Delta J. Sci. 12 (3)1988 1141 - 1166

HISTOLOGICAL STUDIES ON THE DIGESTIVE SYSTEM OF THE FAT SAND RAT PSAMMOMYS OBESUS CRETZSCHMAR, 1828.

BY

Fouad A. Abou-Zaid, Siham B. Salem and Mohamed L. Salem

Department of Zoology, Faculty of Science, Tanta Univ.Tanta. Egypt.

Received : 21. 9. 1988

ABSTRACT

The present study deals with the fat sand rat Psammomys obesus Cretzschmar, 1828, which is widely distributed in the Egyptian deserts. The microscopic anatomy of the alimentary canal, salivary glands, pancreas, liver and gall bladder was described.

INTRODUCTION

The description, distribution , osteology and classiffication of the Egyptian wild rodents were dealt with by many authors, Wassif (1960 and 1972), Harrison (1973), El-Hamzawy (1979), Sohail (1979) and Madkour (1981, 1983 and 1984, . Histological, histochemical and electron microscopy of digestive system of rodents have been carried outer Pearson (1950), Hugnes (1955), Halender (1961), Read and Johnston (1961), Arnold (1965), Bruni (1965), Snipes (1979a , 1981 and 1984) and Perrin and Michael (1986).

Delta J. Sci. 12 (3)1988

Histological Studies

The present study with the histology of the alimentary tract, salivary glands, liver pancreas and the bladder of Psammomys obesus Crestzschmar, 1928 .

MATERIAL AND METHODS

Alive specimens of Psammomys obesus Crestzschmar, 1828 were collected from the desert of El-Ameriah and Burg El-Arab. The specimens were anaesthesized and the alimentary canal was quickly dissected out and washed in a physiological saline solution. Different parts of the alimentary canal, as well as, pieces of the digestive glands were fixed in Bouin's solution, Zenker's fluid, Carnoy's fluid and neutral formaline ; and then dehydrated, embedded in paraffin wax and sectioned serially at 6 μ thickness. The sections were stained with Delafield's haematoxylin and eosin, Mallory's triple stain, periodic acid Sciff (PAS) to demonstrate the mucosubstances, alcian blue for acid mucopolysaccharides, Sudan black B for fats and Herlant's method (1960) for the study of the pancreas.

OBSERVATIONS

1- The alimentary canal.

The tongue : It consists of mucosa, submucosa and muscularis. The mucosa is made up of stratified squamous epithelium which is thick and cornified over the dorsum. It is being thrown into papillae on the dorsal surface of the

tongue.
The lingual papillae are of three kinds; circumvallate, fungiform and filiform. The first kind (Fig.2) is represented by a single, large and flattened papilla located close to the base of the tongue in the midline. It is girdled by a moat or a slit-like fossa within an outer wall. The fungiform (Fig. 1) are lower and broader papillae in which the connective tissue as well as the epithelial layer take part. The filiform papillae (fig. 1) are the most numerous type, they are cone-shaped projections consisting entirely of epithelial cells and their products are of cornified material that forms their pointed apices.

The submucosa is invaded by two types of glands; the serous and mucous glands. The first type is found near the base of the tongue and around the circumvallate papilla. The mucous glands are located at the mid and posterior parts of the tongue.

The muscularis consists of interlacing bundles of striated muscle fibres.
The oral cavity : The roof of the oral cavity is divided into an anterior fixed hard palate (Fig.3) posterior free soft palate (Fig. 4) , both consisting of mucosa, submucosa and muscularis. The mucosa of the hard palate consists of highly Keratinized stratified squamous epithelium, its

surface is thrown into broad folds. The submucosa is composed of loose connective tissue rich in collagenous fibres and is richly vascular. Its posterior part contains well-developed salivary glands. The muscularis is represented by a thin layer of circularly disposed striated, which blends the periosteum of the underlying bone.

The histological structure of the soft palate is very much similar to that of the hard palate. However, the Keratinized layer of the mucosa in the soft palate is somewhat thinner and the mucosa is thrown into narrow folds.

The structure of the floor of the oral cavity is similar to its roof. However, the mucosal folds are low more numerous. Also, the salivary glands are more abundant than those of the roof and the muscular layer consists of a thick striated longitudinal muscle layer (Fig. 5) .

The pharynx : The pharyngeal wall (Fig. 6) consists of four layers; mucosa, submucosa, muscularis and fibrosa. The pharyngeal mucosa is lined by stratified squamous epithelium with a relatively thin luminal horny Keratinized layer. The lamina propria consists mainly of fibrous connective tissue and containing numerous mucous glands. The muscularis mucosae is better developed consisting of smooth longitudinal muscle fibres. The submucosa is represented by a thin layer of homogeneous connective tissue. The muscularis is composed of striated muscle fibres. Inner circular and outer longitudinal

muscle layers are both present . The fibrosa is formed mainly of fibrous tissue.

The oesophagus : Begining with the oesophagus and up to the rectum , the wall of the alimentary tract shows, more or less, the same general plane. It is composed of four layers; viz., from inside outwards, mucosa, submucosa, muscularis and serosa.

The oesophageal mucosa (Fig. 7) is formed of a thick layer of keratinized stratified epithelium. It forms 6-8 broad folds. The muscularis mucosae is well-developed in the lower part of the oesophagus than in the upper. It consists of unstriated longitudinal muscle fibres drained into the lamina propria of the mucosal folds. The submucosa is a relatively thin layer of dense connective tissue. There is much variation in the muscle coat along the oesophagus. At its upper part the muscles are arranged in an inner circular and an outer longitudinal layers. The middle oesphagus has a mixture of mutual orientation of both layers. The lower oesophagus has a defined arrangement of an inner longitudinal and an outer comparatively thicker circular, forming the oesophageal sphincter. The outermost layer of the upper oesophagus is an adventitia of fibrous connective tissue where in the middle and lower oesophagus the outermost layer is a serosa.

Delta J. Sci . 12 (3)1988
Histological Studies

The stomach : The stomach can be divided into two distinct portions ; the nonglandular and the glandular parts In the nonglanddular stomach the mucosa is represented by a thin layer due to the absence of glands. It is thrown into shallow broad folds. The epithelial lining of the folds is made up of wavy Keratinized stratified squamous epithelium. The outer border of the stratified squamous epithelium stains positively with alcian blue and PAS . The muscularis mucosae is composed of a very thin layer of circular muscle fibres. The submucosa is a narrow layer of areolar connective tissue. The muscular coat is composed of an inner circular and an outer longitudinal muscle layers. There is a thin subserous layer below the serosa (Fig. 8).

In the glandular stomach, it has been found that according to the type of the mucosal gastric glands and pits, this part can be divided into three regions ; cardiac, fundic and pyloric regions. Cardiac glands form a narrow,ring shaped area around the nonglandular stomach. Fundic glands lie in the fundus or through the main body of the stomach, whereas the pyloric glands occupy the distal part of the stomach.

The cardiac glands are simple or branched tubular glands. They are bent and compact, having shallow pits. Each pit is lined with columnar, mucous-secreting alcian blue and PAS positive cells, whereas the isthmus portion

of the gland is lined with small cuboidal mucus cells with rounded basal nuclei. Acidophilic parietal cells are curiously found to be present in the neck and the base of the gland, basophilic chief cells are present at the base.

In the fundic glands the mucous membrane is thick and contains little connective tissue. The pits are also shallow, almost of the same size as in the cardiac region. The parietal cells are more abundant, otherwise the structure of the glands are more or less the same as in the cardiac region (Fig. 9).

The pyloric glands are more branched, being coiled with wide lumina. The pits gradually become deeper; pit-gland ratio being 2:3. The glands have only one type of mucus secreting cells which are columnar with oval, basally located nuclei (Fig. 10). The cells give positive stain with alcian blue and PAS.

A thin muscularis mucosae is found. It is composed of an inner circular and an outer longitudinal muscle layer. It extends into the mucosal folds. The submucosa is represented by a more or less thin layer of connective tissue with reticular fibres. The muscularis is a moderatly thick layer. It consists of an inner thick circular and an outer thin longitudinal muscle layers. A thin subserous layer is found below the serosa.

Delta J. Sci. 12 (3)1988

Histlogical Studies

The small intestine: the stucture of the upper duodenum(Fig.11) is basically similar to that of the lower duodenum, jejunum (Fig. 12) and illeum (Fig-13 and 14) except for duodenal glands, which are usually limited to the upper part of the duodenum. Villi differ somewhat in shape and length in the different regions of the small intestine. The mucosal villi of the jujenum and ileum are finger-like, deep and narrow while those of the duodenum are short and somewhat narrow . The connective tissue of the lamina propria extends into the villi. Numerous goblet cells are scattered amongest the simple columnar epithelial cells which constitute the mucous membrane. These gbblet cells which are more numerous caudally are positive with PAS reaction, alcian blue and Sudan black B. The epithelial layer dips down at the bases of the villi forming intestinal glands (crypts of Lieberkuhn). The submucosa, which is well-developed at the upper duodenum, consists of an areolar connective tissue, rich in blood vessels, capillaries and lymphatics. The duodenal or Brunner's glands , which occur in the upper duodenum, are of highly branched tubular type. The muscularis mucosae may be disrupted if these glands penetrate into the deep lamina propria of the mucosa, and strands of muscle may be seen throughout the glandular layer. The duodenal glands open into the base of crypts of lieberkuhn. In addition, at the base of each intestinal gland, is found a group of pyramidal-shaped cells with large acidophilic granules, the Paneth cells. The muscularis consists of an inner circular

and an outer longitudinal layer. Separating the two layers is a connective tissue strands. Serosa forms the outermost layer.

The large intestine: It includes caecum (Fig. 17), colon (Fig. 16) and rectum (Fig. 15). Like the small intestine, the large intestine consists of mucosa, submucosa, muscularis and serosa, all of which are continuous with those of the small intestine. Villi are absent in the large intestine. The mucosa is thrown into folds which are deep and broad in the rectum and colon. Its free surface appears smooth, and is indented at close intervals by long tubular intestinal glands (crypts of Lieberkuhn) which extend to the muscularis mucosae. The surface epithelium is principally columnar cells with thin straight borders and some globet cells. Goblet cells are more numerous in the colon and rectum than in the caecum. In the caecum the muscularis mucosae is represented by a thin circular layer, however, in the rectum and colon it is formed of an inner circular and an outer longitudinal layers. The submucosa is composed of adipose connective tissue while that of the rectum and colon contains many elastic fibres. The muscularis consists of an inner circular and an outer longitudinal layer. Both layers have the same thickness in the caecum. In the colon and rectum, the muscular coat increases in thickness distally, being formed of an inner thick circular layer and an outer thin longitudinal one. The outermost layer of the large

intestine is formed of a thin layer of squamous epithelial cells, the serosa.

The anus :THe recto-anal junction is marked by the transition of the lining mucosa from simple columnar epithelium keratinized stratified squamous epithelium . The muscularis mucosae is completely absent. There is no trace of intestinal glands . The muscularis is composed of a thick layer of striated muscle fibres forming the anal sphincter (Fig.18).

II- The diestive glands ..

The salivary glands : The salivary glands are represented by three pairs of glands; the parotid, the submandibular and the sublingual.

The parotid gland (Fig.22) is a purely serous gland with a well-developed capsule and septa which divide the gland into lobes and lobules. Within each lobule are masses of serous alveoli. Each alveolus is formed of pyramidal cells arranged around a small, scarcely visible lumen. The serous cells have small, rounded, basally placed nuclei. Intralobular ducts (striated ducts), interlobular ducts (intercalated ducts), blood vessels and groups of adipose cells are found within the lobules. Intralobular ducts are of small limina and are lined with low cuboidal cells. Interlobular ducts have a wide lumina and are lined with columnar epithelium. The nuclei are centrally placed.

The submandibular (Fig. 23) is a mixed gland. It is composed primarily of serous alveoi intermingled with small numbers of mucous alveoli. The serous alveoli have the same structure as in the parotid gland. The mucous alveoli are larger and more variable in size and shape . They have oval or flattened nuclei at the bases of the cells. The mucous acini stain positively with alcian blue, PAS and Sudan black B.

The sublingual gland (Fig. 24) is also a mixed gland. It consists predominantly of mucous alveoli with scarce serous alveoli. Generally, the sublingual gland has the same histological structure of both parotid and submandibular glands.

The liver : The liver (Fig. 19) is a compound tubular gland. It is enveloped by a thin layer of connective tissue. There is no definite lobular structure throughout the parenchyma. A central vein, a tributary of the hepatic vein, runs through the hepatocytes. The hepatocytes are infiltrated by sinusoids, radiating outwards from the central vein to the portal space. The hepatic cells are polygonal in shape, with large rounded nuclei and have granular acidophilic cytoplasm.

The gall bladder : The wall of the gall bladder (Fig. 20) consists of mucosa. fibromuscular layer, perimuscular connective tissue layer and a serosa on its free suface. Elsewhere, an adventitia attaches it to the liver. The lining

epithelium is simple tall columnar whose cells have basally placed nuclei. The lamina propria of loose connective tissue has some diffuse lymphatic tissue. In the fibro muscular layer, the smooth muscles do not form a compact layer , but are interspersed with layers of loose connective tissue which is rich in elastic fibers. A wide layer of perimuscular loose connective tissue surrounds the muscle layer.

The pancreas : The pancreas (Fig. 21) is surrounded by a thin capsule of collagenous and elastic fibres. A serosa cover the capsule . The pancreas is composed of masses of serous acini and pancreatic islets. A pancreatic acinus is composed pyramidal secretory zymogenic cells, possess granular cytoplasm and large rounded nuclei situated bassaly. The acini are drained intralobular ducts which have small lumina and are lined with low cuboidal cells. Intralobular ducts drain into layer interlobular ducts lined with columnar epithelium which empty into the main pancreatic duct. The pancreatic islets are rounded structure of varing sizes. Each islet is surrounded by a thin capsule of connective tissue. By using Herlant's technique, α - β - and γ - cells can be distinguished in the islets.

SUMMARY AND DISCUSSION

- The wall of the oral cavity is coated by a layer of Keratinized stratified squamous epithelium, which is thicker in the roof than in the floor. The submucosa is

characterized by the presence of large number of mucous glands.

- The mucosa of the tongue is made up of thick, cornified, stratified squamous epithelium, it is thrown into three kinds of papillae; a single circumvallate, numerous filiform papillae and many fungiform papillae. The same description was found in Arvicanthis niloticus (El-Hamzawy, 1979).

- Begining with the oesphagus and up to the rectum, the wall of the alimentary tract is composed of mucosa, submucosa, muscularis and serosa.

- The muscular coat of the oesphagus shows great variations along its length. At its upper part, it has an inner circular and an outer longitudinal muscle layers. The middle oesophagus has a mixture of both layers. The lower oesophagus has an inner, thin, longitudinal and an outer, thick, circular muscle layer, forming the oesophageal sphincter. Botha (1958) described that the gastrooesophageal sphincter consists entirely of striated muscles (mouse), entirely of smooth muscles (bat) or both (rabbit).

- The stomach can be divided into, a nonglandular and glandular part. The mucosa changes abrubtly from Keratinized stratified squamous epithelium through the nonglandular

portion into a glandular epithelium at the glandular part. Three kinds of glands are demonstrated in the glandular mucosa; cardiac, fundic and pyloric glands. These glands are composed, more or less , of three types of cells , parietal, cheif and mucous cells which were also recorded by Botha (1958) in rabbit, while the parietal cells are absent.

- The structure of the upper duodenum is basically similar to that of the lower duodenum , jejunum and ileum except for duodenal (Brunner's) gland, which are limited to the upper part of the duodenum.

- The large intestine includes caecum, colon and rectum. Villi are absent. The mucosa is thrown into folds and contains numerous intestinal glands (crypts of Lieberkuhn). The surface epithelium contains goblet cells which are more numerous in the colon and rectum. Snipes (1984) described that goblet cells are absent in the caecal mucosa of the manatee.

- The salivary glands are represented by three pairs of glands; the parotid, submandibular and sublingual glands. The parotid gland is purely serous gland, while the submandibular and the sublingual are mixed glands, composed of serous alveoli intermingled with mucous glands. Intralobular

ducts (striated), interlobular ducts (intercalated) are found within the lobules of the glands. Pearson(1950) stated that, the intercalated ducts are completely absent in the shrews.

- There is no definite lobular structure throughout the liver parenchyma. In contrast, Maximow and Bloom (1969)and Ham (1974) described an extreme case of lobulation in the liver of pig, Camel and guinea pig.

- The pancreas is composed of masses of serous acini and pancreatic islets. α - β - and γ - cells can be distinguished in the islets. Similar conditions are found in guinea pig(Thomas 1937). While Bloom and Fawcett (1975) observed an additional nongranular cells designated as C-cells

Delta J. Sci. 12 (3)1988

REFERENCES

Arnold, T. and Leonreebng, (1965): The rat submaxillary gland J.Morph., 117: 295-352.

Bloom W., and Fawcett,D., (1975): Text book of histology, 10 th adition W.B.Saunders company Philandelphia, London.

Botha G,S,M., (1958): A note on the comparative anatomy of the cardio-oesophageal junction. Acta. Anat. 34 : 52-94.

Bruni, C.and Parter K.R.(1965): The fine structure of the parenchymal cell of the normal rat liver. Am. J.Path. 46: 691.

El-Hamzawy, M.A., (1979): Anatomical studies on the common field rat Arvicanthis niloticus found in Egypt. M.Sc. Thesis, Tanta Univ. Tanta, Egypt.

Halender, H.F.,(1961): A preliminary note on the ultra-structure of the argyrophile cells of the mouse gastric mucosa. J.Ultrastr. Res. 5 : 257-262.

Ham, A.W.,(1974): Histology 7th edition. J.B. Lipincott, Comp. Philadelphia and Minterea.

Harrison, D.L., (1973): The mammals of Arabia (Lagomorpha, Rodentia), 3 , Ernest Benn Ltd. London.

Herlant, M., (1960): Etude critique de deux techniques nouvelles destinees a mettre en evidence les differentes categories cellulaires presentes dans la glande pituitaire. Bull. de Microscopie Appliquee 10: 37 - 44.

Hugues, F.B.,(1955): The muscularies mucosa of the oesophagu of the cat, rabbit and rat. J. Physiol., London. 130: 123 - 130.

Madkour, G., (1981): Post-cranial osteology of Egyptian shrews crocidura. Zool. An. Jena, 206: 341 -353.

----------(1983): Osteology of the autopodia of common Qatarian gerbils (Mammalia, Rodentia). Zool. gerbils (Mammalia, Rodentia). Zool. Anz., Jena, 211: 385-395.

----------(1984): Chondral and osteological stractures in the cranial region of common Qatarian gerbils Zool. Anz., Jena, 213: 247-257.

Maximow, R.and Bloom, F., (1969): A text book of histology. 7th edition, W.B., Saunders company , Philade-lphia, London.

Pearson, O.P.,(1950): The submaxillary glands of shrews. Anat. Record, 107: 167-176.

Perrin, C. and Michael, R., (1986): Gastric anatomy and histology of an arboreal folivorous muxid rodents., The blacktailed tree rat Thallany

paedulus. 51(4): 224-236.

Read, A.M. and Johnstone, F.R.C., (1961) : The distribution of parietal cells in gastric mucosa of cat. Anat. rec. 139: 525-530.

Snipes, R.L., (1979a): Anatomy of the caecum of the vol, (Microtus agrestis). Anat. Embryol. 181-203.

----------(1979b): Anatomy of the caecum of the dwarf hamster, Phodopus sungorus. Anat. Embyol. 157: 329-346.

----------(1981): Anatomy of the caecum of laboratory mouse and rat. Anat. Embryol. 162 : 455-474.

----------(1984): Anatomy of the caecum of the West manatee, Trichechus manatus (Mammalia, Sirenia)Zoomorphol. 104: 67 - 78.

Sohail, S.S., (1979): Ecological studies on rodents of the Western desert of Egypt, with special refference to Gerbillus, Andersoni. M.Sc. Thesis, Dep. Zool. Ain Shams Univ.

Thomas , T.B., (1937): Cellular components of the mammalian islets of Langerhans. Am. J. Anat., 62: 31.

Wassif, K., (1960): Studies on the osteology of Egyptian jerboas. (U.A.R.) Ibid., 15: 71-87.

----------(1972): The present distribution of rodents in Egyptian deserts and its bearing on future agricultural projects. Assiute, 1 : 55 -60.

Delta J. Sci. 12 (3)1988

ABBREVIATIONS

AD : adventitia , BG : Brunner's glands , BV: blood vessel,
CH : cheif cell , CML:circular muscle layer, CNV:central vein
CPL:crypts of Leiberkun , CV:circumvallate ,EP:epithelial lay
FG: fungiform papilla , FL:filiform papilla,
EML:fibromuscular layer, GC: goblet cell , HC:hepatocyte,
ICD:intercalated duct , IL:islets of Langerhans, KL:keratiniz
layer
LML:longitudinal muscle layer, LN:lymph node, LP:lamina propr
MA:mucous acini , MG:mucous gland , MM : muscularis mucos
MU:mucosa , PA:parietal cell, PM:perimusclar connective tissu
SA:serous acini , SGL:serousgland , STM:striated muscles
SUBM:submicosa , STD:striated duct , TB: taste bud,
V: villi , α C: α-cell , β C: β-cell , γ C: γ-cell .

Fig. 1- Photomicrograph of a T.S. of tongue(mid. part), showing the fungiform and filiform papillae. F., Bouin , S., HE X 200

Fig. 2- Photomicrograph of a T.S. of the tongue (post. part). showing the circumvallate papilla. F., Bouin, S., HE X190

Fig. 3- Photomicrograph of a T.S. of the roof of the oral cavity, (hard palate). F., Carnoy ; S., HE X200

Fig. 4- Photomicrograph of a T.S. of the roof of the oral cavity, (soft palate). F., Carnoy ; S., HR X200

Fig. 5- Photomicrograph of a T.S. of the floor of the oral cavity, (mid. part). F., n.formaline ; S., HE. X190

Fig. 6- Photomicrograph of a T.S. of the pharynx. F., Bouin; S., HE X250

Fig. 7-Photomicrograph of a T.S. of the upper oesophagus. F., Carnoy; S., HE. X 180

Fig. 8- Photomicrograph of a T.S. of the non-glandular stomach. F., Bouin ; S., HE . X 180

Fig. 9- Photomicrograph of a T.S. of the fundic region of the stomach. F., n. formaline ; S., HE. X 250

Delta J. Sci. 12 (3)1988

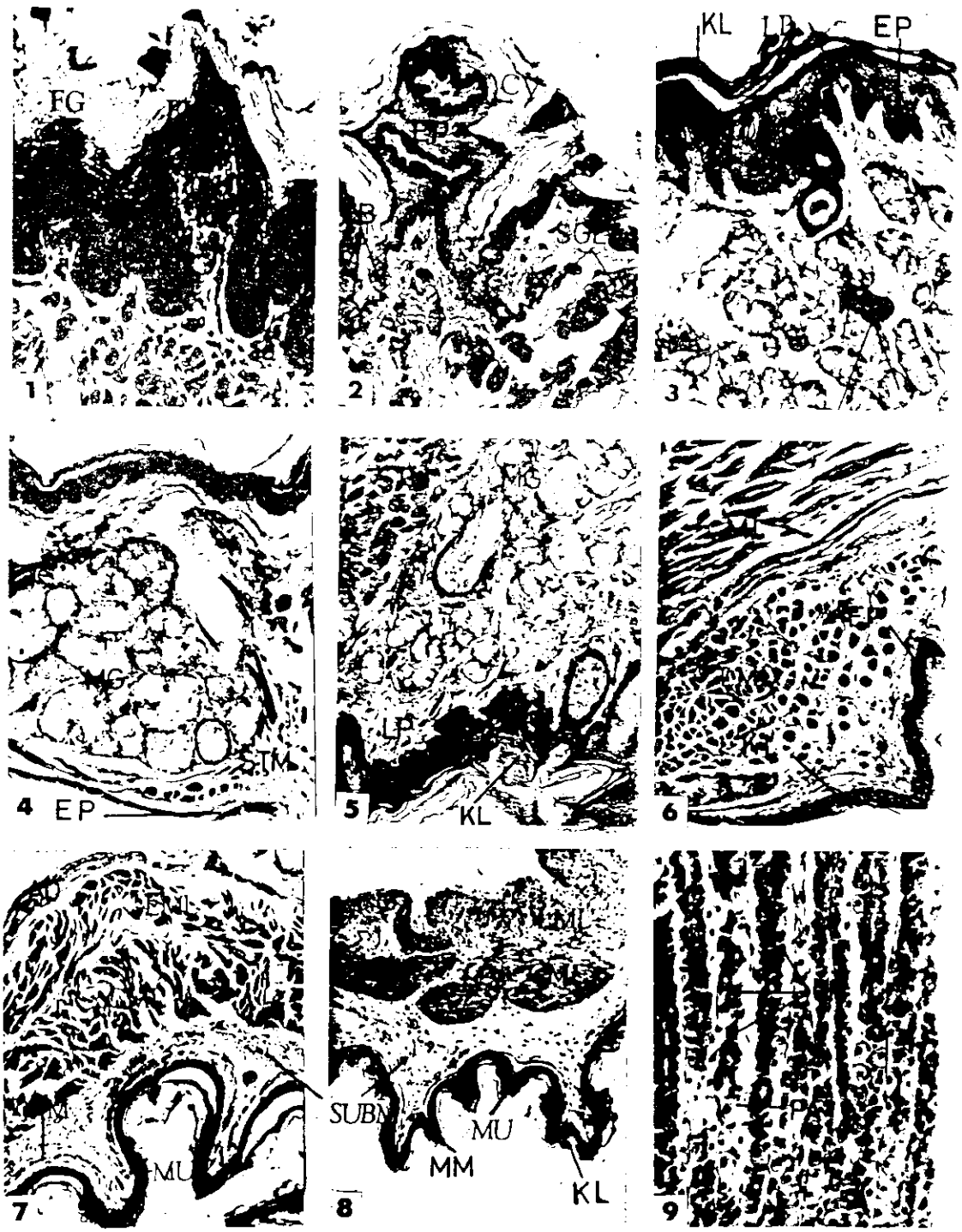


Fig. 10- PHotomicrograph of a T.S. of the fundic region of the stomach. F., n. formaline ; S., HE. X 250

Fig. 11- Photomicrograph of a T.S. of the upper duodenum showing Brunner's glands. F., n.formaline ; S., HE. X 190

Fig. 12- Photomicrograph of a T.S. of the jujenum. F., Bouin ; S.HE. X 190

Fig. 13- Photomicrograph of a T.S. of the middle ileum. F., Bouin; S., HE. X 180

Fig. 14- Photomicrograph of a T.S. of the ileum. F., n. formalin ; S., Sudan black B. X 250

Fig. 15- Photomicrograph of a T.S. of the rectum. F.,n. formaline; S., HE. X 200.

Fig. 16- Photomicrograph of a T.S. of the colon. F., Carnoy; S., PAS X250

Fig. 17- Photomicrograph of a T.S. of the caecum. F., Bouin; S., HE. X200

Fig. 18- Photomicrograph of a L.S. of the recto-anal junction. F., n. formaline; S., HE. X200

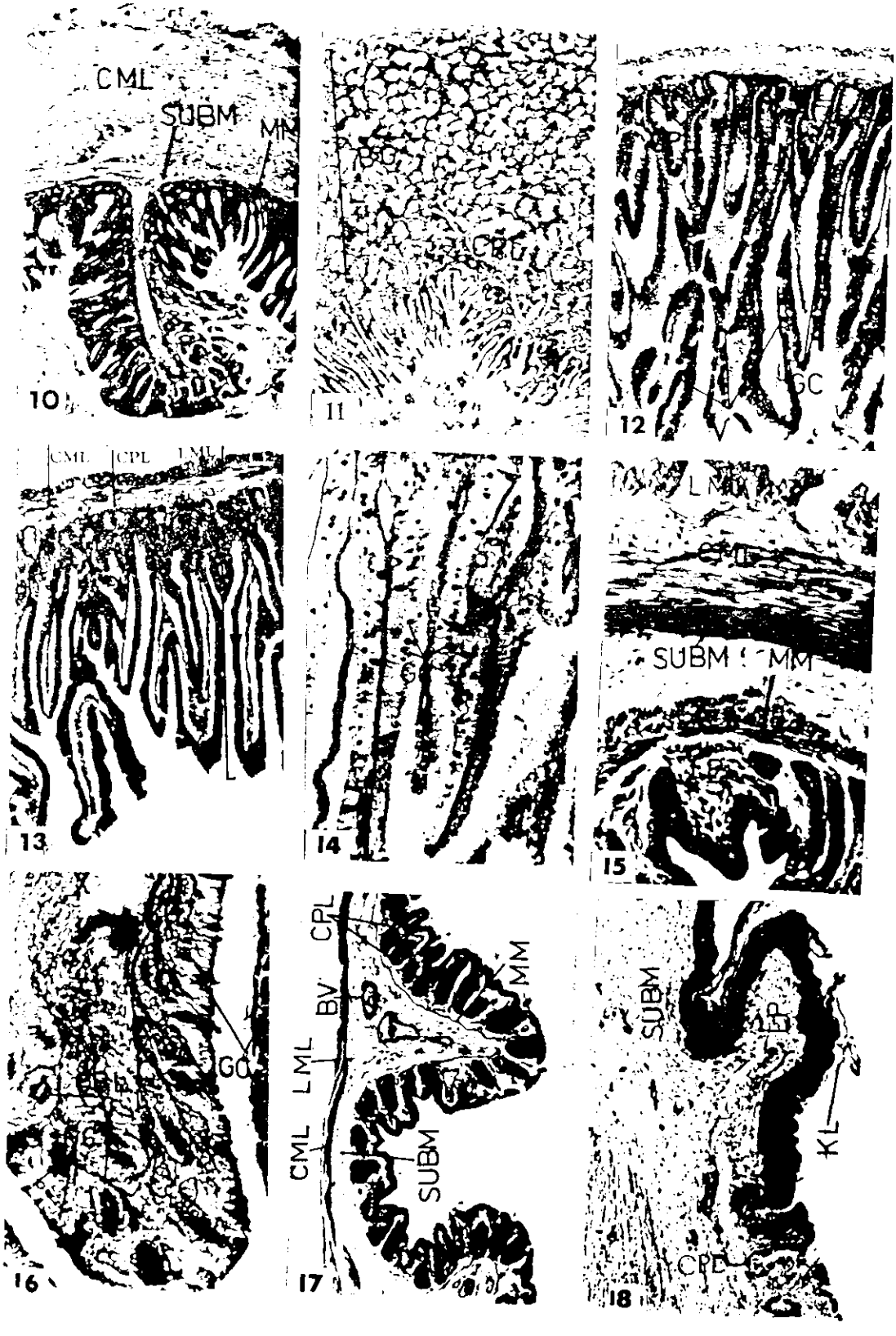

CML
SUBM
MM
10
BG
CBL
11
GC
12
CML
CPL
LML
13
14
LML
CPL
SUBM
MM
15
GC
16
CPL
BV
MM
CML
LML
SUBM
17
SUBM
EP
KL
CPL
18

Fig. 19- Photomicrograph of a section of the liver. F.,n. formaline ; S., HE. X200.

Fig. 20- Photomicrograph of a T.S. of the gall bladder. F., n. formaline; S., HE. X 180.

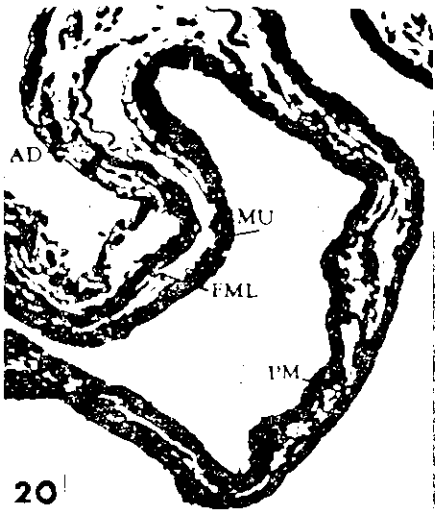
Fig. 21- Photomicrogràph of a section of the pancreas. F., Zenker; S., Herlant's stain X 200.

Fig. 22- Photomicrograph of a section of the parotid gland. F., n. formaline ; S., HE. X 150.

Fig. 23- Photomicrograph of a section of the submandibular gland. F., n. formaline ; S., HE. X250.

Fig. 24- Photomicrograph of a section of the sublingual gland. F., n. formaline ; S., Alcian blue. X250.

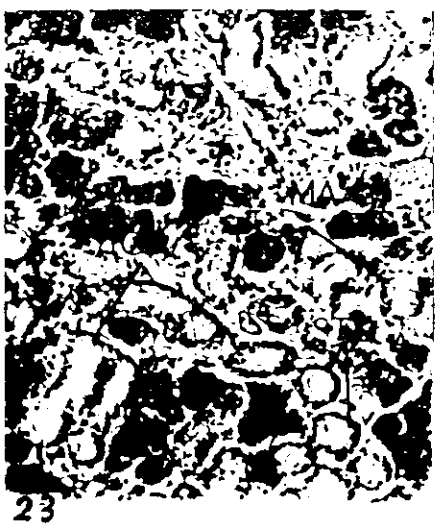

19



20

21


22



23


24

Delta J. Sci. 12 (3)1988

دراسات هستولوجية على القناة الهضميه للجهاز الهضمى لفأر الرمال السمين "بسماومس أوبيسس"

فؤاد عفيفى أبو زيد - سهام بيومى سالم - محمدلبيب سالم
قسم علم الحيوان ، كلية العلوم ، جامعة طنطا - طنطا - مصر

تشمل تلك الدراسة على شرح دقيق للتركيب الهستولوجى لكل من القناة الهضمية ، الغدد اللعابيه ، البنكرياس ، الكبد والحوصله المراريه لفأر الرمال السمين " بساموس أوبيسس " . تتكون الطبقه المخاطيه فى اللسان من طبقه سميكه من طلائيه حرشفيه طبقية وتحتوى على ثلاثه أنواع من الحلمات : حلمة واحده محاطه بمتراس والحلمات الأخرى الاكثر شيوعا هى الحلمات الخيطيه والفطريه . بدايه من المرئ وحتى المستقيم ، يتكون جدار القناة الهضميه من الطبقات التالية : المخاطيه ، تحت المخاطيه ، العضليه والمصليه .

يمكن تقسيم المعده الى جزأين : الجزء الغدى والجزء الغير غدى. يوجد ثلاث أنواع من الغدد فى الجزء الغدى من المعدة وعلى أساسها قسم الجزء الغدى الى ثلاثه أجزاء هى فم وجوف المعدة وتمثل الغدد اللعابيه بثلاثه أزواج من الغدد وهى النكفيه وتحت اللسانيه وهذه الغدد من النوع الحويصلى المركب . الكبد تنتظم خلاياه فى شكل غير واضح الفصوص.

يتركب البنكرياس من جيوب مصليه وجزر لانجرهانز . أمكن تحديد ثلاثه أنواع من الخلايا بتلك الجزر وهى الفا وبيتا وجاما .