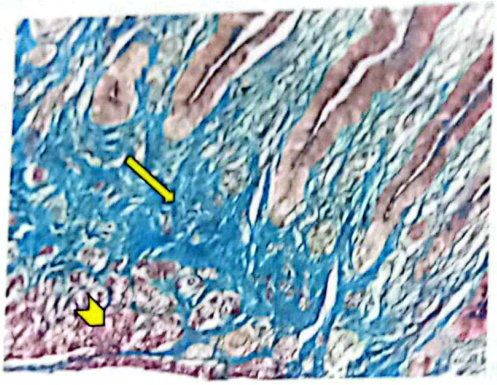
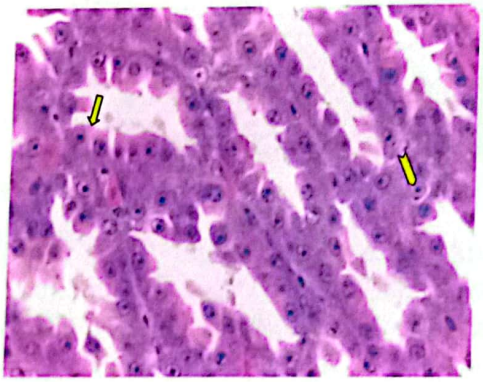


Fig (9): A photomicrograph of a cross section of the proventricular mucosa of adult male Japanese quail showing lamina propria contained collagenous fibers (arrow). Notice lamina muscularis mucosa (arrow head). **Masson's trichrome X400.**

Fig (10): A photomicrograph of a cross section ofthe proventriculus showing numerous polymorphiclobules of proventricular glands. Notice the secondary duct (star). **H&E X40.**



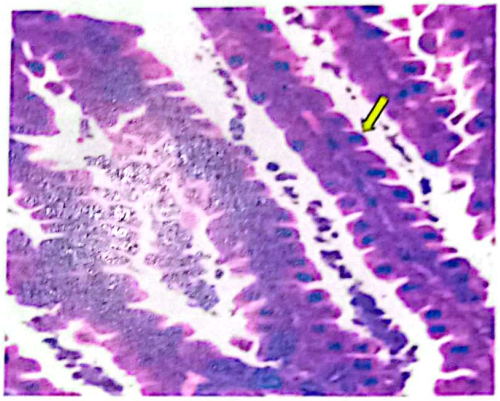


Fig (11): A photomicrograph of theproventricularglands showing oxyntico-peptic cells (arrow) and lightly stained endocrine cell (arrow head) located between the basement membrane and secretory cells. **H&E X1000.**

Fig (12): High magnification of the proventricular glands showing the cuboidal cells of the glandular tubules (arrow). **H&E X1000.**

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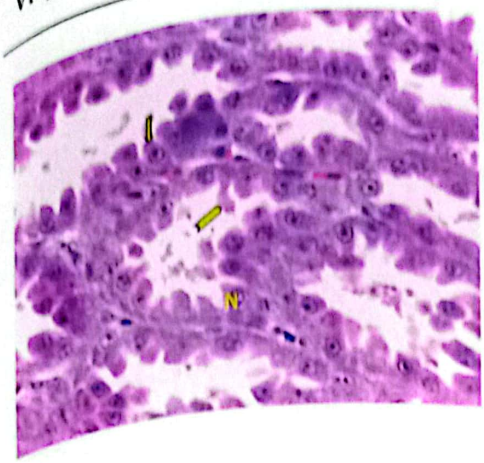


Fig (13): High magnification of the proventricular glandular alveoli showing pyramidal shaped (arrow) or flask -shaped cells with spherical nucleus (N) and bleb-like projection (arrow head). **H&E X1000.**

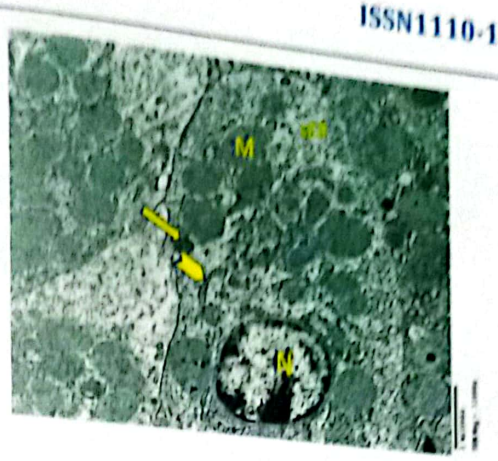


Fig (14): A transmission electron micrograph of the proventricular gland showing alveolar cell was pyramidal in shape with large round nucleus (N),mitochondria (M), secretory granules (arrow), Small vesicular smooth endoplasmic reticulum (sER) and rough endoplasmic reticulum (arrow head). **Uranylacetate & Lead citrate X12000.**

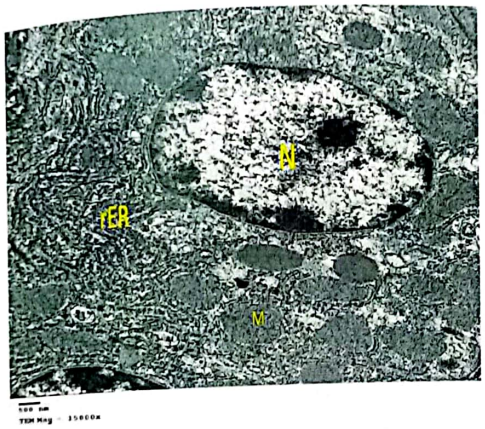


Fig (15): A transmission electron micrograph of a high magnified part of the alveolar proventricular cell showing perinuclear rough endoplasmic reticulum (rER), large round nucleus with marginal heterochromatin (N) and oval mitochondria (M). **Uranyl acetate & Lead citrate X1500.**

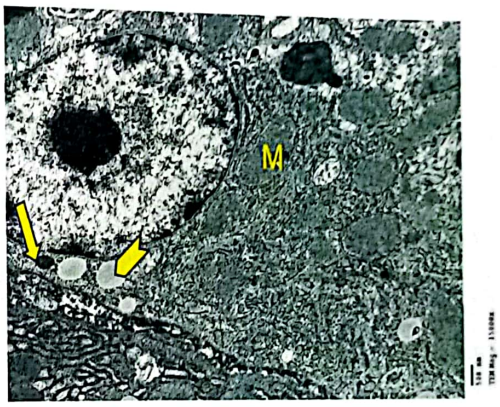


Fig (16): A transmission electron micrograph of a high magnified part of the alveolar proventricular cell showing round mitochondria (M) closely related to the cisternae of rough endoplasmic reticulum, electron dense granules (arrow) and lipid droplets (arrow head). **Uranyl acetate & Lead citrate X20000.**

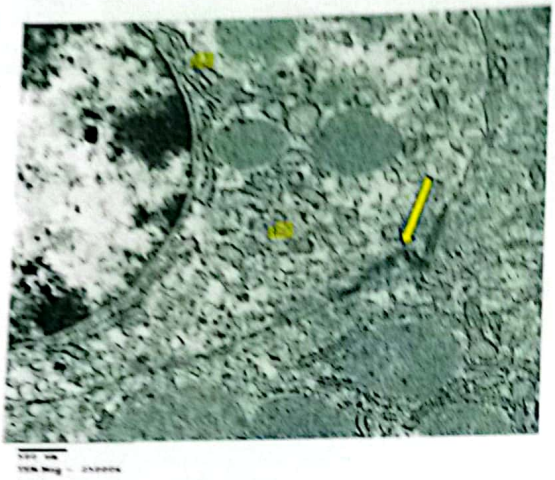
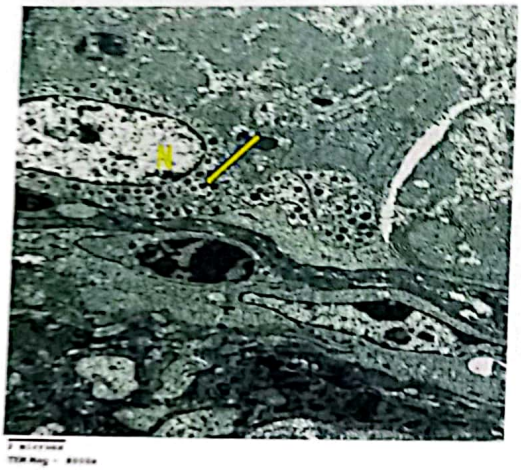


Fig (17): A transmission electron micrograph of the proventricular gland showing the lateral portion of two alveolar cells had desmosomal junction (arrow). Noticeperinuclear rough endoplasmic reticulum (rER) and Small vesicular smooth enoplasmic reticulum (sER). **Uranyl acetate & Lead citrate X25000.**

Fig (18): A transmission electron micrograph of endocrine cell type I of the proventricular gland showing large oval nucleus (N), cytoplasm showed large round electron dense cytoplasmic granules (arrow), cylindrical mitochondria (M). **Uranyl acetate & Lead citrate X15000.**



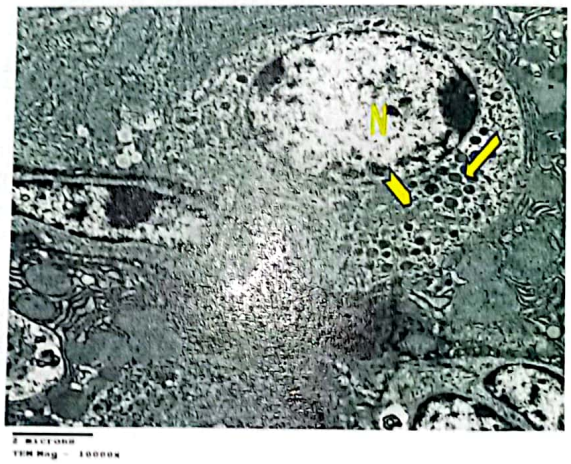


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Fig (19): A transmission electron micrograph of elongated shape endocrine cell type II of the proventricular gland showing large oval nucleus (N), secretory granules (arrow) varied in electron density in the cytoplasm. **Uranyl acetate & Lead citrate X8000.**

Fig (20): A transmission electron micrograph of ovoid shape endocrine cell type III of the proventricular gland showing large spherical nucleus (N), numerous round secretory granules (arrow) and oval mitochondria (arrowhead). **Uranyl acetate & Lead citrate X10000.**

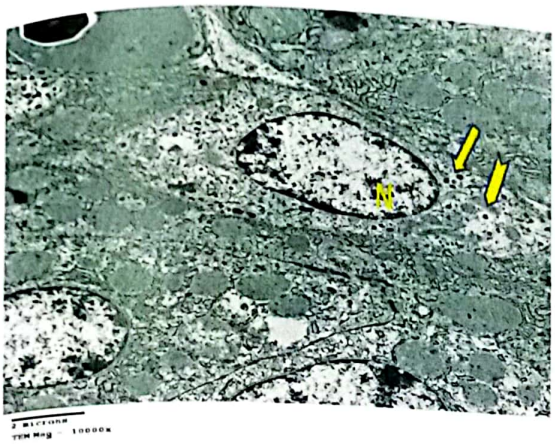

Fig (21): A transmission electron micrograph of spindle shape endocrine cell type IV of the proventricular gland showing large ovoid nucleus (N), small spherical electron dense granules (arrow) and oval mitochondria (arrowhead). **Uranyl acetate & Lead citrate X10000.**

الملخص العربى

بعض الدراسات المجهرية الضوئية والهستوكيميائية والالكترونية على الطبقة المخاطية للمعدة الغدية فى ذكر السمان الياباني.

السيد مسلم محمد مسلم, عبد العليم عبد العليم السبع, شيماء حسين و ياسمين هلال

اجريت هذه الدراسة علي 10ذكور من طيور السمان الياباني والذى تتراوح اعمارهم (8-9) اسابيع وتتراوح اوزانهم (250-300جم) وبعد ذبح الطيور اخذت عينات من المعدة الغدية. فحصت هذه العينات نسجيا ونسجوكيميائيا ومن ناحية التركيب الدقيق. وقد اخذت عينات الفحص المجهري ووضعت فى المثبت 10% فورمالين ثم وضعت فى كحول متدرج تصاعدى ثم زيلين ثم غمست فى البرافين لعمل شرائح وصبغها بالصبغات المختلفة.اثبت الدراسة ان مخاطية المعدة الغدية تتميز بوجود ثنيات اصبعية الشكل وبينها حفرو مبطنة هذه الثنيات بخلايا عمودية بسيطه اظهرت تفاعل موجب مع الشيف الحمضى البير ايودى وكذلك الالسيان الازرق. واوضحت الدراسة الدقيقه بوجود خملات دقيقة علويه وان السيتوبلازم لهذة الخلايا يحتوي علي حبيبات داكنة, شبكة اندوبلازميه وجهاز جولجى بالاضافه الى ميتوكندريا.اما بخصوص الغدد المعدية فكانت حويصلية انبوبية معقدة . وقد ظهرت هذة الغدد على شكل فصيصات . كما اوضحت الدراسه وجود نوعين من الخلايا فى هذه الغدد (اوكسنتيكوبيبتك والخلايا الصماء) وظهر النوع الاول على شكل مكعبى ويحتوى سيتوبلازم هذه الخلايا على شبكة اندوبلازميه خشنه متطوره وشبكه اندوبلازمية ملساء والعديد من الميتوكندريا وقليل من الحبيبات الدقيقة الاكنة وقطيرات دهنية. واوضحت الدراسة وجود4 انواع من الخلايا الصماءبين خلايا الغدد.