DIGESTIVE SYSTEM II

ESOPHAGOUS
The first segment in the alimentary canal is the esophagus in the human adult it is a muscular tube that transport the food and liquid from the pharynx to the stomach, it is covered by non keratinized stratified squamous epithelium in general it have the same layers as the rest of the digestive tract it have four layers:

MUCOSA
The mucosa has atypical structure of the GIT tract the epithelium is non keratinized stratified squamous epithelium that ends in the stomach junction where it becomes simple columnar the lamina propria has a large population of lymphocytes and lymphoid nodules among the fine small branched tubular mucous gland called esophageal cardiac gland because it resemble the cardiac gland in the stomach are found in two area upper esophagus and near the cardiac region of the stomach these glands are a variable in size and may be absent, muscularis mucosa is well developed composed of longitudinal muscle.

SUBMUCOSA
The submucosa is an extensive rather loose callagenous and elastic connective tissue zone because it great resiliency it acts as a shock absorber for the large often rough boluses of food and pass through the esophagus during passage these masses compress the mucosa causing it to bluge into the ample pliable submucosa thus greatly enlarging the diameter of the narrow lumen of the esophagous,
Compound tubuloacinar glands are distributed in the submucosa these are the esophageal gland proper that secret the mucoid secretion to facilitate the movment of the food in the esophagous.

MUSCULARIS EXTERNA
Consist of inner circular and outer longitudinal muscle since the upper third of the esophagus is involved skeletal muscle but in the middle has mix skeletal and smooth but in the lower found only smooth muscle fiber

ADVETITIA
The outer most layer is a loose connective tissue
GLANDS:

Are present in the wall of the esophagus and are of two types both secrete mucus but their location differs:

1- Esophageal gland proper
Lie in the submucosa these glands are scattered along the length of the esophagus but are more concentrated in the upper half, they are small compound tubuloalveolar glands, The mucus that produced by the esophageal gland proper it is acidic

2- Esophageal cardiac glands
Are named for their similarity to the cardiac gland of the stomach and are found in the lamina propria of the mucosa they are present in the terminal part of the esophagus, Esophageal cardiac glands produced neutral mucus.
**STOMACH**
The stomach is the expanded part of the digestive tube it receives the food from the esophagus, mixing and partial digestion of the food in the stomach by its gastric secretions produce pulpy fluid mix called chyme the chyme then passes in to the small intestine for further digestion and absorption.
The stomach are divided into three region:

1-cardiac region (cardia)
The part which are near the esophageal orifice that have the cardiac gland

2-pyloric region(pylorus)
The part proximal to the pyloric sphincter which contain the pyloric gland

3-fundic region (fundus) The largest part of the stomach which is situated between the cardia and the pylorus and contain the fundic or gastric gland

**MUCOSA**
the mucous membrane (mucosa) of the empty stomach is thrown in to deep irregular longitudinal folds called rugae the surface of the epithelium is simple columnar which invaginates in to lamina propria to form gastric pits, into these pits empty the million of gastric glands largely branched tubulars types the thickness of mucosa due to the presence of these gastric glands.
The gastric glands are of the three types located in different region in the stomach:
1-cardiac glands located in the narrow ring shaped region when the stomach joins with the esophagus
2-the gastric or fundic glands shaped throughout the body and fundus of the stomach
3-the pyloric glands confined to the pyloric region where the stomach joins the small intestine
The cells lining the gastric glands are:
1-mucose secreting surface epithelium (simple columnar)
2-chief zymogenic cells that produce the digestive enzymes pepsin and lipase
3-partial (oxyntic) cells that produce hydrochloride acid
4-mucous neck cells limited to the initial (neck) regions
5-enteroendocrine cells located in the base of the gastric glands they secret the secretin, gastrin.

GASTRIC GLANDS
A normal gastric glands are a simple tubular type that may be straight or coiled depending on region the initial segment the neck is lined with modified surface cells called mucous neck cells undistinguished morphological yet functionally important beside secreting mucin, they are the ancestral stem cells that give rise to all of the epithelial cells of the mucosa.
The intermediate gland segment is the body of the major straight portion of the gland here the epithelium in the most of the stomach fundus and body is specialized into 2 different secretory cells:
1-the small basophilic chief or peptic cells that secret pepsinogen
2-large eosinophilic partial (oxyntic )cells that produce hydrochloric acid.
The terminal part of the glands is the base is lined with the same cells that line the body of the gland.

SUBMUCOSA
Composed of blood vessels and nerves (meissners submucosal plexus) with loosely arranged collagenous and elastic fibers.
MUSCULARIS EXTERNA
Has 3 layers of smooth muscle inner oblique, middle circular, outer longitudinal layer
Auerbaches myenteric nerve plexus lies between circular and longitudinal muscle layers

SEROSA
Covering by loose connective tissue surrounded by mesothelium

REGIONAL DIFFRENCES

1-CARDIAC REGION
In the small cardiac region the glands are the least numerous because the cardia of the stomach is limited to collar wide around the esophageal orifice, they have rather wide, open, deep pits, that continue into short, coiled glands lined with mucous type cells the glands occupy the lamina propria and the base rest on muscularis mucosa.

2-FUNDUC AND BODY REGION
In the body and the fundus the glands called fundic glands are the most numerous because these regions occupy about three fourths of stomach, fundic glands are narrow, shallow pits that usually terminate by bifurcating into 2 simple straight, long tubules, the pits are lined with surface mucous – type cells the small irregular neck mucous cells have pale secretary granules mucous neck cells produce intermediate product between serous and mucous secretions, the body of elongated fundic gland is lined with partial and chief cells, the chief cells are most numerous they are also called zymogenic cells, they are concentrated in the in the lower part of the fundic glands, the basal part of the cells is basophilic
3-PYLORIC REGION

It is continuous with the duodenum the pyloric glands resemble with cardiac glands but has deeper pits and more branching and coiling of the tubular glands they contain parietal cells and gastrin secreting cells among the mucous like cells that line the pyloric glands

SMALL INTESTINE

Small intestine extends from the stomach to the large intestine a distance about 6-8 m has 4 layers resemble the pattern of the GI tract it divided to 3 regions (duodenum, jejunum, and ileum) small intestine has 3 principle functions:
1-comos that complete the digestion of the food by action of the enzyme
2-absorbed the finished product of digestion into the blood and lymph vessels
3-synthesized and release hormone

MUCOSA

Plicae circularis the mucosal surface of the small intestine undergoes several specializations to increase the surface area the first of these modifications the permanent spiral or circular mucosal folds that extends through out the length of the organ called plicae circularis they greatly increase the mucosal area they reach maximum development in the duodenum and upper jejunum and gradually disappear in the ileum,
Villi are long finger like or leaf like projections of the mucosa that extends in to the gut lumen, they are cover by simple columnar epithelium resting on surface membrane, intestinal glands (crypts lieberkuhn) other mucosal modifications that
increase the surface area, these are straight, unbranched, tubular glands located in the base of the villi and the muscularis mucosa. Microvilli is the striated border of the lining epithelial cells composed of parallel rows of microvilli of even height, they extend from the cell border like brush bristles, hence the term brush border is a synonym for striated border each microvillus covered by cell plasma membrane, in the center of the microvillus are many longitudinal fine microfilaments some of these microfilaments are actin filaments, Lamina propria the loose reticular connective tissue of the lamina propria forms the core of each villus and fill the potential space between the intestinal glands collections of small lymphocytes form lymph nodules with or without the germinal centers the nodules increase in size and number until in the ileum they form large aggregations called peyers patches.

MUSCULARIS MUCOSA
It is thin has 2 layers of smooth muscle inner circular and outer longitudinal layer these layers separate the lamina propria from the submucosa, penetrated with meissners plexus.

SUBMUCOSA
Large zone compose of areolar connective tissue surrounding larger blood and lymph vessels and nerve plexuses (meissners plexus) and also contain peyers patches in lamina propria contain no glands except in the duodenum.

MUSCULARIS EXTERNA
Large, has 2 layers inner circular and outer longitudinal of smooth muscle between this 2 layers are frequent parasympathetic (Auerbach plexus), these muscle also facilitate the mixing of food with the digestive enzymes

SEROSA
Single layer of mesothelial cells resting on thin layer of loose connective tissue, blood and lymph and nerve traverse the serosa

Regional differences

DUODENUM
it is extends from the pyloric end of the stomach to its junction with the jejunum it is has bruners gland in the submucosa, leaf shape villi, adventitia and termination of bile and pancreatic ducts
Bruners glands are mucous compound tubular largely in the submucosa but occasionally in lamina propria, their mucin secreting cells are low columnar type, the secretion is strongly alkaline which neutralizes the acidic chyme of the stomach and thus protect the duodenal mucosa from auto digestion, Bruners glands contain urogastrone, apetide hormone that inhibits the HCL production in the stomach also called human epidermal growth facto(HEGF)
The rather short broad leaf shaped villi are most numerous in the duodenum, Serosa replaced by the adventitia
JEJUNUM
Has no really distinctive features, although the finger like villi are the tallest, if the histological section of small intestine does not contain submucosal glands Bruners glands or aggregates of lymph nodules in the lamina propria (pyers patches) the organ is probably Jejunum.

ILEUM
The ileum has only one diagnostic feature: the presence of many aggregates of lymph nodules in the lamina propria (pyers patches) the lymph nodules are usually pear shaped with tier rounded dome shaped apices directed toward the lumen covered by single layer of epithelium there is evidence that these cells are transport antigens from the lumen to the lymphoid follicles these cells have been designated as follicle associated epithelium (FAE).
LARGE INTESTINE
These parts lie between the ileum and the anus belong to the large intestine in sequences they are cecum, appendix, colon (ascending + transvers + descending) And the anal canal

COLON

MUCOSA
The mucosa of the colon free from the villi the surface epithelium consist of three type of the cells
1- simple columnar absorptive cells have a thin striated border
2-goblet cells intercalate between the absorptive cells increase in number in the more distal segments of the colon
3-undifferentiated epithelial cells in the bases of the intestine gland(stem cells)
The lamina propria is similar to that in the small intestine except the solitary lymph nodules are larger and more numerous because of this size they often bulge in the submucosa ,the muscularis has the typical 2 layers of smooth muscles

SUBMUCOSA
Contain no glands , it has no essential differences

MUSCULARIS EXTERNA
The inner layer circular and the outer longitudinal

SEROSA
Because the ascending and descending colon are pressed against the body wall by the peritoneum the serosa is incomplete present only on their anterior surface these region attached with the body by adventitia the other regions transverse and pelvic colon have serosa .

MUC: mucosa, MM: muscularis mucosa, SubM: submucosa, ME: muscularis externa S: serosa
CECUM
The beginning of the large intestine is the cecum large sac it is similar to transverse colon including serosa

APPENDIX
It is small worm shaped tube projection from the end of the cecum it has lymphatic nodules in the lamina propria they may also occupy the submucosa and reduce the lumen appendix to the narrow ,stellate slit .

SM: submucosa, ME: muscularis externa, LN: lymphatic nodule, L: lumen ,S: serosa
RECTUM
Some structural changes gradually occur in the colon in making the transition to rectal structure:
Teniae coli flatten out to form uniform, longitudinal sheets of muscle, the mucosa is thicker, lymphoid nodules are less

ANAL CANAL

Present longitudinal folds, anal valves, the epithelium changes from the simple columnar of the rectum, to simple cuboidal at the anal valves, to stratified squamous at the anus. The submucosa is rich in vascular supply, while the muscularis externa forms the internal anal sphincter muscle, an adventitia connects the anus to the surrounding structures.