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Article Review: Histologic Structure of Stomach in Carnivores

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ABSTRACT: Astudy aims to explain the histological features and supplying an important data about stomach wall structure for surgery and medicine in carnivores. The stomach wall in these carnivores consist from following layers, (mucosa, submucosa, muscularis and serosa) while some dissimilar in some of tunic features, mainly in tunica mucosa (lamina muscularis and stratum compactum). The stratum compactum found in the tunica mucosa of domestic cats resting on muscularis mucosa which made from of dense layer white fibers spread underneath mucosa which looked obviously in fundic gland region.

Keywords: Gastric tissue, Fundic gland region, Stratum compactum, carnivores.

1- INTRODUCTION

Gut is chief structures in body of animal's function to digestion and accumulation nutrition [1]. In animals, the gut main job is destruction large elements of food to easily the digestion processing and quickly absorbed process in intestine [2]. There are many differences in the digestive systems of different species. Requirements vary widely between omnivores, herbivores, and carnivores, the monocular stomach type are quite different from multilocular stomach animals [3]. Carnivores usually chew and tear food thanks to brachidont teeth, while herbivores munch from side to side and have hypsodont teeth [4, 5]. Gut of carnivore is noticeably larger than of herbivore, they occupy about 60% to 70% of digestive system. There are many digestive enzymes found in gut to help in digestion process. The hydrochloric acid release more than in human and omnivores in gut of carnivores due to the type of nutrition. The morphologically of in carnivores gut like to humans' gut, in histology structure which have glandular epithelial shields the all-internal surface [6, 7]. Gut in carnivorous is a simple monolocular histology consist from four tunics [8].

2- HISTOLOGY

The gut of grey mongoose, cats, fox, jackals, and dogs were simple type monogastric [3, 9, 10]. The histlogical structure of gut wall consist from four tunics which arrangement from internal to external (mucosa, submucosa, muscularis, serosa). the mucous membranes lining gut which were separated into, three zones (cardiac, fundic , pyloric zones) [3, 11]. Mucosa layer were lined smple columnar epitheleum (SCE)tissue invagintion to form the stomach crypts, its glands empty their secretions in these pits. The layer stratum compactum (stratum sub-glandular) presented in tunica mucosa of three gland regions in some animals like tiger, wild and domestic cats while absent in dogs, wolfs and jackals this layer contain white fibers positioned below the foundations of , glands, in three, gland zones of the gut, which appeared obviously in the fundic region, this stratum rested on the muscularis mucosa [8, 12, 13]. Other studies mentioned that the stratum compactum absent in stomach in the grey wolf stomach the stratum of white, fibers, specified forte gut wall, and protects gut from diffusion in meat-eaters [14, 15].

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2-1 Cardiac zone

This region looks as slim area, the cardiac, glands found in around cardiac, opening. The mucosa layer is lining smple columnar epithlium, tissue(SCE) inner coating cells reach to gut crypts, a foundations of gastric crypts continous the orifice of glands to the lamina, propria layer of tunica mucosa [14,16].The epithelial lining cells secrete mucopolysaccharides that represent a barrier system protection against acidic substances and for lubrication of mucosa [13, 17, 18]. The function of epithelial cells protecting the stomach from digestive acid and enzymes secreted by these glands [18]. The glands found in the lamina propria layer appear simple divided tube-like small with moderately shallow or lengthy stomach [19, 9] in wild cats and dog. submucosa involves of loose connective soft tissue houses the vessels & muscularis layer were involve two sheets of smooth, muscle filaments set as (inner circular &outer longitudinal layer) through this layers Auerbach's plexus found [20]. last layer, serosa layer looks a loose connective tissue enclosed by layer mesothelium in the feline [16]. A abundance of mucus neck cells in this zone of gut mucosa layer is sign that great amounts slimy produced at this zone, for neutralize the harmful & harsh effects, of HCL which secretion by oxyntic cells in this zone. Mucus neck cells doesn't secretion gastric enzyms, only mucus secretion, this is sign the ingestion of nutrition doesn't happen in this area (cardiac). [10]. A manifestation of little oxyntic cells in this zone shows that slight quantity of Hcl secretion in this site [21, 22]; it may be because of that the Hcl secretion in the body area is not sufficient to transmit of pepsinogen to pepsin enzyme [23]. Other authors mentioned that the cardiac zone is contain of solitary mucous neck cells and no oxyntic and peptic cells are found [24]. The mucous neck cells look short columnar or columnar its nuclei are elliptical located near the base, of the cells, and the dispersed oxyntic cells look big, round with position central round nucleus, the secretion units of glands in this area look great round or ovoid, and the amount of secretory parts in this portion is less than in the other region of the stomach of dogs and feline [13, 16, 19].

2-2 Fundic zone

The inner surface of fundus zone contains of longitudinal crinkles or (rugae) protruded to the cavity of the gut, splitting to the small minor crinkle and extensive crinkles extending to the, depth of the fundus region which located among the crypts, of the gut this fold act to distention the internal surface of stomach to accommodates a large amount of food [25, 12]. It seems that the longitudinal folds, which are numerous in number and height in the domestic cat, the folds are very clear when the stomach is empty and become flat when the stomach expands according to the degree of its fullness The epithelial tissue coating cells in this zone are simple columnar epithelium tissue (SCE) , continuous to long or narrow stomach crypts, the abundance these cells is an sign defensive job of this cells to mucosa layer from the harmful result of Hcl secretion by oxyntic [10, 13]. Amount of glands at these zone was extra than the glands in the cardiac zone due to this region being greater than the cardiac and pyloric regions, these glands differ in dimension and look as simple split tubular long over, greatest of their, long & as whole longitudinal partitions of tubules thickly set, horizontally to the superficial [12, 13]. Muscularis mucosa, consists of bundles of smooth muscle filaments arranged to separate tunica mucosa from the tunica submucosa. Tunica submucosa look a loos, connactive tissue ,lymphocyte, eosinophilic, bloody vessels & lymphatic vessels, submucosa made the central of the crinkles (rugae) in mucosa layer. Muscularis layer about two bundle layer (thick inner circular layer and a thinner outer longitudinal layer) of smooth muscle fibers and among of it Auerbach's plexus is found. Outermost layer of the wall of gut is the serosa layer which looks a loose connective tissue-enclosed by (mesothelum) [3]. A fundic glands comprise a varied aggregation of cells then the main cells were; mucus cells, the oxyntic & peptic cells. oxyntic cells were spread lengthways the , of the gland however they are current chiefly in the upper, partial of the fundic, glands they frequently swelling from the side surface of the gland to the lamina propria layer, it looked big round cell and have widespread eosinophilia cytoplasm, centrally positioned round nucleus. Oxyntic cells indicates that the greatest volume of Hcl secretion from this area of stomach. Hcl changes pepsinogen enzyme to pepsin enzyme to commence digestion of protein [26, 27]. Peptic cells' pyramidal shape has a flat nucleus located at the base of the cells, the secretory parts in fundic glands are great ovoid in shape and have extensive lumen relatively the cardiac glands the amount of secretory parts further than in the cardiac zone, may be greater operation of digestion occurs in this part [13].

2-3 pyloric zone

pyloric zone comprises small straight extensive folds un branched which enclose the crypts between them, the epithelium covering the superficial mucosa layer and lining the crypts by simple columnar epithelium(SCE) and the crypts in this zone looked deep than, in the fundic zone and cardiac zone. which is mucus-secreting playing a key role in the defense mechanism of these cells from the corrosive Hcl & against pepsin enzyme of the stomach juice Fundamental the epithelial, is lamina propria layer which look differentiate connactive tissues full by pyloric, glands,

these glands they appear as simple split tube-shaped open into the deep gastric pits [12]. stratum compactum about white bundle this stratum of white looked as a strip spreading along the gut wall, found in some carnivores and absent in some carnivores [14,19] in indigenous cat and grey wolf, in gray mongoose this layer absent [12]. Layer of smooth muscle filaments orient longitudinal, & circular fundamental the mucosa layer represents the muscularis mucosa [16]. The tunica submucosa looks loos, connective tissue fibroblast, white fibers, adipose cells &big bloody vessels, lymphatic vessals in Grey Mongoose [3].Tunica muscularis involve two of smooth muscle layer set (thick inner circular layer & thin outer longitudinal layers)of muscle fibers [3, 13]. The fourth tunica serosa is the last stratum of the wall of the gut made from loose connective tissue coated by (mesothelium). the main cell kinds in the pyloric glands zone are mucus discharging cells with little oxyntic cells & the peptic cells are absent in the pyloric gland's region, the main cell kind of the pyloric glands zone is the mucous-secreting cells some oxyntic cells are present. and no peptic cells, the mucous, cells look cuboidal or pyramidal with basally situated elliptical or round nuclei [28, 29].

3. CONCLUSION

This review appearances that the stomach histological structure in carnivores consist from the following (mucosa, submucosa, muscularis and serosa layer), with some different in the tunica mucosa in certain type.

REFERENCES

[1] Thulin CG, Simberloff D, Barun A, Mccracken G, Pascal M, Islam MA. (2006). Genetic divergence in the small Indian mongoose (Herpestes auropunctatus), a widely distributed invasive species. Molecular Ecology.Nov;15(13):3947-56.

[2] Nowak E, Kuchinka J, Szczurkowski A, Kuder T. (2015). Extrahepatic Biliary Tract in Chinchilla (C hinchilla laniger, M olina). Anatomia, histologia, embryologia. Jun;44(3):236-40.

[3] Kadhim KK. (2019). Histomorphology and histochemical study of esophagus and stomach in grey mongoose (Herpestes Edwardson) in Iraq. Indian J Natural Sci.9(52):16458-75.

[4] Gendron K, McDonough SP, Flanders JA, Tse M, Scrivani PV. (2018). The pathogenesis of paraesophageal empyema in dogs and constancy of radiographic and computed tomography signs are linked to involvement of the mediastinal serous cavity. Veterinary Radiology & Ultrasound. Mar;59(2):169-79.

[5] Bremner CG, Shorter RG, Ellis Jr FH. (19970). Anatomy of feline esophagus with special reference to its muscular wall and phrenoesophageal membrane. Journal of Surgical research. Jul 1;10(7):327-31.
[6] König HE, Bragulla H. (2007). Veterinary anatomy of domestic mammals: textbook and colour atlas. Schattauer Verlag.

[7] Ghoshal NG, Bal HS. (1989). Comparative morphology of the stomach of some laboratory mammals. Laboratory animals. Jan 1;23(1):21-9.7.

[8] Bacha, W. Jr., L. M. Wood (1990). Color atlas of digestive system. veterinary histology. Bacha, Philadelphia, USA, Williams and Wilkins Scientific Publishers, 111-150.

[9] Cavalcante, Clarisse, Maria Michele de Sousa, Maria Barbosa, Fonseca, Tarsia Giabardo Silva Mendonça and Airton Mendes Conde Júnior. (2021). Structure of the stomach in the canine neonate. Jorn. Inter. Bioc., v.6, n.2.

[10] Salih, A. N. and Hamza,L,O.(2022). Histological and histochemical study of stomach in neonatal cats. Ann. For. Res. 65(1): 6441-6452, 2022 ISSN: 18448135, 20652445. DOI: 10.5281/zenodo.7410248.
[11] Dyce, K. M., Sack, W. O. and Wensing, C. J. G. (2010). Veterinary Anatomy. 4thedn, Pp. 680-684. ISBN 978-1-4160-6607-1.

[12] Mahmood, H. B, Obead, W. F and Muna Hussain AL-Aameli. (2023). A review of Morphological and Histological Features of stomach in carnivores. Kerbala journal of pharmacy and pharmaceutical.

[13] Salih, A. N. (2024). Histomorphological and Histochemical study of Stomach and Small Intestine in Indigenous Cat (Felis catus) at neonate and adult stage A thesis Submitted to the Council of the College of Veterinary Medicine/ University of Baghdad, as a Partial Fulfillment of the Requirements for the Degree of Doctorate of Philosophy in Science of Veterinary Medicine/ Veterinary Anatomy and Histology.

[14] Sapundzhiev, Petko Zahariev, Stoyan Stoyanov. (2017). Histological structure of the grey wolf (canis lupu) stomach. tradition and modernity in veterinary. medicine, vol.2, no.2(3):66–68.

[15] Fayed M.H, Elnasharty M. Shoaib M. (2010). Localisation of sugar residues in the stomach of three species of monkeys (Tupaiidaeglis,Nyctice buscocang and Callithrixjacchus) by lectin histochemistry. International Journal of Morphology. 28 (1):111-120.

[16] Ashwaq, A.H. (2019). Comparative morphologic, morphometric and histological study of stomach in two mammal's species (filus catus and sciurus anomalus). PhD thesis. College of education for pure science Ibn Al-Haitham. Baghdad University. Biology department, Zoology.

[17] Ahmed, YA., El-Hafez, A.A. E and Zayed, A.E. (2009). Histological and histochemical studies on the esophagus, stomach and small intestines of Varanusniloticus.J. Vet.Anat. Vol:2No1, pp35-48.

[18] King, D. (2010). Gastric surface mucous cell. Http: //www. siumed. edu/dking2/erg/gicells.htm.

[19] Zahariev, P.Sapundzhiev, E., Pupaki, D., Rashev, P., Palov, A.Todorov, T.(2010). Morphological characteristics of the canine and feline stomach mucosa. J. Anatomy Histology Embryology, 39, 6, pp.563-568.

[20] Smith, D. M., Grasty, R. C., Theodosiou, N. A., Tabin, C. J. and Nasconer-Yoder, N. M. (2000). Evolutionary relationships between the amphibian, Ovian and mammalian stomachs. Evolution and Develop- ment . 2. (6):348-359.

[21] Joseph IMP, Zavros Y, Merchant JL, Kirschner D. (2003). A model for integrative study of human gastric acid secretion. J Appl Physiol. 94:1602–1618

[22] Richter JE. (2007). The many manifestations of gastroesophageal reflux disease: presentation, evaluation, and treatment. GastroenterolClin North Am.36:577–59.

[23] Schubert ML. (2008). Control of Gastric Acid Secretion in Health and Disease, Gastroenterology 134: 7, 1842-1860.

[24] Johannes, A. G. and Rhodin, M. D. (1974). Histology A text and Atlas. Oxford University Press. New York. London. Tornoto. J. Anat. 149, pp. 21-39.

[25] Langer P. (1984). Comparative anatomy of the stomach in mammalian herbivores. Quarterly J. Exp Physiol. 69, 615-625.

[26] Baum B, Meneses F, Kleinschmidt S, Nolte I, Hewicker-Trautwein M. (2007). Age-related histomorphologic changes in the canine gastrointestinal tract: a histologic and immunohistologic study. World Journal of Gastroenterology: WJG.Jan 1;13(1):152

[27] Dare, W. N, Charles, A. O. and Al-Hassan,M I.(2012).Study of the Structure of the Gastric Mucosa in the Mouse Cell Population, J. Life Sci. Biomed. 2(5): 182-186.

[28] Maccoy DM, Kneller SK, Sundberg JP, Harari J.(1986). Partial invagination of the canine stomach for treatment of infarction of the gastric wall. Veterinary Surgery.May;15(3):237-45.

[29] Håkanson R, Sundler F. Session. (1991). Histamine-producing cells in the stomach and their role in the regulation of acid secretion. Scandinavian Journal of Gastroenterology.Jan 1;26(sup180):88-94.