



P-ISSN: 2349-8528
E-ISSN: 2321-4902
IJCS 2017; 5(2): 531-534
© 2017 JEZS
Received: 18-01-2017
Accepted: 19-02-2017

Sukanta Das
Assistant Professor, Department
of Veterinary Anatomy, C.V.Sc
and AH, R.K. Nagar, Tripura,
India

Balwinder Singh Dhote
Professor, Department of
Anatomy, College of Veterinary
and Animal Sciences,
G.B. Pant University of
Agriculture and Technology,
Pantnagar, Uttarakhand, India

GK Singh
Professor & Dean, Department
of Anatomy, College of
Veterinary and Animal Sciences,
G.B. Pant University of
Agriculture and Technology,
Pantnagar, Uttarakhand, India

Anil Deka
Assistant Professor, Department
of Anatomy & Histology, C.V.Sc,
AAU, Khanapara, Guwahati,
Assam, India

Correspondence
Bhat ZA
Assistant Professor, Department
of Veterinary Anatomy, C.V.Sc
and AH, R.K. Nagar, Tripura,
India

Ultra structural studies on the proventriculus of Kadaknath Fowl

Sukanta Das, Balwinder Singh Dhote, GK Singh and Anil Deka

Abstract

The study was conducted to investigate the ultrastructure of proventriculus of the 7 days and 112 days old kadaknath fowl. The Scanning electron microscopic studies revealed that proventriculus was composed of tunica mucosa, tunica submucosa, tunica muscularis, and thin tunica serosa. The Mucosal folds formed concentric ring around the mucosal papillae at the proventricular glandular opening. Mucosal folds were composed of finger like tall columnar epithelium embedded on the mucosal folds. Proventricular glands were divided into several varying sized lobules with a central excretory cavity. TEM of proventriculus showed that the tall columnar epithelium of the mucosal fold, with numerous rough endoplasmic reticulum, mitochondria and basally positioned large round to oval nucleus, mostly oval. Numerous secretory granules of varying size were present at the supranuclear portion of the cell. the numbers of the secretory granules were more in the 112 days old bird compare to the 7 days old bird. Submucosal glands of proventriculus were composed of low columnar to cuboidal epithelium having large pear shaped basally positioned nucleus and numerous mitochondria and rER. The endocrine cells appeared in close contact with the basal lamina among the mucous and oxynticopeptic cells and they were more abundant deep in the tubular glands and crypts with numerous secretory granules of varying sized darkly stained at supranuclear portion.

Keywords: Kadaknath, proventriculus, ultrastructure

1. Introduction

Kadaknath is an important indigenous breed of poultry inhabiting vast areas of Western Madhya Pradesh mainly the Jhabua and Dhar Districts and adjoining areas of Gujarat and Rajasthan spreading over an area of about 800sq. miles which is considered to be its home tract in India. It is locally known as "Kalamasi". The meat and eggs are reckoned to be a rich source of protein (25.47% in flesh) and iron with proteins and special amino acids (Department of Public Relations, CRISP, Bhopal, Madhya Pradesh, INDIA, 2006). The present study was conducted to know about the ultrastructural (Transmission and Scanning electron microscopic) details of the proventriculus of the kadaknath fowl. Ultrastructure of the Proventriculus of Kadaknath breed of poultry have not been studied so far. Present study was conducted with aim to investigate the ultrastructural anatomy of proventriculus of kadaknath fowl

2. Materials and methods

The present study was conducted on 7 days and 112 days old Kadaknath breed of fowl in the Department of Veterinary Anatomy, College of Veterinary & Animal Sciences, G. B. Pant University of Agriculture & Technology, Pantnagar. The birds were procured from from Instructional Poultry Farm. The birds were sacrificed by severing the carotid artery and jugular veins. Feathers were removed manually and the proventriculus sample of 2mm sizes was carefully collected with sharp BP blade and primarily fixed in Karnovsky's fluid for 24 hrs at 4 °C. Then the tissue were washed in phosphate buffer and then postfixed in 1% osmium tetroxide for 2 hrs at 4 °C. Tissue samples were then undergone treatment with graded acetone and cleared with toluidine. Infiltrated tissue than emebded in Araldite mixture finally blocks were prepared and cut under ultramicrotome Leica Ultracut UCT using glass knives and picked upon grids and observed under JEOL TEM. At different magnification. For scanning electron microscopy the samples after fixing in 2% gluteraldehyde at 4 °C for 24 hrs taken to AIIMS for further processing and viewing under SEM.

3. Results and discussion

Scanning electron microscopy of the proventriculus revealed that in both the age groups of birds it was composed of tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa and tunica mucosa is the thickest. The tunica mucosa formed a profuse covering of thick finger-like mucosal folds of various sizes towards the luminal surface. Which were arranged in very close association to each other (Fig.1). The tall columnar epithelium of the tunica mucosa were visible just like villi embedded in the mucosal fold basement (Fig.2). These findings were in accordance with the findings of Soo-Siang (1977)^[10]. Several papillae were present on the mucosal surface and each of these papillae was surrounded by concentric mucosal folds. Similar finding were also reported by Turk (1982)^[12] and Soo-Siang (1977)^[10]. The mucosal folds were arranged in concentric plicae branched and anastomosed (Fig.3). Tunica submucosa was composed of numerous proventricular glands. Each proventricular glandular lobule was having a large central excretory cavity (Fig.1). The size of the proventricular glands was larger in 112 days old birds than the 7 days old. The present findings were in accordance with the findings of Soo-Siang (1977)^[10]. Transmission electron microscopy of the proventriculus in both the age groups of birds showed that the sub mucosal glands were composed of cuboidal to low columnar epithelium with a wide base. The cell apices were rounded and bulge into the lumen of the gland. The lateral cell membrane were not closely apposed (Fig.4). Few secretory granules of varying size were present at the supranuclear portion of the cell. The numbers of the secretory granules were more in the 112 days old bird compare to the 7 days old bird. The apex of the cell were packed with many round, clear cytoplasmic vacuoles and the free surface of the cells were smooth without microvilli, similar findings were also recorded by Salender, U (1963)^[11]. The basal cytoplasm of cells were containing granular endoplasmic reticulum and abundant mitochondria particularly in the supranuclear cytoplasm and are oval to round in shape. Golgi apparatus were seen around the nucleus and at the apical cytoplasm with some Golgi vesicles (Fig.5). Similar findings were also recorded by whereas reported that the shape of the nucleus is spherical to ovoid with uniform granular chromatin material and the location of the nucleus in the cells varies depending upon the functional status.

In between the proventricular submucosal glands some irregular shaped endocrine cells were found which were full of secretory round vesicles rare mitochondria presented electron dense matrix and large nucleus and large nucleus (Fig.6). Similar findings were also recorded by Okamoto-T; Yamada-J (1980, 1981)^[9] in duck; Forssmann *et al.* (1969)^[4] in rat and Martínez *et al.*, (1991)^[7] in chicken proventriculus and Catroxo, M. H. B. *et al.* (2001)^[7]; Helander *et al.* (1981)^[6] in red-capped cardinal, Yamanaka *et al.* (1989)^[14] in chicken. In the present study the endocrine cells appeared in close contact with the basal lamina among the mucous and oxynticopeptic cells and they were more abundant deep in the tubular glands and crypts Yamanaka *et al.*, (1989)^[14] and Martínez *et al.*, (1991)^[7]. The epithelium cells of mucosal folds of proventriculus were tall columnar with basally positioned round to spherical nucleus. Apical portion of the cells were containing numerous secretory granules which

were similar to the mucous secretory cells of mammalian stomach (Horvath, 1974)^[5] (Fig.7). Mitochondria and Golgi bodies were abundant throughout the cytoplasm. The columnar epithelium were supported by basement membrane. Numerous cytoplasmic vacuoles were found throughout the cytoplasm (Fig.8).

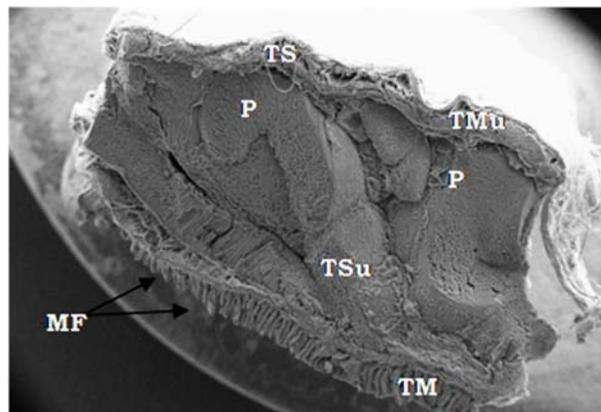


Fig 1: Scanning electron micrograph of proventriculus of 112 days old kadaknath fowl showing tunica mucosa (TM), tunicasubmucosa(TSu),tunica muscularis(TMü) and tunica serosa(TS) layers, finger like mucosal folds (MF) and proventricular glandular lobules(P).(19 X)

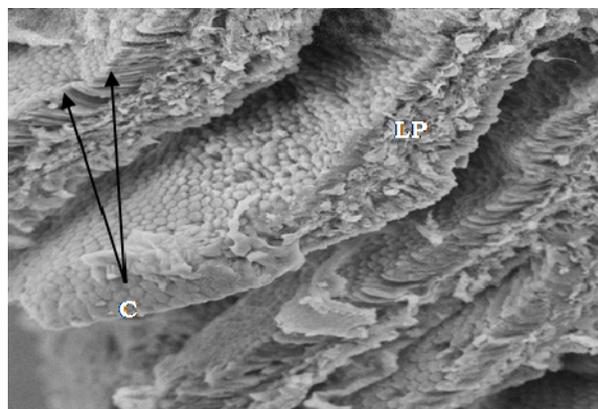


Fig 2: Scanning electron micrograph of proventriculus of 112 days old Kadaknath fowl showing villi like columnar epithelium (C) on the mucosal folds (MF) of tunica mucosa and lamina propria (LP) (750 X).

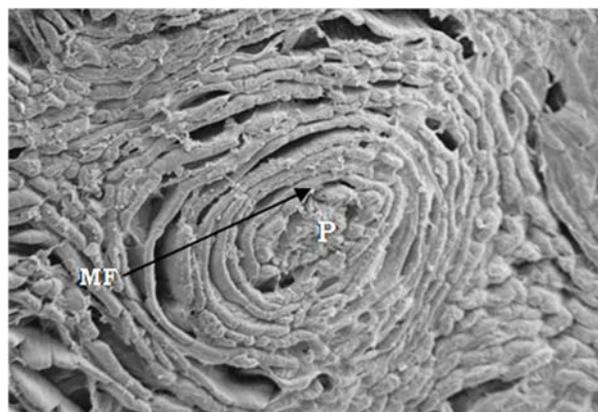


Fig 3: Scanning electron micrograph of proventriculus of 112 days old kadaknath fowl showing the concentric arrangement of the mucosal folds (MF) around the papillae (P). (60X).

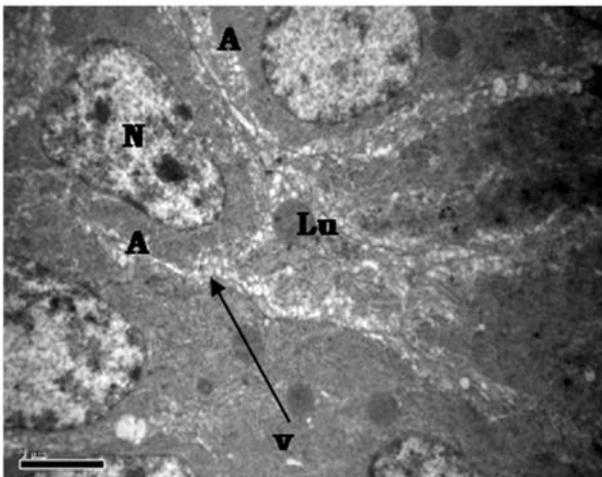


Fig 4: Transmission electron micrograph of proventriculus 7 days old kadaknath fowl showing cuboidal to low columnar epithelium of proventricular submucosal gland (A) with numerous cytoplasmic vacuoles at the apical cytoplasm (v) and lumen (Lu) (X 1330).

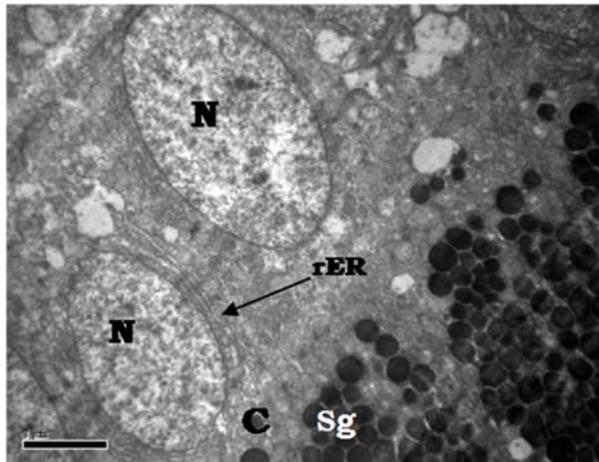


Fig 7: Transmission electron micrograph of proventriculus 112 days old kadaknath fowl showing tall columnar cells (C) with oval nucleus(N) numerous secretory granules (Sg) at the apical portion and rough endoplasmic reticulum (rER). (X 1330).

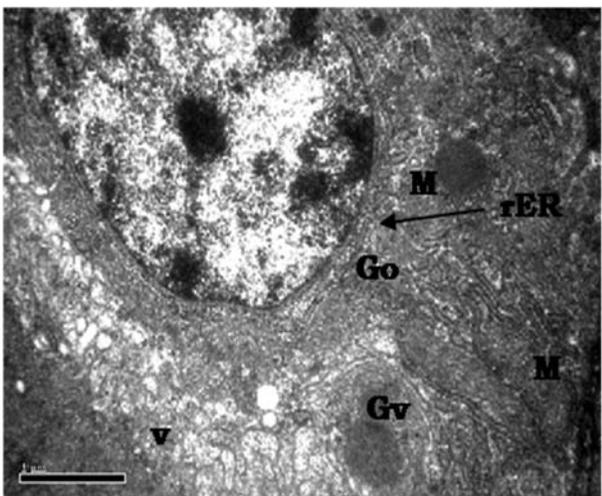


Fig 5: Transmission electron micrograph of proventriculus 7 days old kadaknath fowl showing mitochondria(M), rough endoplasmic reticulum (rER), Golgi complex(Go) with vesicles (Gv), cytoplasmic vacuoles in the proventricular glandular epithelium and round nucleus (N) with chromatin material (Cr) (X 2500).

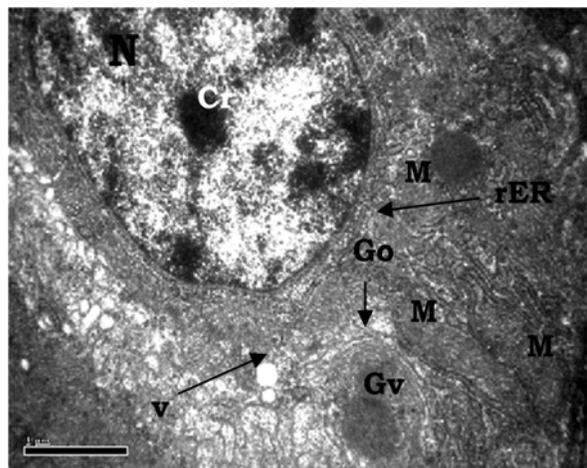


Fig 8: Transmission electron micrograph of proventriculus 7 days old kadaknath fowl showing mitochondria (M), cytoplasmic vacuoles(v) and rough endoplasmic reticulum (rER) in the tall columnar epithelium with few secretory granules (Sg) at the apical portion and large round nucleus (N). (X 2650).

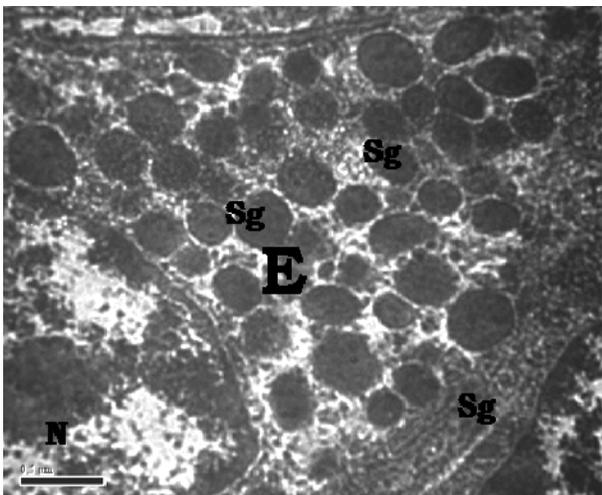


Fig 6: Transmission electron micrograph of proventriculus 112 days old kadaknath fowl showing endocrine cells (E) with abundant round secretory vesicles (Sg) and round nucleus (N) (X 5310).

4. References

1. Chondnick KS. A cytological study of the alimentary tract of the domestic fowl (*Gallus domesticus*). *Quart. J. Micro. Sci.* 1947; 88:419-443
2. Catroxo MHB, Lima MAI, Petrella S. Ultrastructure of endocrine cells of the stomach (proventriculus and gizzard) of the red-capped cardinal (*Paroaria g. gularis*, Linnaeus, 1766). *Rev Chil Anat.* 2001; 19:239-244.
3. Chauhan RS. *Veterinary Laboratory Diagnosis*. IBDC, Lucknow, 2003, 293-297.
4. Forssmann WG, Orci L, Pictet R, Renold AE, Rouiller C. The endocrine cells in the epithelium of the gastrointestinal mucosa of the rat. An electron microscope study. *J. Cell. Biol.* 1969; 40:692-715.
5. Horvath I. Electron microscope study of chicken proventriculus. *Acta-Veterinaria-Academiae-Scientiarum Hungaricae.* 1974; 24(1-2):85-97.
6. Helander HF. The cells of the gastric mucosa. *Int. Rev. Cit.*, 1981; 70:273-89.
7. Martínez A, López J, Barrenechea MA, Sesma P. Immunocytochemical and ultrastructural characterization

- of endocrine cells in chicken proventriculus. *Cell Tissue Res.* 1991; 263:541-548.
8. Okamoto T, Yamada J. Light and electron microscopic studies on the endocrine cells in the duck proventriculus. *Japanese-Journal-of-Veterinary-Science.* 1981; 43:6:863-870; 20.
 9. Okamoto-T, Yamada-J. An electron microscopic study of endocrine cells in the pyloric region of duck Japanese-*Journal-of-Veterinary-Science.* 1981; 42:169-176.
 10. Soo-Siang Lim, Frank N. Low. scanning electron microscopy of the developing alimentary canal in the chick. *Am. J. Anat.* 1977; 150:149-174.
 11. Salender U. Fine structure of oxyntic cell in the chicken proventriculus. *Acta. Anat.* 1963; 55:299-310.
 12. Turk DE. The anatomy of the avian digestive tract as related to feed utilization. *Poultry Sci.* 1982; 61:1225-44.
 13. Tonner PG. Fine structure of active and resting cells in the submucosal of fowl proventriculus. *J. Anat. Lond.* 97, 1963; 4:575-58.
 14. Yamanaka Y, Yamada J, Kitamura N, Yamashita T. An immunohistochemical study on the distribution of endocrine cells in the chicken gastrointestinal tract. *Z. mikrosk. Anat. Forsch. Leipzig,* 1989; 103:437-46.