



ISSN: 2456-2912

VET 2024; 9(6): 141-144

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Received: 27-08-2024

Accepted: 01-10-2024

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## Histomorphological study of esophagus in adult guinea pigs (*Cavia porcellus*)

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**DOI:** <https://dx.doi.org/10.22271/veterinary.2024.v9.i6c.1850>

### Abstract

The research elucidated the histological and morphological characteristics of the esophagus during adulthood. A selection of fifteen healthy guinea pigs was obtained from the public market for this study. The animals were euthanized using ketamine at a dosage of 30 ml/kg body weight via intramuscular injection. The esophagus was examined topographically in situ. Morphologically, the esophagus is a muscular tube divided into three segments: cervical, thoracic, and abdominal. It extends from the oropharynx to the cardiac region of the stomach, where it connects at the distal end. Histological analysis revealed that the esophagus comprises four layers: mucosa, submucosa, muscularis, and adventitia or serosa, and it lacks glandular structures. This study enhances the understanding of both the gross and microscopic morphometrics of the esophagus in guinea pigs.

**Keywords:** Morphology, histology, guinea pig, esophagus, adult period

### Introduction

The esophagus is a narrow, muscular conduit and serves to connect with cardiac region of the stomach in a linear fashion. It traverses from oropharynx to stomach cardiac sphincter. Consequently, it is categorized into three distinct macroscopic sections: cervical, thoracic, and abdominal. The esophagus leads to the fundus of the stomach through the cardiac section, which is lined histologically by a thick, stratified squamous epithelium. The keratinization of this epithelium is influenced by food and species diversity, playing a vital role in the conversion of food into the energy necessary for bodily functions. This study aims to elucidate occurring in these organs at this stage and to underscore the significance of the adult guinea pig as biomedical research by examining the histomorphological features of its esophagus.

### Materials and Methods

Numbers of good health animals measuring  $15.030 \pm 0.17$  cm in length and weighing  $66.87 \pm 0.50$  g from the public market [3]. These animals were anesthesia by injection about 30 mg/kg bw ketamine. As soon as the esophagus was isolated from the abdominal cavity, they were carefully dissected, and measured for length, and weight. The study involved histological and histochemical analyses. The pieces were fixed for two days using 10% neutral buffered formalin, which was changed daily. The samples underwent histological and histochemical staining after successfully passing through routine histological sectioning with a thickness of 5 micrometers [4, 5]. Hematoxylin Eosin and Masson's trichrome stains were used on the specimens to determine micromorphometric parameters and get a general histological characteristic. The esophageal were stained and identified using PAS and Alcian blue [6].

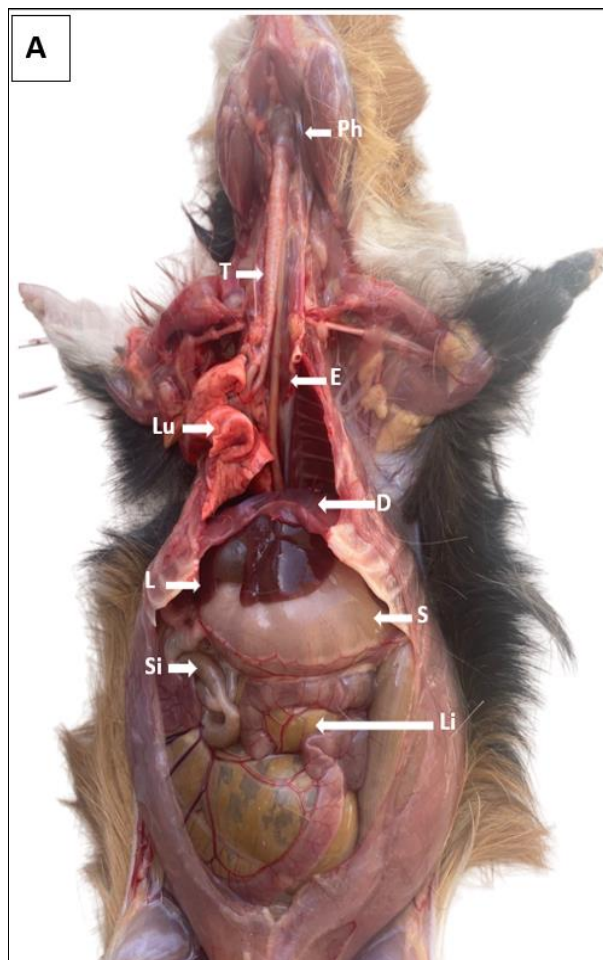
### Results and Discussion

#### Esophagus

Esophagus is a skeletal muscle tube that connects with cardiac orifice of stomach. It measures 12.53 cm in length and 0.36 grams in weight. Its color varies from white to gray. Approximately 12.53 by 0.16 cm and 0.00g in weight, it varies in color from white to pink. The esophagus is divided into the neck can be divided into three part cervical, thoracic and abdominal (Fig. 1a, b). These results agree with [7]. The thoracic esophagus extends from the thoracic inlet dorsally. (Fig 1-a, b). who reported that the esophagus was

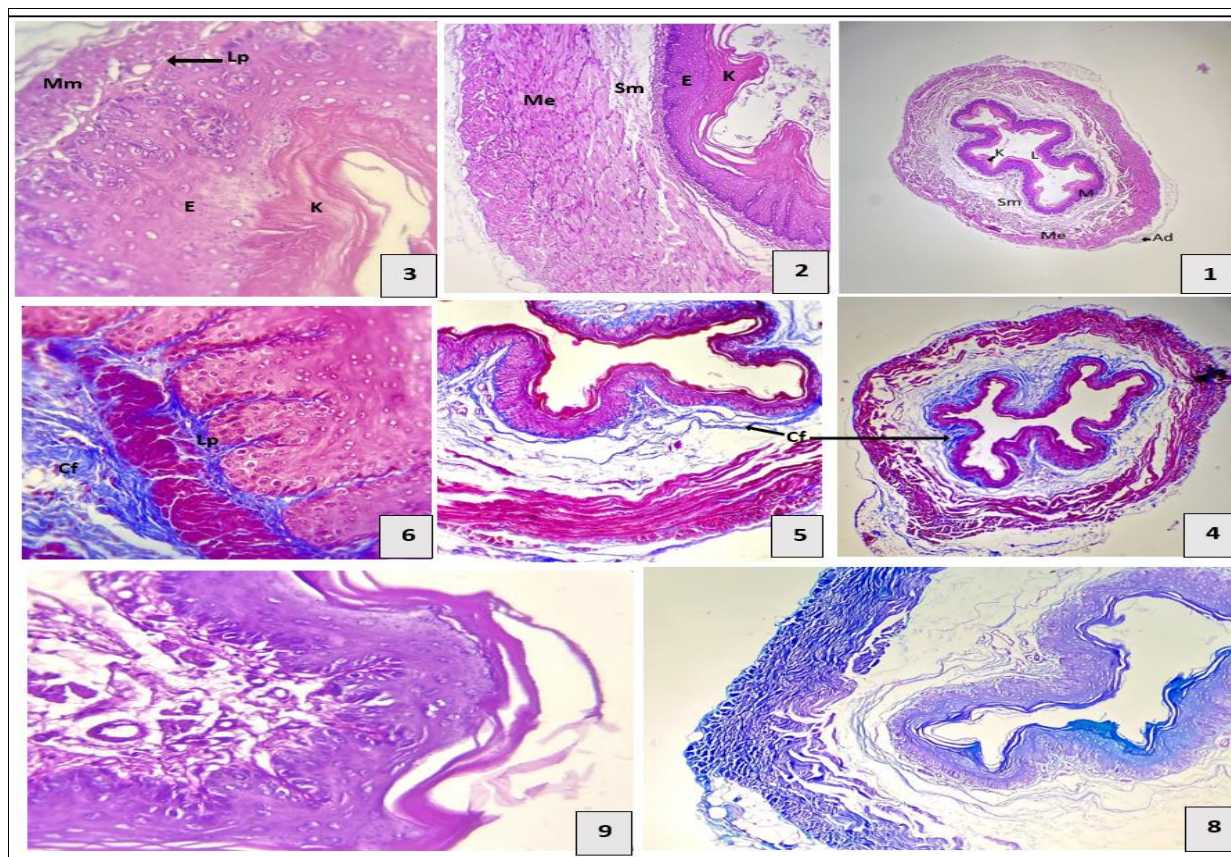
situated ventral to ventral cervical muscles of the cats and dorsally to the trachea. On the posterior surface of the left lobe of the liver's esophageal groove, the short abdominal segment of the esophagus is located. measuring  $3.20 \pm 0.06$  cm in length and  $0.07 \pm 0.003$  gm in weight. At the base of the esophagus, it extended from the esophageal hiatus of the diaphragm to the gastroesophageal at the stomach cardiac orifice. It is surrounded by a thicker region of muscle fibers making a circular muscle known as the esophageal sphincter (Fig 1-B). These results agree with [8, 9, 12, 13]. The histological description, it's has the mucosa, submucosa, muscularis, and adventitia or serosa formed the four tunics of the esophagus. This observation is similar to that made by [15], which noted that the rabbit esophageal lumen appears star-shaped from the cross-section. This mucosa consists of the epithelium, lamina propria, and muscularis mucosae. Throughout the length of the esophagus, the epithelial lining is characterized by keratinized stratified squamous epithelium. (Fig 2-1, 2, 3). This epithelium is interspersed with a well-developed lamina propria, which consists of relatively dense connective tissue, scattered lymphocytes, and vascular structures (Fig 2-3, 6). This observation is consistent with the findings reported in

reference [10]. These findings contrast with those reported by [16], which indicated that the lamina muscularis in grey mongooses was thin and comprised scattered, interrupted bundles of skeletal muscle in the cervical area. Submucosa have no esophageal glands and characteristic *via* loose connective tissue abundant in collagen fibers, a small amount of elastic fibers, and the presence of blood vessels and lymphocytes (Fig 2-A; B 1, 2, 3). This observation, which noted the presence of some elastic and collagen fibers but no distinct submucosal glands, aligned with the findings of [10]. In the cranial region, the tunica muscularis was composed of striated muscle fibers that transitioned to mixed fibers in the intermediate region and smooth fibers in the caudal region. It consisted of three layers arranged from outermost to innermost: a thinner outer layer of longitudinally oriented muscle fibers, a thicker middle layer with circularly arranged muscle fibers, and an internal layer of longitudinal muscle fibers that covered less than half of the esophageal circumference, consistent with [16]. The adventitia was loose connective tissue that was highly vascularized, it covered by simple squamous epithelium which called serosa (Fig 2-1), similar to the observations of [9, 16].



**Fig 1:** Topographic photograph in adult guinea pig shows:

(A) The esophagus (E), stomach (S), pharynx (Ph), trachea (T), lung (Lu), diaphragm (D), liver (L), small Intestine (Si), large Intestine (Li).



**Fig 2:** Histological cross section of the esophagus in adult guinea pigs shows:

- (1) Lumen (L), keratin (K), mucosa (M), submucosa (Sm), muscularis (Me), and adventia (Ad). X4 H&E stain.
- (2) Keratin (K), stratified squamous epithelium (E), submucosa (Sm), and muscularis (Me). X10 H&E stain.
- (3) Keratin (K), stratified squamous epithelium (E), lamina propria (Lp), and muscularis mucosa (Mm). X40 H&E stain.
- (3,4) Collagen fibers (Cf). X10, X40 Masson's trichrome stain.
- (6) Collagen fibers (Cf), and lamina propria (Lp). X100 Masson's trichrome stain.
- (7, 8) No esophageal glands. X10, Alcian blue and PAS stains.

#### Conflict of Interest

Not available

#### Financial Support

Not available

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**How to Cite This Article**

Al-Taai SAH, Khalaf TK. Histomorphological study of esophagus in adult guinea pigs (*Cavia porcellus*). International Journal of Veterinary Sciences and Animal Husbandry. 2024; 9(6): 141-144.

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