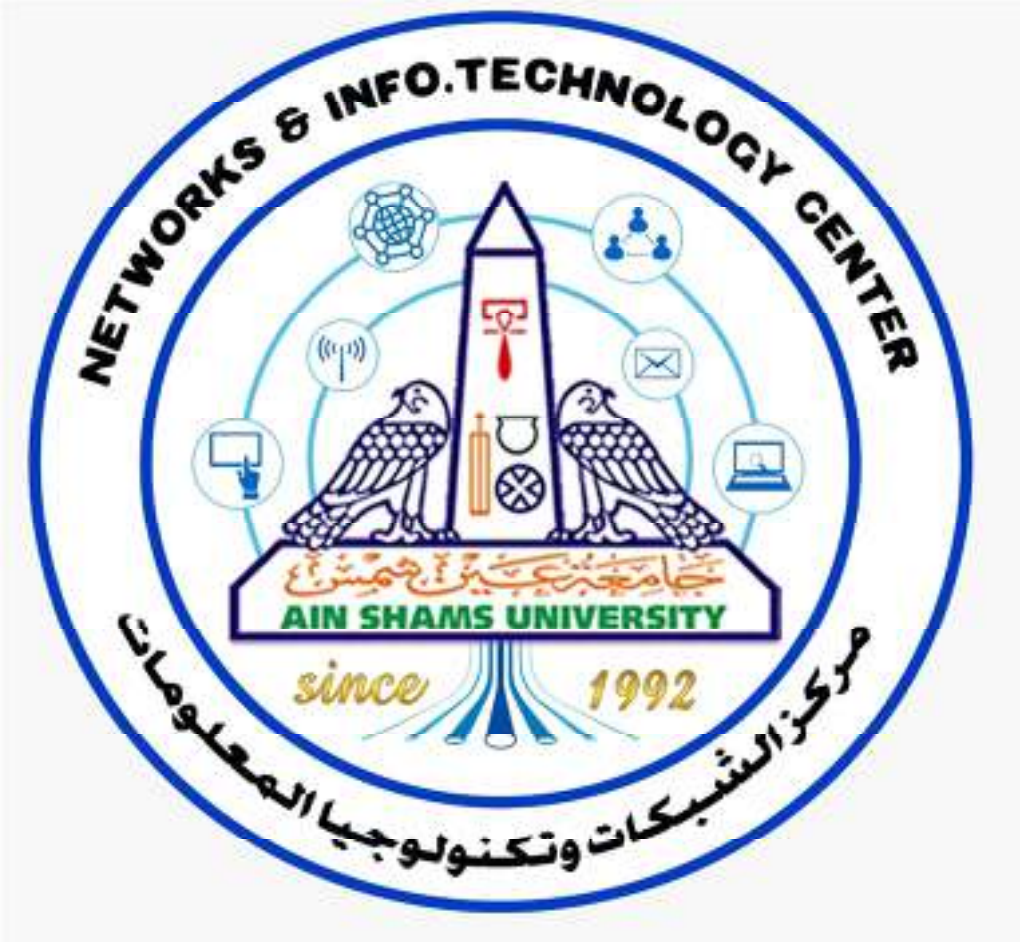
Mona maghraby



بعض الوثائق الأصلية تالفة
وبالرسالة صفحات لم ترد بالأصل

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Developmental Studies On The Stomach Of The Camel

Thesis

Submitted for the Award of the Degree of
M.V. Sc. In Histology

By

Enas Ahmed Abdel-Hafez
Demonstrator of Histology "B.V.Sc." (Assiut)

Under the Supervision of

Prof. Dr.
Gamal Kamel Mohamed Ali
Professor of Histology
The Head of Anatomy & Histology Dept.
Faculty of Vet. Medicine
Assiut University, Egypt

Prof. Dr.
Mohamed Nabil Kamel Moustafa
Professor of Histology
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بسم الله الرحمن الرحيم

"أفلا ينظرون إلى الإبل كيف خلقت"

صدق الله العظيم

سورة الغاشية الآية رقم ١٧

DEDICATION

To the SOUL of My Mother

To My Father

&

To My lovely Husband Wael

"Without his patience and support this work could not be"

ACKNOWLEDGMENT

All thanks are to Allah, who gives me the ability to do, helps me, eases difficulties and for all his donations.

The words I write are not enogh to express my actual feelings and my thanks for my professors.

Iam absolutely lucky to be supervised and direct by ***Dr. Gamal K. M. Ali, Prof. of Histology*** *and Head of Anatomy and Histology Department, Faculty of Veterinary Medicine, Assiut University, For his excellent supervision, unlimited encourgement and wise advice.*

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Enas Ahmed Abdel Safez

INTRODUCTION

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The histomorphological features of the ruminant stomach at various stages of growth and development have been described in different species (Osman, 1977; Arias, Fernandez and Cabrera, 1979; Ewais; Mobark, Foad, El-Gaafry and Ammar, 1977; Dougbag, 1981; Fath El-bab; Schwarz and Ali,1983; Kamel, Hassan, Ali and Moustafa,1987 and Soliman, 1987).

The camel being a ruminant has a large multilocular stomach. However the structure of the camel stomach differs from that of the other domestic ruminants (Dellmann and Fayez, 1964; Vallenas, Cummings and Munnel, 1971; Cummings, Munnell and Vallenas, 1972; Dougbag, 1979). Attempts to homologize the compartments of the camel stomach with those of the other domestic ruminants have lead to considerable controversy (Vallenas, Cummings and Munnel, 1971).

Informations on the prenatal development of the camel stomach in the available literature are scanty (Ammar, 1977; Ewais, Mobark, Foad, El-Gaafry and Ammar, 1977; Soliman, 1979 and Dougbag, 1981). The presence and distribution of endocrine cells in the gastroentric system have been widly investigated in the gastrointestinal tract of many domestic ruminants (Calingasan, Kitamura, Yamada, Oomori and Yamashita, 1984; Weyrauch, Blähser and Perschbacher, 1987; Weyrauch, Schnorr and Glaser, 1989; Ceccarelli, Pedini and Gargiulo, 1995). These investigations have been conducted mainly on adults, little is known on the ontogenic changes. Moreover, Informations on the presence and distribution of endocrine cells in the stomach of the camel in both prenatal and adult period are lacking in the available literature.

Therefore, the present study was undertaken to give more informations on the prenatal development, of the camel stomach using both light and scanning electron microscopy.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Sheep and goat :

Trautmann and Fiebiger *(1957)* presented the general histology of the stomach of the adult ruminant. They mentioned that ruminants have a stomach consisting of four compartments: three nonglandular diverticula comprising the forestomach and a true glandular stomach. The wall of the forestomach consists of a nonglandular cutaneous mucus membrane, a two-layered muscular tunic and a serosa. The wall of the glandular stomach is composed of a mucosa, a tunica muscularis consisting of smooth muscle fibers and a serosa.

Wardrop *(1961)* studied the histological changes of the forestomachs of lamb in the period from *46* days of fetal life to *77* days of postnatal life. He stated that in all the rumen fetal specimens, the mucosal surface was smooth. At birth small conical papillae were visible and from this age onwards these papillae increased rapidly in size and tended to be long and tongue shaped in apperance. Little change occured in apperance of the rumen papillae after *56* days of age. The outlines of the reticulum reticular ribs were visible in the *100* - days old fetal specimen. At birth the normal honeycomb-like strructure of the reticulum was well developed, but the papillae on and between the reticular ribs were small and had rounded tips. From *20* days of age onwards the reticulum features incresed in size and the papillae became pointed in shape. At *46* days of fetal life the omasum wall was folded to form developing laminae and by *70* days of fetal life laminae of four orders were present. The main age changes in the apperance of the mucosal surface from this age onward was an increase in the length of the laminae, the formation of small conical papillae on the

laminae, and an increase in the inter-laminae spaces. All three forestomachs showed the same general histological changes with age. The epithelium changed from a stratified cuboidal type in the fetal specimens to a keratinised, stratfied squamous epithelium in the postnatal specimens. The basal layer of the epithelium became folded to form papillae, reticular ribs and laminae and in the rumen and reticulum further folding of this layer took place to form papillary bodies .

Ramkrishna and Tiwari *(1979)* studied the histology and histochemistry of the goat forestomach during the prenatal life (*11.5* to *39.5* cm CVR lengths). They mentioned that the mucosa of the forestomach was lined by non keratinized stratified squamous epithelium. The mucosal appendages in the form of ruminal papillae didn't develop in the rumen during this study, however omasal laminae and reticular ribs were evident in groups I (*11.5* to *14.6* cm CVR lengths) and II (*16.2* to *24.5* cm CVR lengths) respectively. Cytoplasmic accumulations were evident in the middle layer of the epithelium, which was characteristic of this region. The thickness of the epithelium increased constantly in the rumen and reticulum but in the omasum it remained constant with the increased in the size of the fetus. The corial papillae in the rumen, reticulum and omasum appeared at the *12.7*-,*11.5* and *14.6*-cm CVR stage, respectively. The muscularis appeard in the omasum at the *14.6*-cm CVR stage in the first-order laminae. The tunica muscularis consisted of spirally arranged muscle fiber bundles. Cross - cut muscle fiber bundles below the tip of the omasal laminae descended down- ward with the increase in the size of the fetus and continued with the inner circular layer. Acid and alkaline phosphatases and fat could not be observed. The concentration of glycogen in the epithelium was maximum in group III (*30.8 - 39.5* cm CVR lengths) and minimum in group II .

Fath El-Bab, Schwarz and Ali *(1983)* studied the micromorphology of the stomach of sheep during the prenatal life from *26*th to *130*th day of pregnancy. They mentioned that the rumen and reticulum were similar in structure at the early stages of development and commenced differentiation around the *78*th day of fetal life. The formation of ruminal papillae started at the *104*th day and the primary elements of the reticular ridges developed at *78*th day of the intrauterine life. The histogenesis of the omasum was pronounced at the *52*nd day of embryonic life. The smooth muscle fibers of the omasal lamina originated from the muscularis mucosae and the inner circular layer of muscularis. The gastric pits were seen at the *78*th day and the gastric glands started to appear at the *104*th day and were distinctly differentiated at the *130*th day of fetal development.

Calingasan, Kitamura, Yamada, Oomori and Yamashita *(1984)* studied the gastroenteropancreatic (GEP) endocrine cells of the sheep by using immunocytochemistry. In the abomasum, somatostatin, gastrin, glucagon and glicentin-immunoreactive cells were detected with the highest frequency in the pyloric region. The immunoreactive endocrine cells were oval or pyramidal in shape and having luminal contact with their apical cytoplasmic processes (open type).

Kamel, Hassan, Ali and Moustafa *(1987)* Studied the histological development of the goat stomach during the fetal and early neonatal period. They reported that at *8* cm CVR length the ruminal and reticular mucosae were smooth and covered with stratified columnar epithelium however the omasal mucosa was thrown into various folds. The abomasum beared a longitudinally folded mucosa and was lined with pseudostratified columnar epithelium. The primordia of the reticular folds were observed as early as *22* cm CVR length. However the primary elements of the omasal laminae were pronounced at *25* cm CVR length.

The gastric glands started to develop at *25* cm CVR length. The parietal, chief and mucus neck cells could be recognized in fetuses of *33* cm CVR length. The gastric epithelium demonstrated abundant mucopolysaccharides during the early periods of intrauterine life . However at the end of gestation and in newborn goats the gastric epithelium contained much fewer amount of these materials. In *3* day-old goats, the gastric mucosae simulated that of adult animals.

Weyrauch, Blähser, Perchbacher *(1987)* studied somatostatin endocrine cells in the gastric mucosa of sheep and goat using immunohistochemical techniques. The immunoreactive endocrine cells of the abomasal mucus membrane showed individual and species dependent differences. The mucosal epithelium of the abomasum of the sheep contained more immunoreactive endocrine cells than that of the goat. Open and closed type of immunoreactive endocrine cells were demonstrated in the abomasum of sheep and goat. The open type cells were pyramidal or pear- shaped and mainly found in the surface epithelium or in the basal third of the glandular tubule. The open type cells established contact to the epithelial surface by apical cytoplasmic processes. The second cell group, the closed type cells did not have luminal contact. They were placed between the epithelial cells of the mucosal surface and the tubular gland of the abomasum.

Franco, Regodon, Robina and Redondo *(1992)* studied the histomorphometry and scanning electorn microscopy of the rumen of sheep during prenatal, early postnatal and adult age. They found that the histodifferentiation of the rumen took place at *33* days of fetal life. Ruminal pillars were observed at *42* days and at *61* days, ruminal papillae appeared as evaginations of the epithelial stratum basale. Neutral mucopolysaccharides first appeared in epithelial cells at *46* days of fetal life;

thereafter numbers decreased gradually and subsequently stabilized in postnatal life . Acid mucopolysaccharides, mucins and mucoid compounds were not detected.

The histo-morphometric analysis of the abomasum of the sheep during development was performed by Franco , Robina, Guillen, Mayoral and Redondo *(1993)*. They stated that the histological differentiation of the abomasum commenced at *33* days of gestation and villi appeared at *53* days. The epithelium changed from pseudostratified to simple mucus cylindrical at *64* days. Acidic glycoproteins appeared at *46* days and neutral glycoproteins at about the time of birth .

Franco, Rodriguez, Mayoral, Guillen and Robina (*1993*) used one hundred forty four ovine embryos and feti in an investigation to determine mathematical models describing the histo-morphometric growth of tissues and compartments of the ruminant stomach. Their results indicated that during prenatal life the diameter of the gastric chambers increased more slowly than the length. The tissue layers of gastric walls, particularly the muscular tunic of all compartments demonestrated a uniform tendency toward more rapid development than the compartment walls proper.

Yamamoto, Kitamura, Yamada, Andrén and Yamashita *(1994)* examined the morphology of the surface structure of the omasal laminae in cattle, sheep and goats by naked eye , stereoscopic microscope and scanning electron microscope. They found that the mucosal relief of the omasum showed wide variations both between and within these species. Omasal papillae on the laminae varied highly in shape, i.e. conical, rounded, claw-like, finger-like, etc. They decreased gradually in size from the oral to the aboral region of the omasal lamina. Ridge-like structures and linear arrangements of the papillae were also seen on the omasal laminae of cattle and sheep. Many grooves and folds were found on the

lateral surface of the omasal papillae in adult cattle and on the inter-papillar surface of the laminae of all *3* species . The mucosal relief of the omasum in cattle seemed to be more well-developed than those of sheep and goats. Dietary effects on the mucosa were also discussed.

Ceccarelli, Pedini and Gargiulo *(1995)*, studied the endocrine cells in the gastro-enteric tract of adult fallow deer using immunocytochemical technique. Somatostatin immunoreactive endocrine cells were present throughout the gastrointestinal mucosa from the cardiac region of the abomasum to the rectum. Somatostatin endocrine cells were of both open and closed types. Closed-type cells were found predominantly in the gland region of the abomasum. The cells were cricular in shape and occasionally provided with thin cytoplasmic processes running along the basement membrane. The open type, flask shaped cells were numerous in the fundic region. Gastrin-immunoreactive were the most numerous endocrine cells in the abomasum and were located in the neck region of pyloric gland.

Cattle and buffalo :

Lambert *(1948)* described the development of the stomach in the ox. He concluded that the stomach was formed by dilations of the primitive gut and not, as was previously thought, from the oesophagus .

Becker, Arnold and Marshall *(1951)* studied the development of the bovine stomach during fetal life. They observed that in early fetal life the rumen was largest of the four stomach compartments. At full term, however, the abomasum weighed about one-half as much as the total stomach. Differentiation of the honeycomb in the reticulum was noticed between the *72* nd and *100* th days. Papillae on laminae in the omasum developed slowly. The empty stomach comprised approximately *1.8*