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## التطور الهستولوجي لغدد المرئ بالجمل وحيد السنم في مصر

رويلف برج ، أنور قاسم ، عبد السلام حموده ، محمد أمين

هذه الدراسة أجريت على عشرة أجنة جمال تتراوح بين ٢ - ٩٥ سم ، وجمل صغير عمره ١ ¼ سنة ، وجمل بالغ عمره ٦ سنوات ، وأخذت العينات من جميع أجزاء المرئ وعولمت بالطريقه التقليديه وقد وجد أن غدد المرئ موجوده في جميع الأجزاء على طوال المرئ وتظهر لأول مرة عند عمر ٢٥ سم . ويظهر تجويف القنوات الأخرائية عند عمر ٤١ سم ، أما بالنسبة للجزء الأفرأزي عند عمر ٦٤ سم وتكون الغدد مخاطيه في طبيعة افرازها .

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**HISTOGENESIS OF THE ESOPHAGEAL GLANDS  
OF THE ONE HUMPED CAMEL IN EGYPT**  
(With 7 Figs.)

By  
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**SUMMARY**

The esophageal glands are present in all parts of the esophagus, equally distributed around the esophageal lumen, and have mucous character. The first epithelial sprouts of the esophageal glands project from the lamina epithelialis into the lamina propria mucosae/submucosa at CVRL 25 cm. The excretory ducts become canalized at CVRL 41 cm, and the solid glandular epithelial sprouts at CVRL 64 cm.

**INTRODUCTION**

We have selected the subject in an attempt to give some morphological information on the camel's esophagus, which has not received the adequate attention when compared with the other farm animals. This paper deals with structure of the esophagus, during the prenatal and postnatal phases.

**MATERIAL and METHODS**

This study was carried on ten camel fetuses of 2 to 95 cm crown vertebral rump length (CVRL). A young camel of 1 1/2 years old and an adult camel of 6 years old collected from Cairo abattoir. The esophagus was cleaned with normal saline and the samples were taken from its different parts (Pharyngo-esophageal junction, the middle cervical part, at the level of the thoracic inlet, at the base of the heart, cranial from the esophageal hiatus). They were fixed in 10% formaline for 48 hours, dehydrated in graded series of alcohol, cleared by xylene and embedded in paraffine. The following stains were used:

- 1) Hematoxylin (after HARRIS 1900) and eosin for general studies.
- 2) VAN GIESON (1889) stain for the differentiation of collagenous fibers, smooth muscle and glands.
- 3) ALCIAN blue PAS for the histochemical studies (MOWRY 1956).

**RESULTS**

The esophageal glands are first demonstrated in the camel fetus of CVRL 25 cm. They appear as epithelial buds projecting from the esophageal epithelium into the surrounding mesenchymal mass, lamina propria mucosae/submucosa (Fig. 1&2). The glandular epithelial cells have large, rounded, and basophilic nuclei. They are connected with the esophageal epithelium by solid epithelial strands which represent the excretory ducts of the esophageal glands. The glands are evenly distributed in the lamina propria mucosae/submucosa, around the esophageal



lumen and along the whole length of the esophagus in all stages of the fetal development. At the stage of 64 cm CVRL the lamina muscularis mucosa appear for the first time and becomes interrupted by the esophageal glands and their excretory ducts (Fig. 3). The glands occupy nearly the whole tela submucosa and extend toward the tunica muscularis.

The canalization of the excretory ducts in the camel fetus appears at CVRL 30 cm in the pharyngoesophageal junction and in the rest of the esophagus at the stage of CVRL 41 cm. The canalization of the secretory units in the pharyngoesophageal junction appears at CVRL 41 cm (Fig. 4) and in the rest of the esophagus at CVRL 52 cm. The canalization of all the excretory ducts and secretory units are completed at CVRL 64 cm (Fig. 5). The mucous character of the glands appears at CVRL 64 cm. The lumen of the glandular end-pieces is wide and the epithelial cell nuclei are flattened and pushed to the periphery (Fig. 6).

In the young camels of 1.5 years old as well as, in adult ones of 6 years old, the esophageal glands are arranged in clusters occupying most of the thickness of lamina propria mucosae/submucosa. At the caudal part of esophagus, the very thin muscularis mucosa is found between the lamina propria mucosa and submucosa. The glands occupy the entire submucosa close to the tunica muscularis (Fig. 7).

#### DISCUSSION

The present research reveals that the esophageal glands appear for the first time in the camel fetus at 25 cm CVRL. ENANY (1980) detected the esophageal glands in the buffalo fetus at 9 cm CVRL and his description was in agreement with our report regarding the appearance of these glands as solid glandular epithelial sprouts in the lamina propria mucosae/submucosa, and are connected with the lamina epithelialis by strip of solid epithelium, representing the excretory ducts. ENANY (1980) mentioned that in the case of the buffalo esophagus the canalization of the excretory ducts primordia appeared at 67 cm, CVRL and later on the canalization of the solid epithelial sprouts occur at 94 cm CVRL. Meanwhile in the camel fetus the canalization of the excretory ducts appeared at 30 cm CVRL and in the secretory units at 41 cm CVRL. Followed by the canalization of the excretory ducts and the secretory units at 64 cm CVRL. The early appearance and the relative faster canalization of the camel's esophageal glands may be in correlation with the more advanced function of these glands in the camel.

The present findings on the development of the mucous glands of the one-humped camel are in agreement with that of LESBRE (1903) on the adult two humped camel. He found that these mucous glands are extremely developed and distributed along the whole length of the esophagus. They occupy about half of the lamina propria mucosae/submucosa and rested on the tunica muscularis. This extreme development of the esophageal glands, explain the keep of the esophagus in constant moisture and facilitate the passage of the food, and the resistance against thirst, to which this animal may be subjected to a high degree.

In comparison with the present findings, TIWARI (1978) and ENANY (1980) observed that these glands are of mucous nature and are only present at the pharyngoesophageal junction of adult buffalo esophagus. SENGAR and SINGH (1970) reported that the esophageal glands in the prenatal and postnatal Indian buffalo could not be identified. In case of the cattle WAKURL and MUTO (1972), STINSON and CALHOUN (1976) recorded that the esophageal glands are present only at the pharyngoesophageal junction, They are of mixed type containing mucous acini with serous demilunes. STINSON and CALHOUN (1976) recorded the same for the horse and cat, but in the dog according to the same authors these mixed glands extending into the cardiac region of the stomach. While they added that in case of the pig these mixed glands are abundant in the cranial half but do not extend into the caudal half. COPENHAUER *et al* (1971) described the esophageal glands in human as typical mucous alveoli.

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LEESE (1927) reported that the camel esophagus has no special features, but the present results demonstrate that the camel is the only animal who presents esophageal glands of mucous nature and are distributed throughout the esophagus, from the pharyngoesophageal junction up to the cardiac opening of the stomach.

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## LEGENDS

- Fig. (1): Longitudinal section through the Pharyngo-esophageal junction of a camel fetus (CVRL 25cm) H & E stain. Obj. 10; Ocular 5 : IK  
 1- Lamina epithelialis.      2- Lamina propria mucosae/submucosa.  
 3- Glandulae esophageae in the Lamina propria mucosae/submucosa.
- Fig. (2): Cross section through the esophagus at the thoracic inlet of a camel fetus (CVRL 25cm) H & E stain Obj. 20; Ocular 5 : IK  
 1- Lamina epithelialis.      2- Lamina propria mucosae/submucosa.  
 3- Tunica muscularis.      4- Glandula esophageae.
- Fig. (3): Cross section through the thoracic part of the esophagus (just in front of the esophageal hiastus) of a camel fetus (CVRL 64cm). H & E stain. Obj. 20; Ocular 5 : IK  
 1- Lamina epithelialis.      2- Lamina propria mucosae.  
 3- Lamina muscularis mucosae.      4- Tela submucosa.      5- Glandulae esophageae.
- Fig. (4): Longitudinal section through the pharyngo-esophageal junction of a camel fetus (CVRL 41cm) H & E stain. Obj. 20; Ocular 5 : IK  
 1- Lamina epithelialis.      2- Lamina propria mucosae/submucosa.  
 3- Glandulae esophageae.      4- Excretory duct of a Glandula esophageae.
- Fig. (5): Cross section through the thoracic part of the esophagus (at the level of the base of the heart) of a camel fetus (CVRL 64cm). VAN GLESON stain. Obj. 20; Ocular 5 : IK  
 1- Lamina epithelialis.      2- Lamina propria mucosae/submucosa.  
 3- Glandulae esophageae.      4- Excretory duct of the Glandula esophageae.
- Fig. (6): Longitudinal section of the esophagus of an adult camel showing the typical mucous glands of the esophagus. H & E stain. Obj. 40; Ocular 5 : IK
- Fig. (7): Longitudinal section through the thoracic part of the esophagus (just in front of esophageal hiastus) of a young camel (1.5 years of age). H & E stain. Obj. 3.2; Ocular 5 : IK  
 1- Lamina epithelialis.      2- Lamina propria mucosae.  
 3- Lamina muscularis mucosae.      4- Tela submucosa.      5- Glandulae esophageae.  
 6- Tunica muscularis.



Fig. (1)

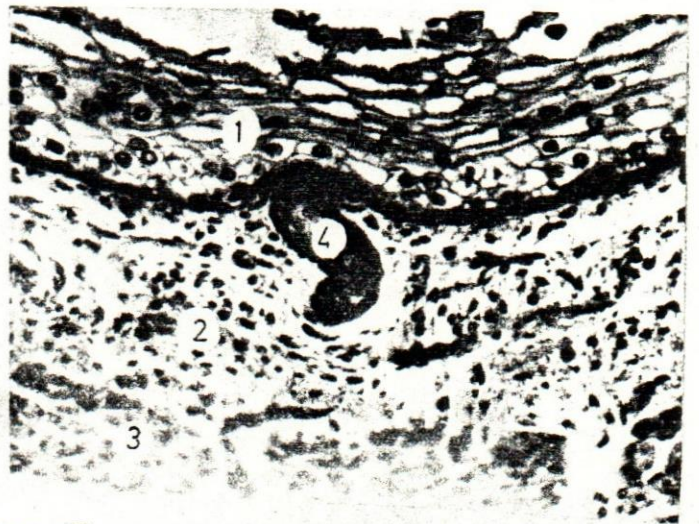


Fig. (2)

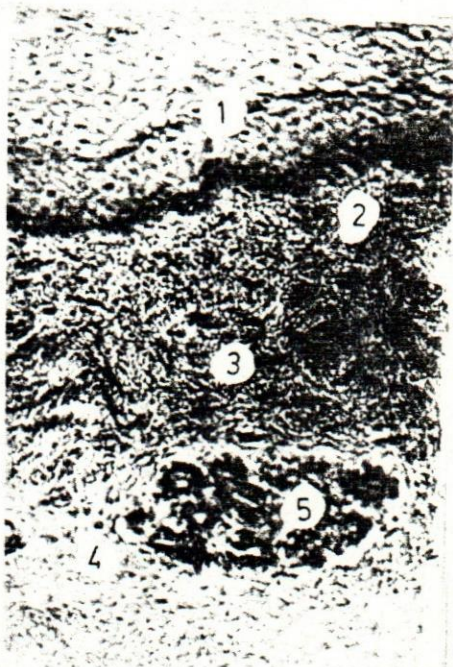


Fig. (3)





Fig. (4)



Fig. (5)

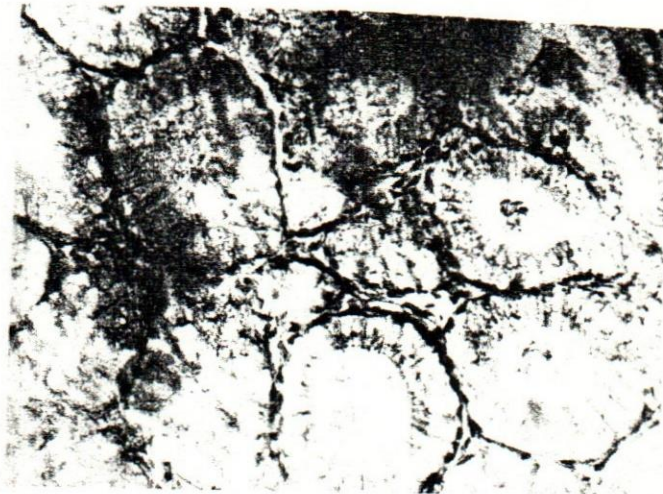


Fig. (6)

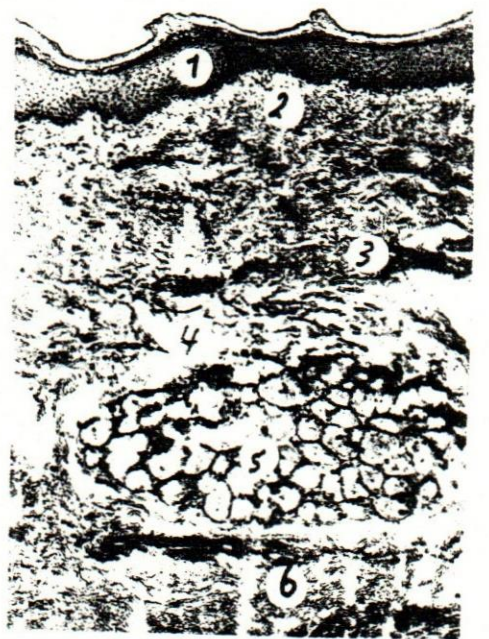


Fig. (7)