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COMPARATIVE ANATOMICAL STUDY OF THE SMALL INTESTINE IN CHINCHILLA AND DOMESTIC RABBIT

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Abstract
The species that belong to the Rodentia and Lagomorpha orders present visible differences on the morphology in the digestive tract, especially in the small intestine. The purpose of this study was to obtain a complete anatomical description of the differences between these two species and also to complete the knowledge about chinchillas. It is known that both chinchillas and domestic rabbits have lately become animal models for research, but also raised as a pets.The reseach has been carried out in the Comparative Anatomy Laboratory of the Faculty of Veterinary Medicine in Cluj-Napoca. The study was performed by dissection and macroscopic examination on five chinchillas and five rabbits. Both species have the small intestine divided into: duodenum, jejunum and ileum. In rabbits, the duodenal ampulla is not so developed as in chinchillas. In chinchillas, the ileum, the ascending segment of the large intestine and the cecal body, do not make a common block. But, in rabbits, because of a greatly developed ileocecal ligament, the ileum is attached to both of the aforementioned anatomical formations. Also, the terminal segment of the ileum of this species is represented by a sacculus rotundus, which is absent in chinchillas. Following this study, we observed differences in the morphology of the small intestine segments of these two species, that are particulary important in understanding and, also, solving the various digestive disorders that are usually found in both species.

Keywords: *Chinchilla lanigera,Oryctolagus cuniculus, anatomical description, small intestine, digestive tract, digestive disorders.*

INTRODUCTION

Chinchilla lanigera and *Oryctolagus cuniculus*, are increasingly popular pets and many of the diseases they contract are the result of improper husbandry (Richardson, 2003). Gastrointestinal disorders are a major cause of morbidity and mortality in domestic rabbits and chinchillas, observed in farm individuals, but also in pets (Quesenberry and Carpenter, 2012). In this paper, we have outlined in detail the morphological differences in the small intestine, emphasizing on the existing particular features, important in understanding and solving the various digestive disorders encountered in domestic rabbits and chinchillas. The study contributes to the extension of anatomical knowledge in both species, and can be a useful support in research, in clinical practice and also in breeding practice.

MATERIAL AND METHODS

For study we used ten healthy animals, five chinchillas and five rabbits from private breeders, without taking into account the age and the weight. The dissection and the macroscopic examination were performed with standardized tools, following standardized methods. The dissection was performed immediately after euthanasia and it was done through an incision of the white line, from the xiphoid appendix, to the pubic region into the pelvic cavity. After the complete opening of the abdominal cavity we also observed the topography of the abdominal organs. The intestinal mass was detached by cutting above the duodenal ampulla and under the ileocecocolic orifice, with the complete separation of this segment off the dorsal abdominal wall**.** This was followed by the delimitation of the each segment of the small intestine in both species, and then each was photographed, opened up

and described, following the main anatomical differences.

RESULTS AND DISCUSSION

In both species the small intestine is divided into duodenum, jejunum and ileum.

The small intestine in rabbits

The duodenum is supported by extensive peritoneal folds that form the mesoduodenum, and because of the mesoduodenum's size, the duodenum can easily move caudally, on the right side of the abdominal cavity, up to the entrance into the pelvic cavity. Furthermore, the duodenum is divided into three parts: a descending, a transverse and an ascending segment. The concavity formed by the three duodenal segments houses the pancreas with a diffuse appearance (Fig. 2). The accessory pancreatic duct opens into the duodenum, at about the passage from the descending segment of the duodenum to its transverse segment, compared to the pancreatic duct , which is slightly distal to the first (Mark A. et al, 2012). Also, between the descending segment of the duodenum and the ascending colon - the dorsal segment, we noticed the location of the duodenocolic ligament. The first duodenal segment called the duodenal ampulla is reduced and forms an obvious flexure with a caudal orientation.

Fig.1 Gastrointestinal tract in rabbit

It initially comes in contact with the omental bursa, and then continues in an narrow angle the end of the pyloric orifice, which is slightly compressed by the duodenum. Because of this compression, in some situations such as gas accumulations, the valve of the pyloric orifice might also be compressed, which might prevent the passage of the gastric contents (Fig.1).The transition from the duodenal segment to the jejunal segment corresponds to the duodéno- jejunal flexure, this is the cranial delimitation of the latter, and is located at the level of the third lumbar vertebra (Barone, 1997).

Fig.2 The duodenal ampulla and the pancreas in rabbits

The jejunum has a complicated aspect, highly creased, but at the same time supported by a very well developed mesentery. Compared to the duodenal segment, the jejunal segment has a darker color, because the intestinal wall is thinner. When opening the abdominal cavity, we observed that it is located between the body the caecum and the ventral segment of the ascending colon, supported by the ileocecal ligament. The three anatomical formations have the appearance of a compact common block. In order to examine its components, this block was detached by careful manual dilacerations of all its supporting ligaments. The end of the ileum is marked by the existence of a spherical formation, called *sacculus rotundus,* which represents the junction between the ileum, the caecum and the proximal colon. The expansion possibly has immunological properties because the interior of this expansion has a honeycomb appearance due to the presence of multiple lymph follicles, which suggests immunological properties, concurring with the statement of Katherine E. Quesenberry and Carpenter James W, 2012. (Fig. 3).

Fig. 3 The ileum and the *sacullus rotundus* in rabbit

The small intestine in chinchillas

When opening the abdominal cavity and removing the parietal peritoneum, we noted that, topographically, part of the duodenal segment is located ventro-laterally on the right side, and the wall's color is light yellow, in contrast with the green dark coloration of the large intestine (Fig. 4). The duodenum is supported by the mesoduodenum. The duodenum begins at the pylorus and at this level the duodenal ampulla is prominent, compared to that of the rabbit. The duodenum then orients itself to the right side and continues with the descending segment. The duodenal descending segment extends from the cranial duodenal flexure up to the caudal duodenal flexure, both flexures visible on the anatomical piece. Following the macroscopical examination of the cranial duodenal segment, we noticed that, similar to the rabbit, the pancreas in chinchillas is located at this level, supported by the peritoneal folds. Another aspect divergent from rabbits, observed on the anatomical pieces, is that after the caudal duodenal flexure, the duodenal descending segment is directly followed by the ascending segment, because the transverse segment is represented only by a short segment. Another feature that differentiates chinchillas from rabbits is the absence of the common block, present in the latter, but separated into three intestinal segments in the former. The terminal segment of the ileum opens into the caecum, without any previous expansion, because in chinchillas the *sacculus rotundus* is absent (Fig. 5 and 6).

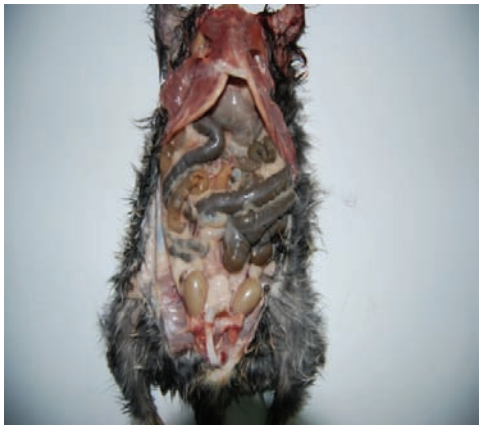

Fig. 4 The topography of the abdominal organs in chinchilla

Fig. 5 The gastrointestinal tract, completely detached in chinchilla

Fig. 6 The ileum terminal segment in chinchilla

CONCLUSIONS

Following the present study, we can underline that in chinchillas the duodenal ampulla is well represented, compared to rabbits, where its development is reduced. The duodenal transverse segment is short, which shows a continuation of the duodenal ascending segment with the duodenal descending segment. In rabbits, the ileum, the ventral segment of the ascending colon and the body of the caecum form together a common block due to the highly developed supporting ligaments, compared to chinchillas, where the common block is missing, and the three anatomical formations are distinct. The *sacculus rotundus*, present in rabbits, is absent in chinchillas. Due to the described aspects, which facilitate a better understanding of these species' digestion and use of the nutrients made available for them, this study undertaken by us contributes **to the broadening of morpho-physiologic** knowledge, And ca also reflect on practical applications in terms of gastro-intestinal diseases diagnosis and their treatment.

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