

HISTOLOGICAL RESEARCHES CONCERNING THE DUODEUM IN STRUTHIO CAMELUS

ȘTEFANIA PREDOI, N. CORNILA, IULIANA CAZIMIR,
CRISTINA CONSTANTINESCU

The Faculty of Veterinary Medicine Bucharest

Summary

In the speciality literature the information regarding the histostructure of the duodenum in ostrich (*Struthio camelus*) are rare, most of them referring to *Gallus domesticus* species.

The intestinal villi are long, occupying two thirds of the thickness of the duodenal wall.

At the age of 17 days, the typical goblet cells are numerically reduced, while many cells in which the process of accumulating mucus has started were observed.

The Lieberkühn intestinal glands are short and the Brunner glands are missing.

Muscularis mucosae is poorly represented.

Key words: ostrich, duodeum, histostructure.

The detailed knowledge of the elements seen at cellular, tisular or organ at certain ages permits the correct explaining and interpretation of different physiological or pathological aspect connected to the studied structures.

The data observed in the specialty literature regarding the microstructure of the duodenum in birds are relatively rare and refer, especially to the *Gallus domesticus* species. Transposing the histological data from a species to another appears to be inadequate, being known that the structure and function of some organs presents particularities of species [3, 4, 5].

The duodenum detaches from the muscular stomach and includes entirely the first ansa of the intestine. The transition to the jejunum is made from the caudal extremity of the duodenum, the junction between the two segments being approximately the point where the pancreatic ducts and the bile drain into the intestinal lumen [1, 2, 6].

The histological aspects of the duodenum in the *Struthio camelus* species aged 17 days will be presented in this paper.

Materials and methods

The researches followed the histological study of the duodenum in ostrich aged 17 days. The studies were made on five subjects, sacrificed for the experiment, bought from a breeder from Constantza County.

The selected pieces, represented by duodenal fragments, fixed in saline neutral formalin, have been processed thru a histological technique based on

inclusion in paraffin. The paraffin blocks were sectioned into 6 microns thick sections, while the coloring techniques used was Hemalaun-eosin and Giemsa.

The examination of the histological permanent sections were made with the NIKON-LABPHOT2 optical microscope, a light filter BG-33, Nikon AFX-DX and a Canon 640 digital photo camera, and the images have been processed on the computer using *Adobe Photoshop 6.0* software.

Results and discussions

At the age of 2,5 weeks, the duodenum presents villi of different heights, but, in general, a constant diameter. The ones with maximum height tend to form numerous lateral expansions, starting from the middle third, to the apical region. The general image is closer to the aspect of the villi observed in mammals, than to the ones seen in different species of birds, where both the height and the diameter are relatively constant, usually, no matter the age of the subject (Figure 1).

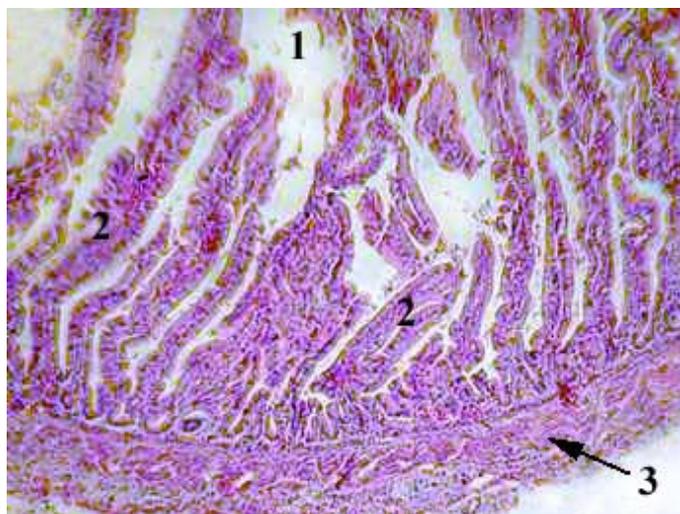


Fig.1. General view of the duodenum wall structure, at the ostrich in 17 days old/ HE, ob.10x (authentic)

1. Lumen; 2. Duodenal villi; 3. Muscularis externa.

The epithelium that lines the villi is simple columnar with border brush, in which we find columnar cells, goblet cells and cells that are in progress of differentiation.

The columnar cells can be elongated, typical or more reduced dimensionally to the base of the villi. They present oval, eucromatic nuclei, with approximately two nucleoli. They occupy the basal pole of each cell, leaving the cytoplasm clear and evenly on the whole surface (Figure 2).

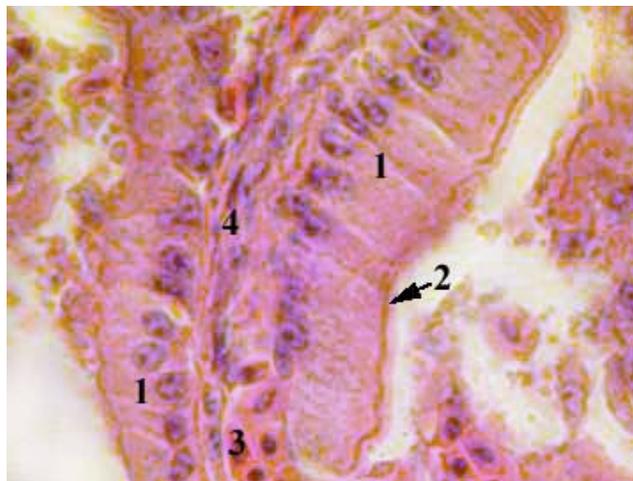


Figure 2. Detail of the simple columnar epithelium with microvilli border, which cover the intestine villi who exists in the duodenum wall structure, at the ostrich in 17 days old/ HE, ob.40x (authentic)

1. Epithelial columnar cells; 2. Microvilli border; 3. Capillary; 4. Villus core.

Typical goblet cells are rare, but, in exchange, numerous cells in progress of accumulating mucus can be seen. These are characterized by a dilated apical zone and a basal region with a tendency of narrowing, where the oval nucleus can be seen.

In the case of the cells in progress of differentiation, the ulterior development orientation cannot be determined, except for the goblet cells, already mentioned.

The axis of the villi is very fine, composed by a loose connective tissue that incorporates rare smooth muscle cells, fibroblasts, plasma cells. At this level multiple, large capillaries, observed in the apical, central and basal region are notable (Figure 3, 4, 5, 6).

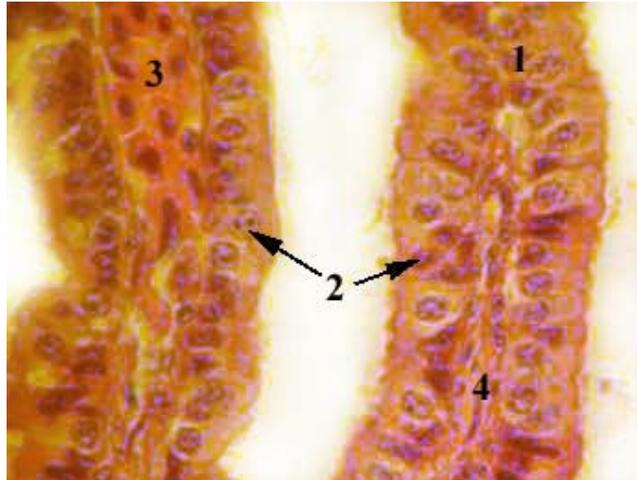


Fig. 3. Aspect of the intestine villi which exists in the duodenum structure, at the ostrich in 17 days old/ HE, ob.20x (authentic)
1. Duodenal villi; 2. Simple columnar epithelium; 3. Capillary.

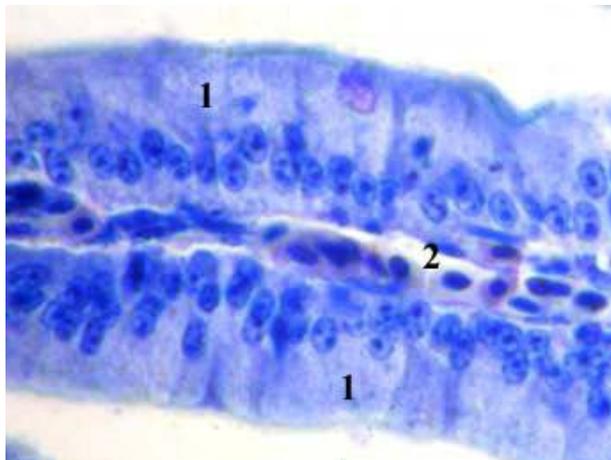


Fig.4. Detail concerning the intestine villi which exists in the duodenum structure, at the ostrich in 17 days old/Giemsa, ob.40x (authentic)
1. Simple columnar epithelium; 2. Capillary.

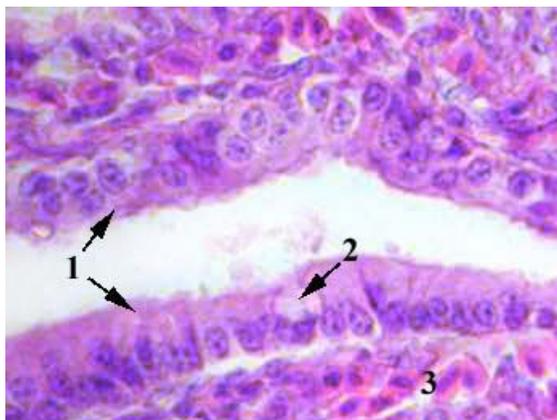


Figure 5. Presence of the goblet cell in the simple columnar epithelium of the duodenum villi structure, at the ostrich in 17 days old/ HE, ob.20x (authentic)
1. Simple columnar epithelium; 2. Goblet cell; 3. Capillary.

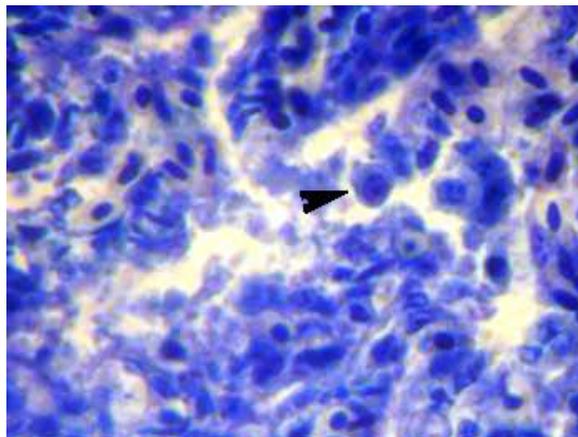


Figure 6. Presence of the plasma cell in the duodenum villi core structure, at the ostrich in 17 days old/ HE, ob.40x (authentic)
◄ Plasma cell.

The continuing of the duodenal epithelium in the depth of the lamina propria determines the forming of the Lieberkühn glands, rather short. They terminate into a

dilatated portion close to the muscularis mucosae, obtaining a tubulo-alveolar aspect. Their cellularity is in process of diferentiating at this age (Figure 7).

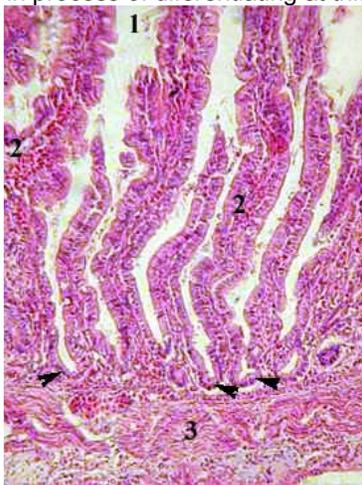


Fig. 7. Image concerning aspects of the Lieberkühn glands integrated in the duodenum wall structure, at the ostrich in 17 days old/ HE, ob.6x (authentic)

1. Lumen; 2. Duodenal villi; 3. Muscularis externa; ◀ Lieberkühn glands.

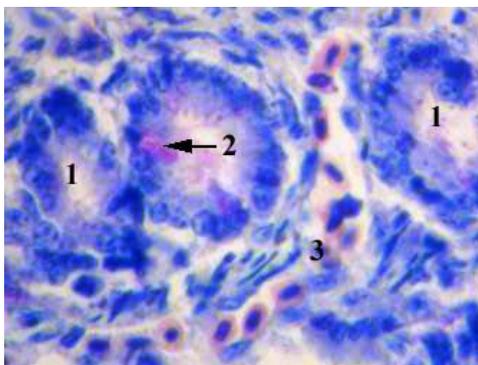


Fig. 8. Transverse section of the Lieberkühn glands integrated in the duodenum wall structure, at the ostrich in 17 days old/ HE, ob.6x (authentic)

1. Lieberkühn glands; 2. Goblet cells; 3. Capillary.

The muscularis mucosae is represented by a single layer of smooth muscular fibers, longitudinally oriented, adhesive to the muscularis externa because of a submucosae composed only by rare connective fibers.

The muscularis externa presents an internal, circular layer and an external, longitudinal layer, between which integrated neurons belonging to the Auerbach nervous system appear. The external layer is in contact with the loose connective tissue, covered by a simple squamous epithelium, together constituting the serosa, where the vascular formations are numerous (Figure 9, 10).

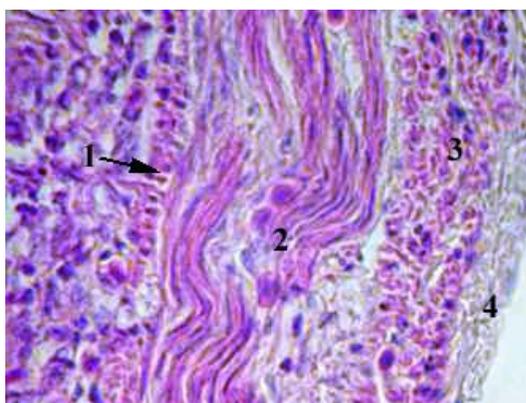


Fig.9. Aspects concerning muscularis mucosae and muscularis externa in the duodenum wall structure, at the ostrich in 17 days old/ HE, ob.20x (authentic)
1.Muscularis mucosae; 2. Muscularis externa, inner circular layer; 3. Muscularis externa, outer longitudinal layer; 4. Serosa.

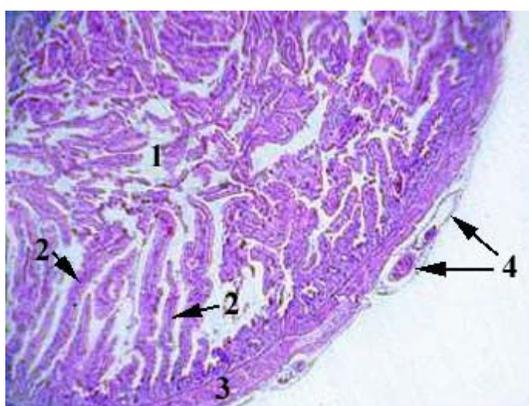


Fig. 10. General view of the duodenum wall structure, at the ostrich in 17 days old/ HE, ob.3x (authentic)
1. Lumen; 2. Duodenal villi; 3. Muscularis externa; 4. Blood vessels integrated in serosa layer.

Conclusions

The intestinal villi are long, occupying two thirds of the thickness of the duodenal wall.

At the age of 17 days, the typical goblet cells are numerically reduced, while numerous cells in process of accumulating mucus have been observed.

Lieberkühn intestinal glands are short and Brunner glands are missing.

Muscularis mucosae is poorly represented.

References

1. **Cornilă, N.**- Morfologia microscopică a animalelor domestice (cu elemente de embriologie), Vol. II. Ed. ALL, București, 2001.
2. **Delhmann, H., E.M. Brown** – Textbook of Veterinary Histology, Ed. Philadelphia, Lea & Febinger, 1992.
3. **Gheție, V., ȘT. Chițescu, V. Coțofan, A. Hillebrand** - Atlas de anatomie a păsărilor domestice, Ed. Academiei R.S.R., București, 1976.
4. **Hodges, R.D.** - The histology of the fowl, Academic Press Inc., London – New – York – San Francisco, 1974.
5. **King, A.S., J. Mc Lelland** - Birds their structure and function, Second edition, Ed. Baillere Tindall, London – Philadelphia – Toronto, 1984.
6. **King, A.S** – Form and Function in Birds, Vol.2, Ed. King, A.S. & McLelland J. London & New York, Academic Press, 1980.
7. *** **Nomina Anatomica Veterinaria** (Fourth Edition) together with **Nomina Histologica** (Revised Second Edition) and **Nomina Embryologica Veterinaria**. Zurich and Ithaca, New York, 1994.