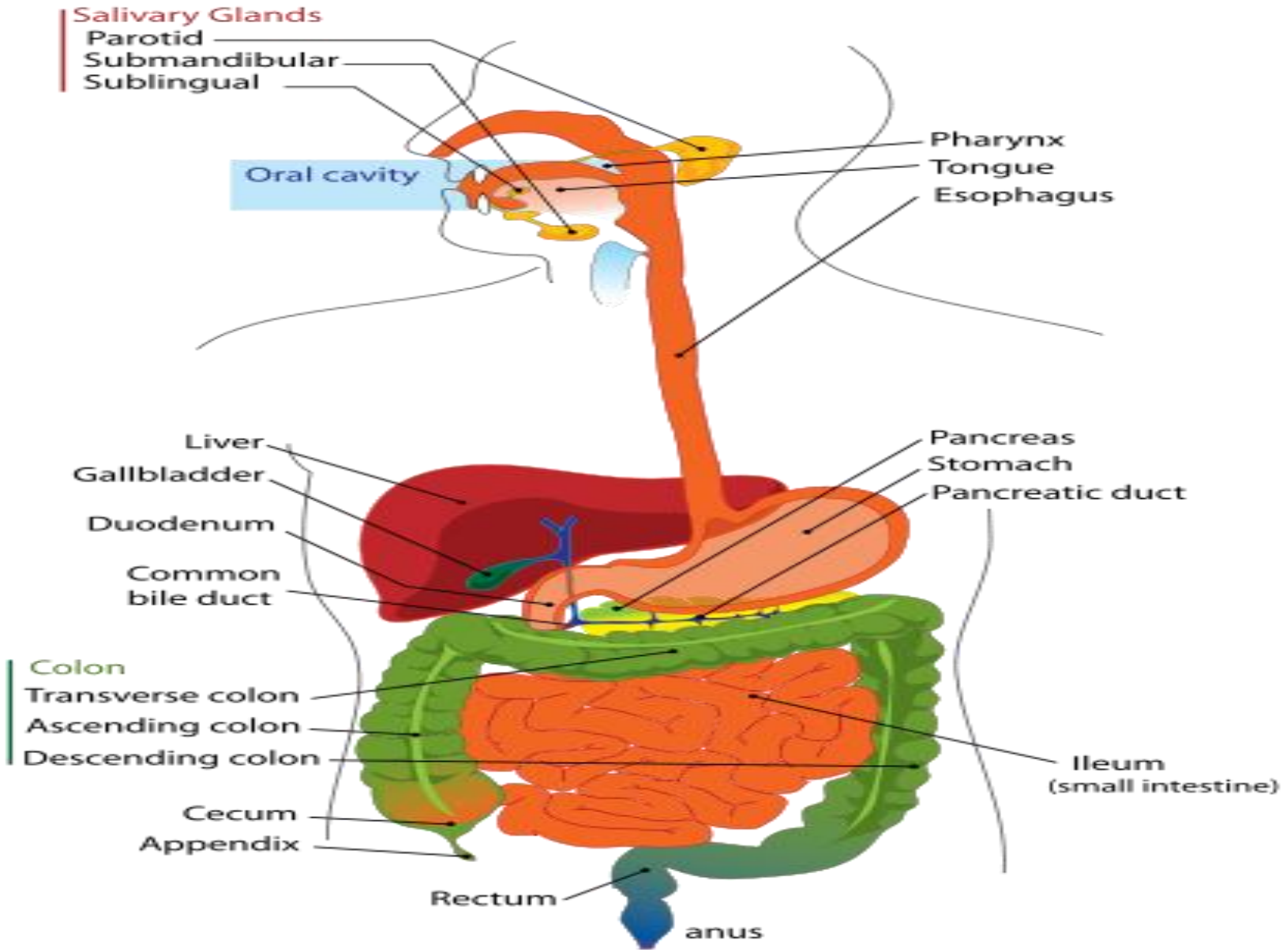
فیزیولوژی دو، جلسه هشتم

اهمیت پیدایش دستگاه گوارش

الگوی ساختمانی مشترک دستگاه گوارشی

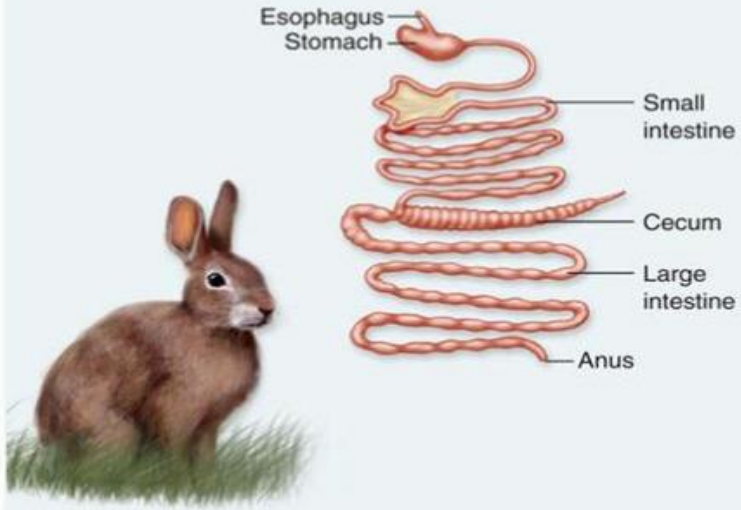
کلیاتی پیرامون کارکردهای حرکتی، ترشحی، هضمی و جذبی دستگاه گوارش

انواع غدد و ترشحات گوارشی و اعمال آنها


Salivary Glands
Parotid
Submandibular
Sublingual
Oral cavity
Pharynx
Tongue
Esophagus
Liver
Gallbladder
Duodenum
Common bile duct
Pancreas
Stomach
Pancreatic duct
Colon
Transverse colon
Ascending colon
Descending colon
Ileum (small intestine)
Cecum
Appendix
Rectum
anus

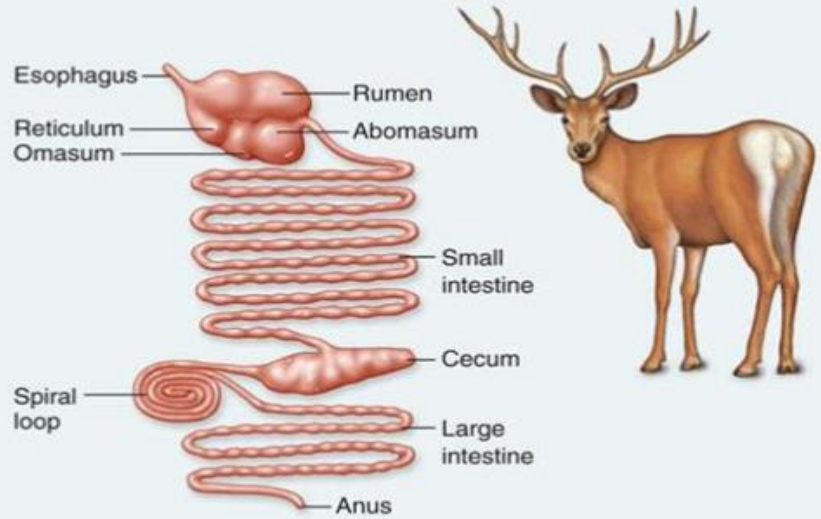
Nonruminant Herbivore

Simple stomach, large cecum



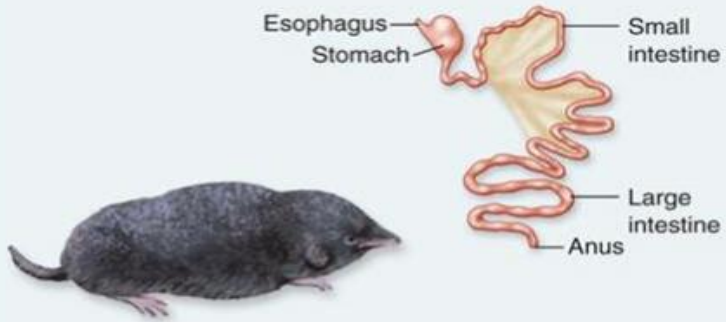
Ruminant Herbivore

Four-chambered stomach with large rumen; long small and large intestine



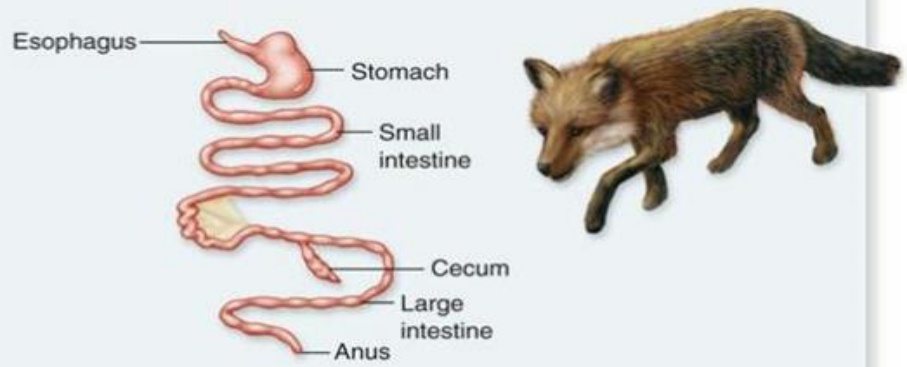
Insectivore

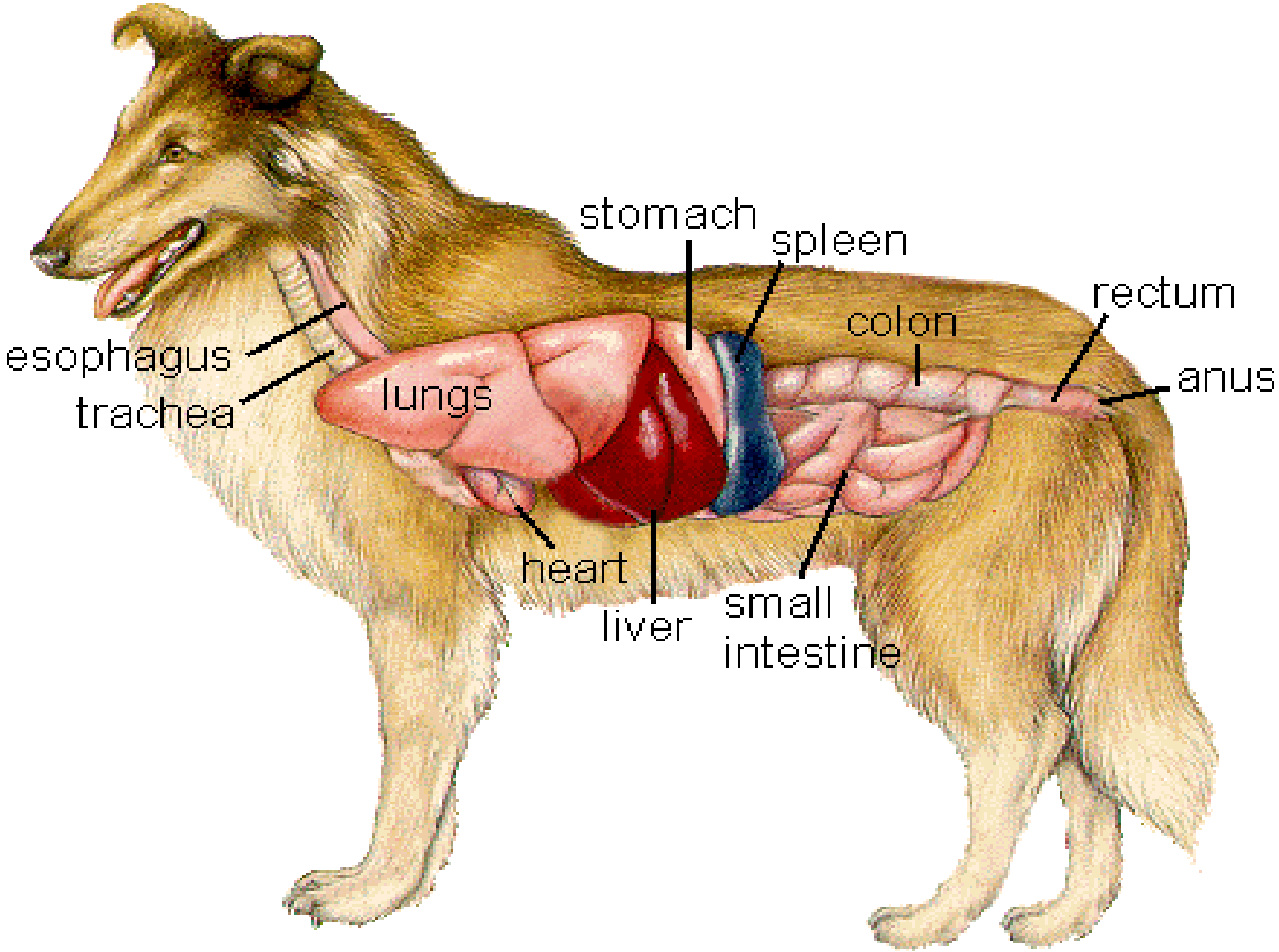
Short intestine, no cecum

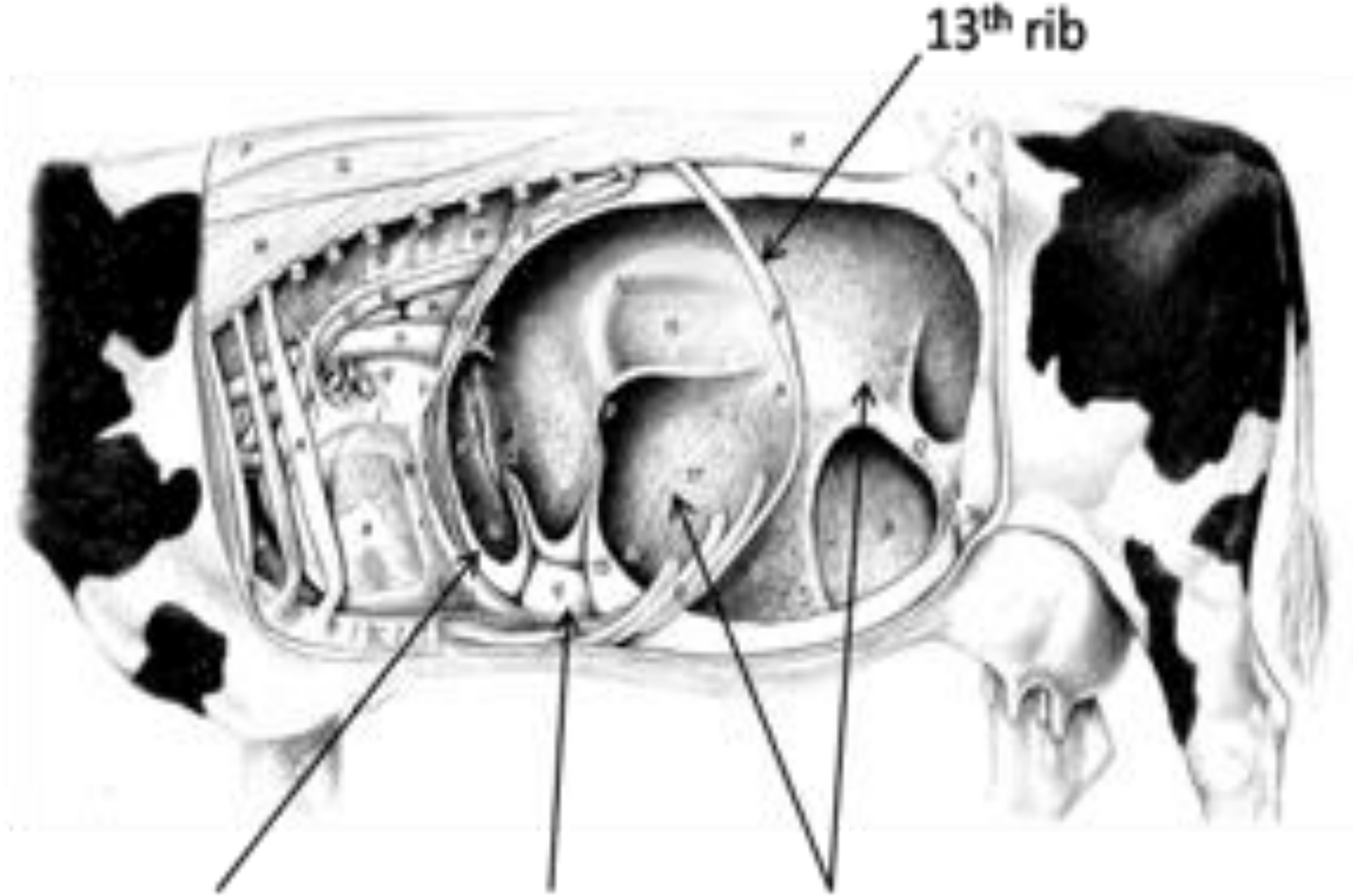


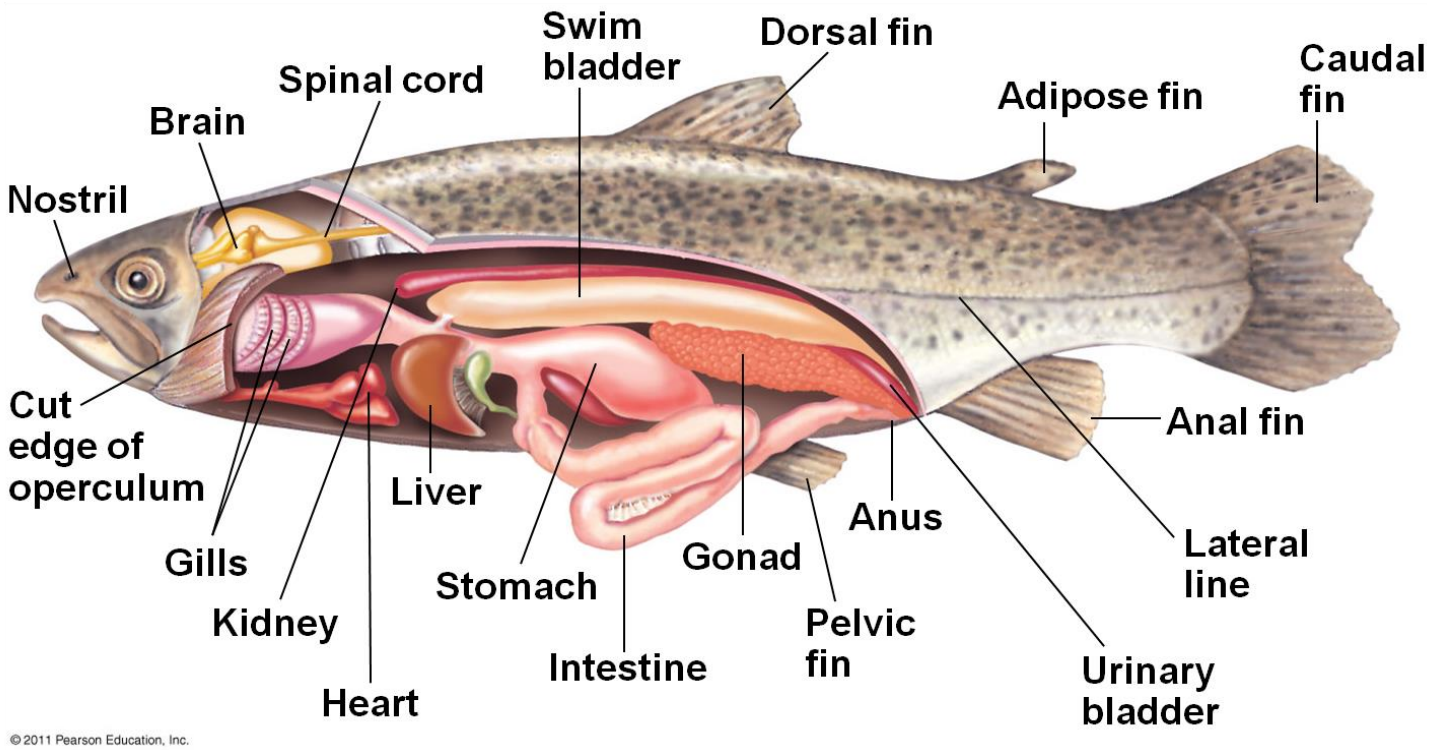
Carnivore

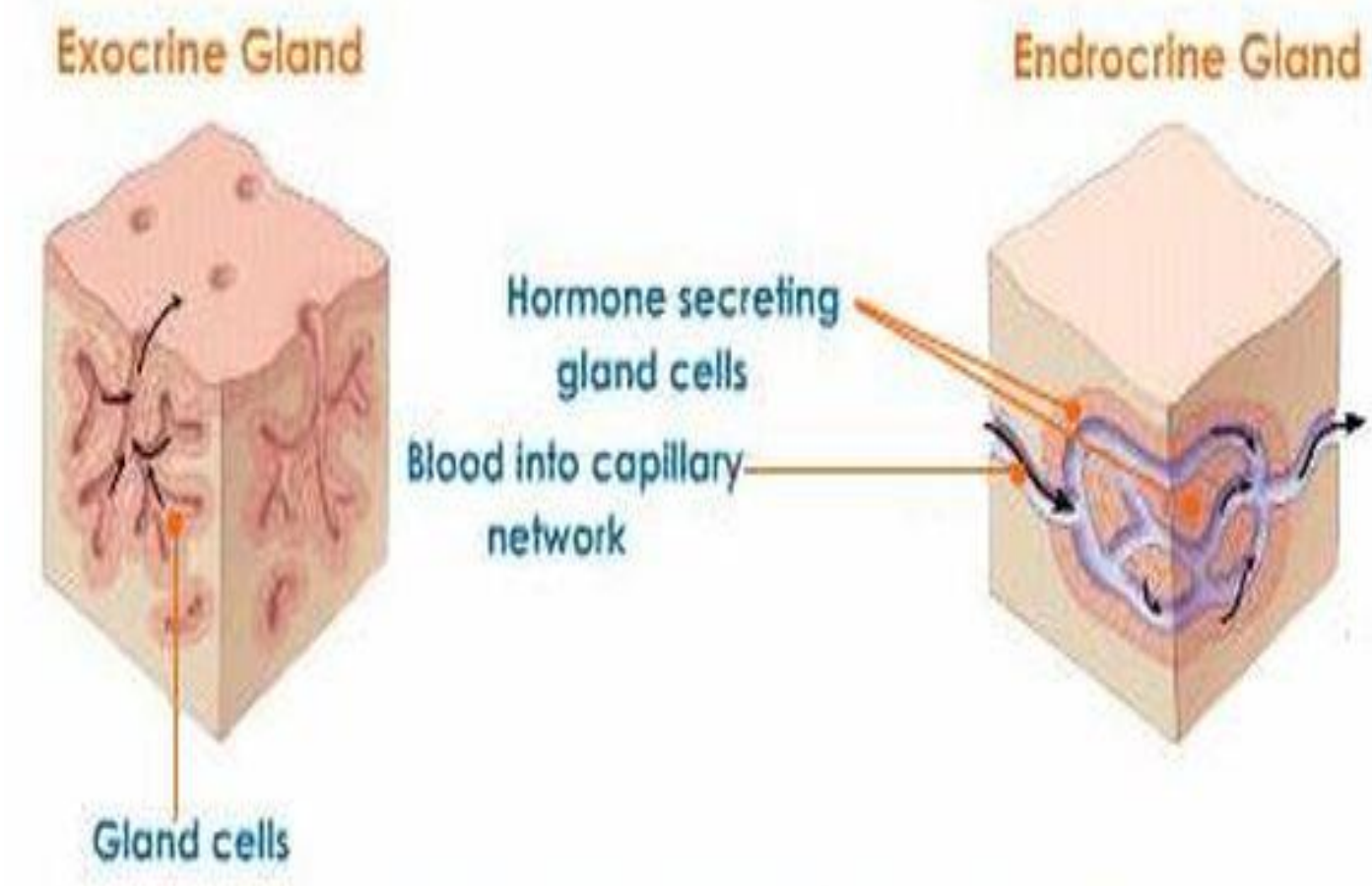
Short intestine and colon, small cecum



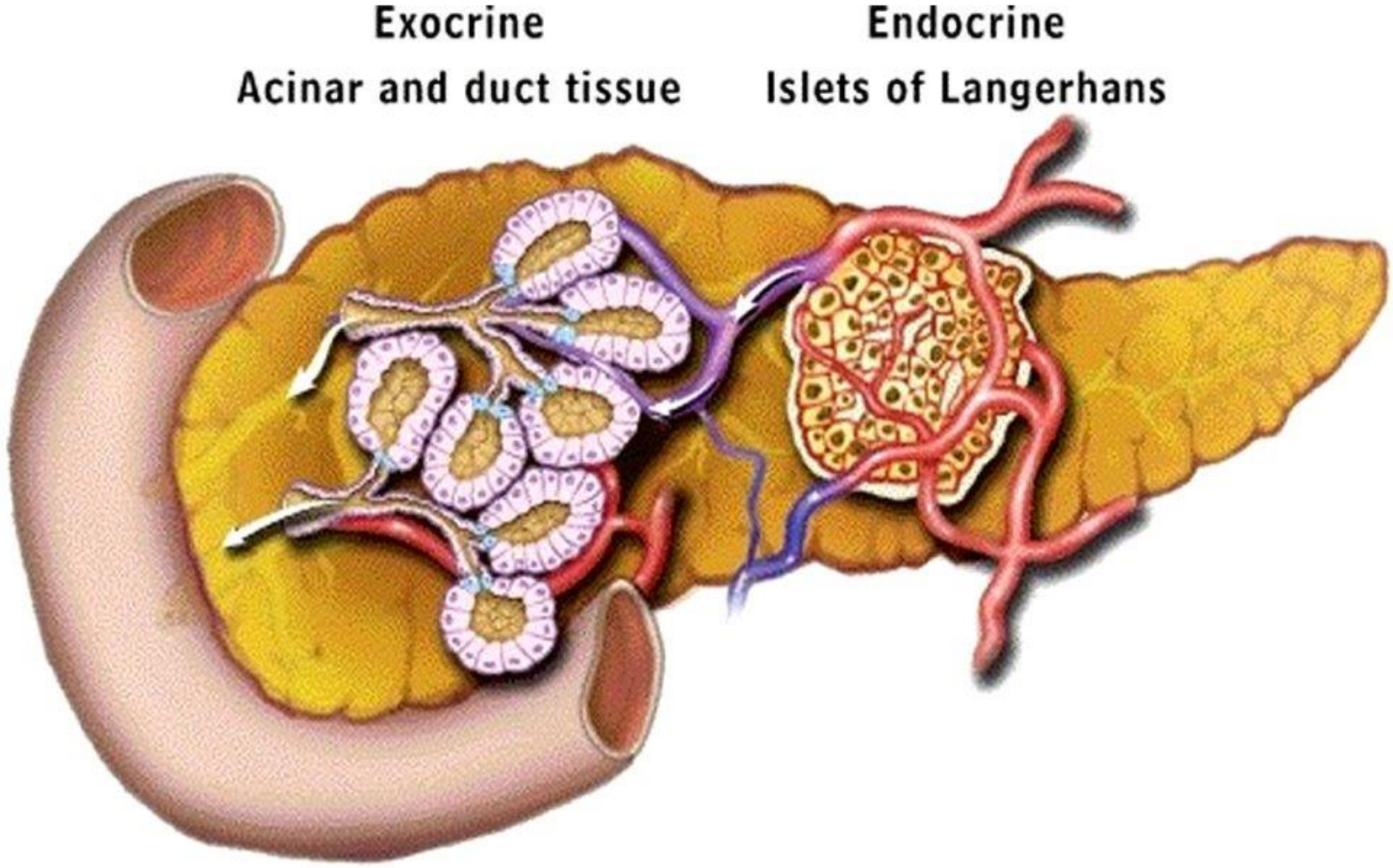

stomach
spleen
rectum
colon
esophagus
anus
trachea
lungs
heart
liver
small
intestine

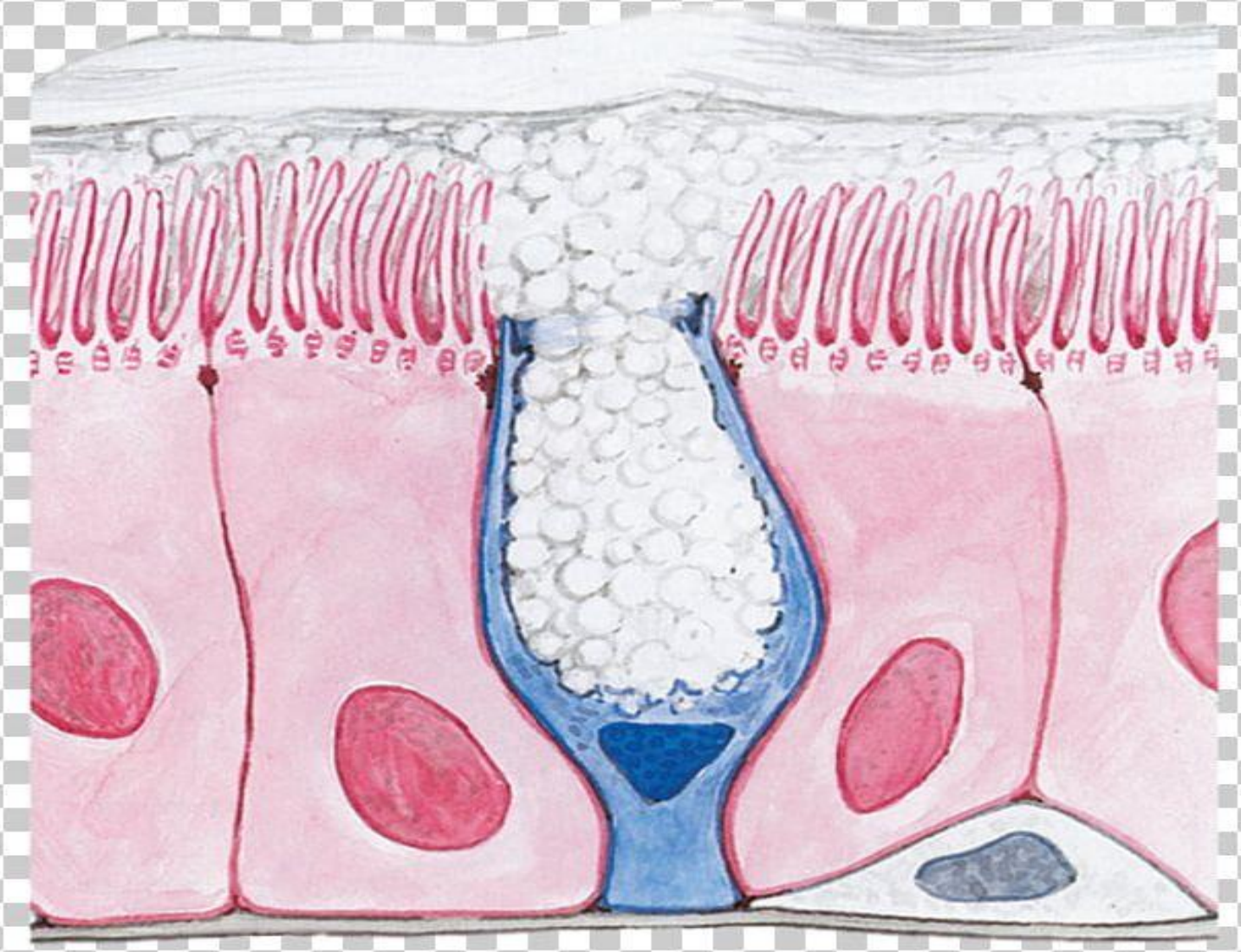

13th rib
reticulum
abomasum
rumen





Exocrine and Endocrine Gland Showing Release of Secretion


Exocrine
Acinar and duct tissue
Endocrine
Islets of Langerhans



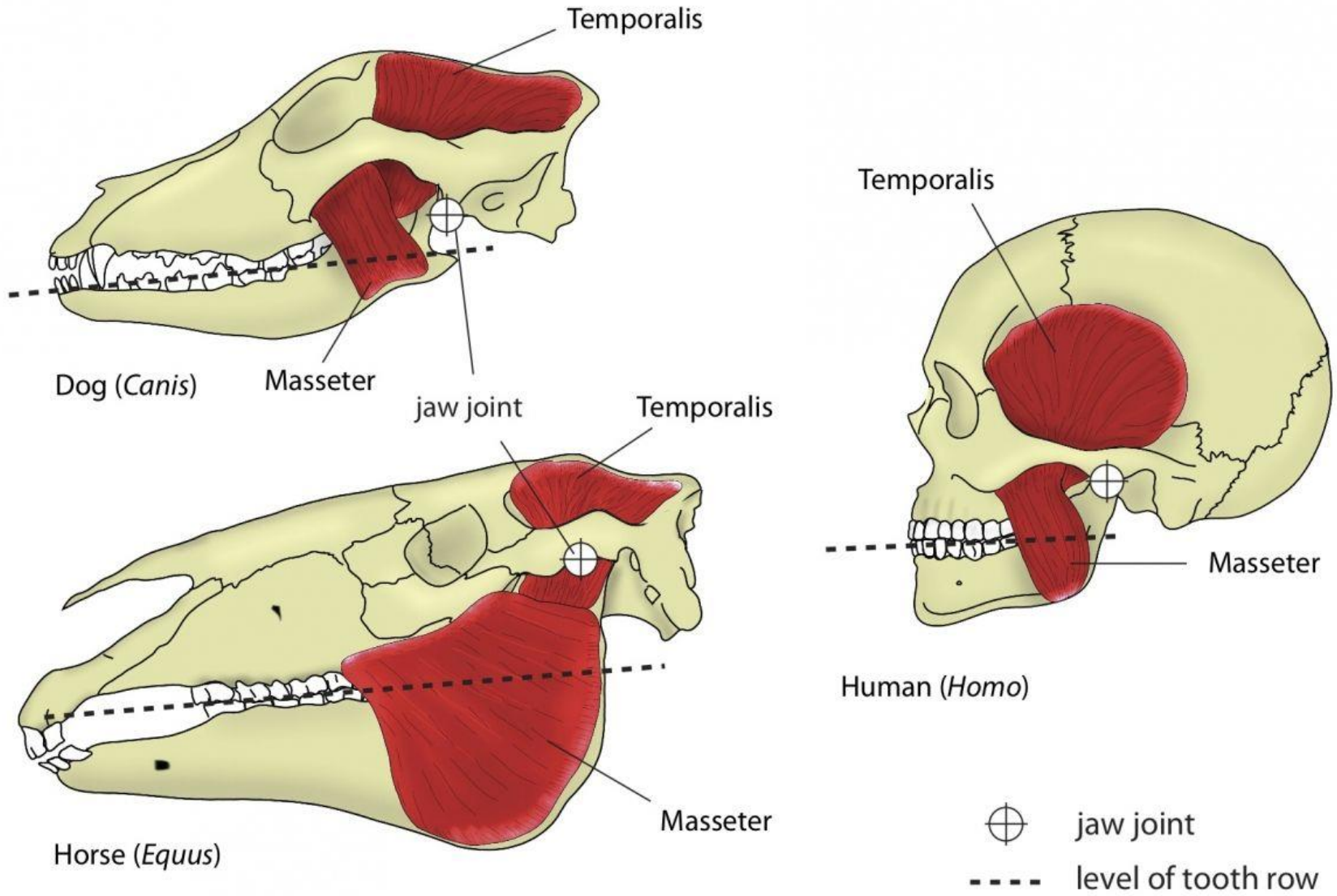
فیزیولوژی دو، جلسه نهم

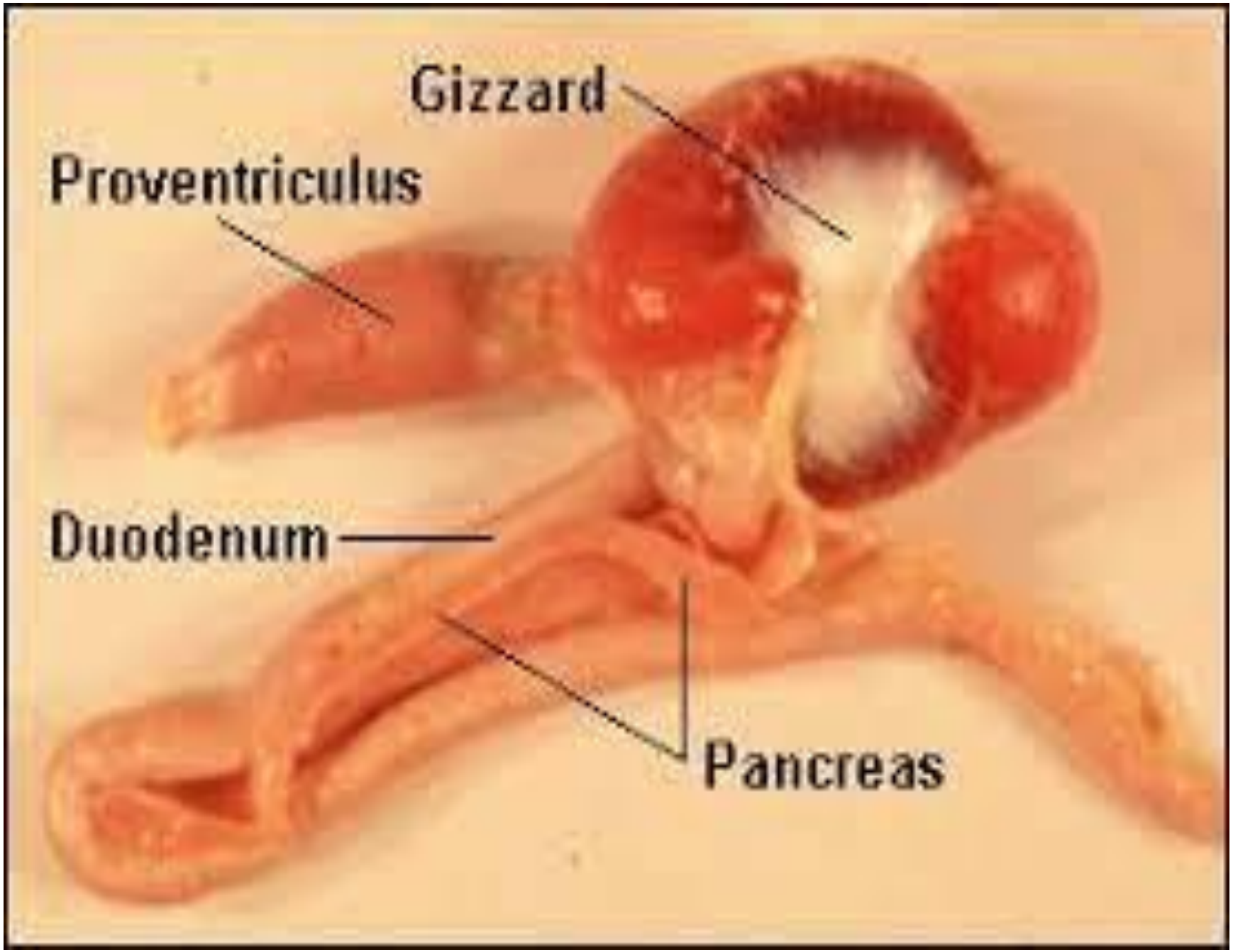
اعمال هضمی مکانیکی، شیمیایی و میکروارگانیسمی

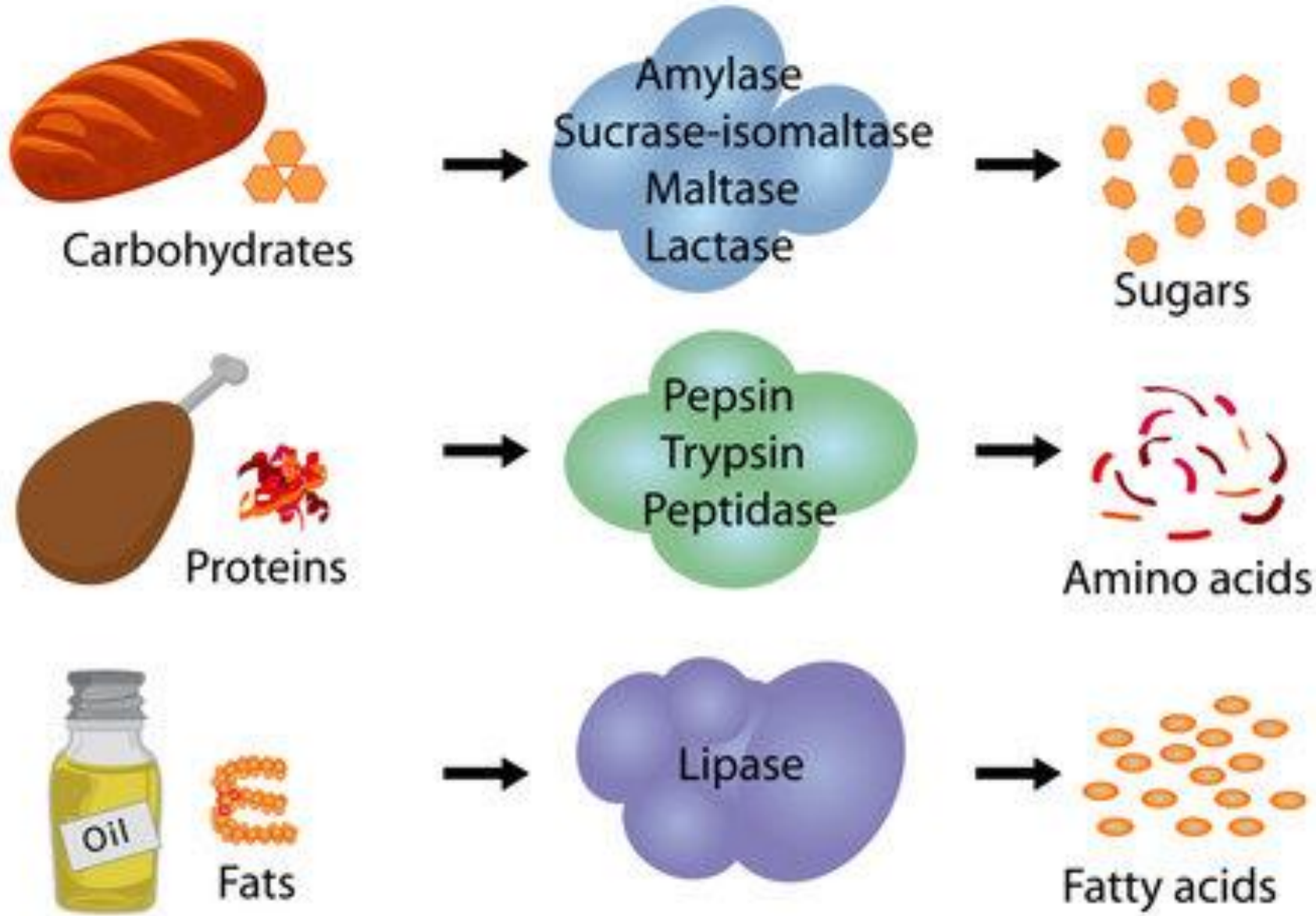
هضم های لومینال، غشایی و درون سلولی

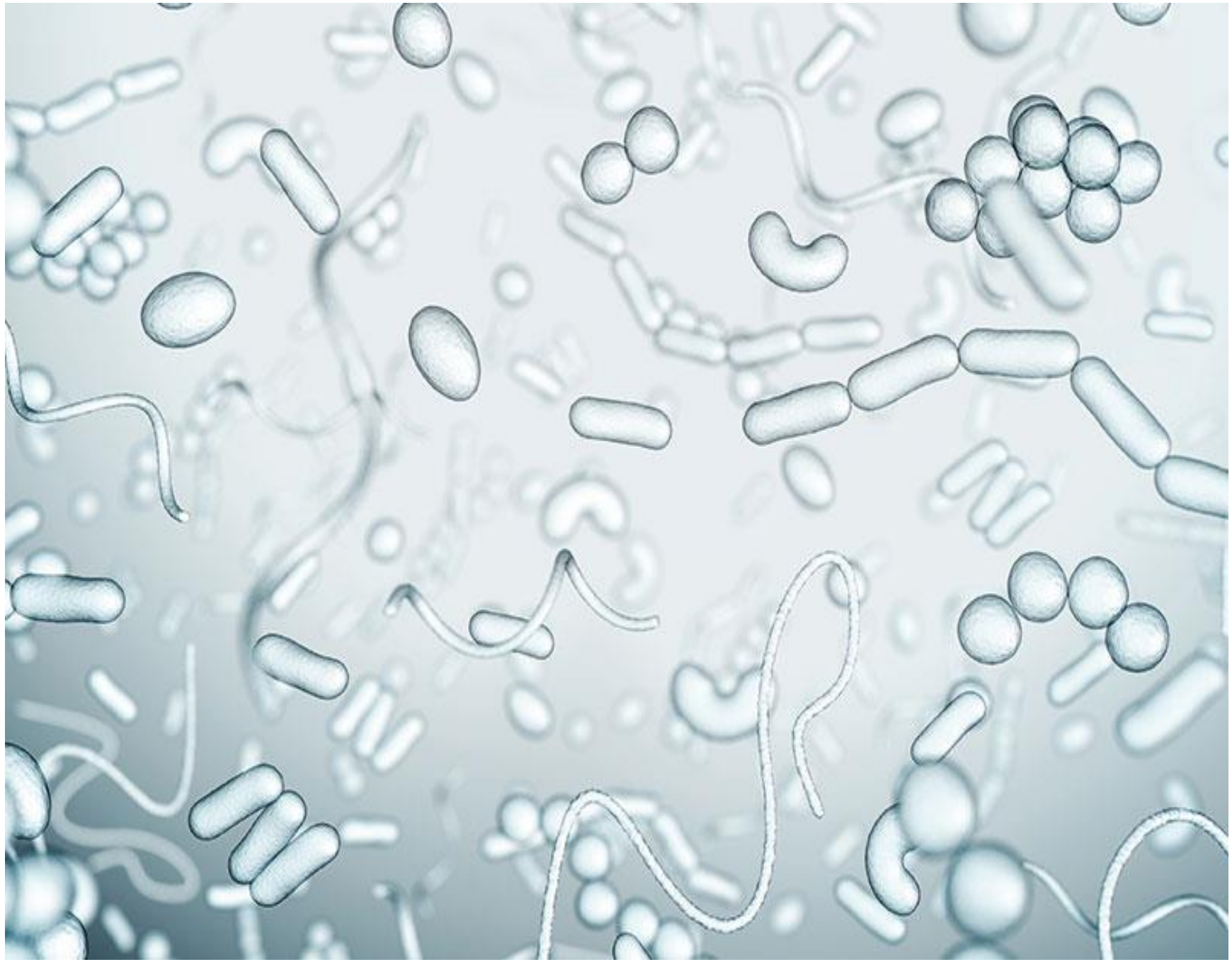
انواع حرکت در لوله گوارشی

عضلات و اسفنکترهای گوارشی

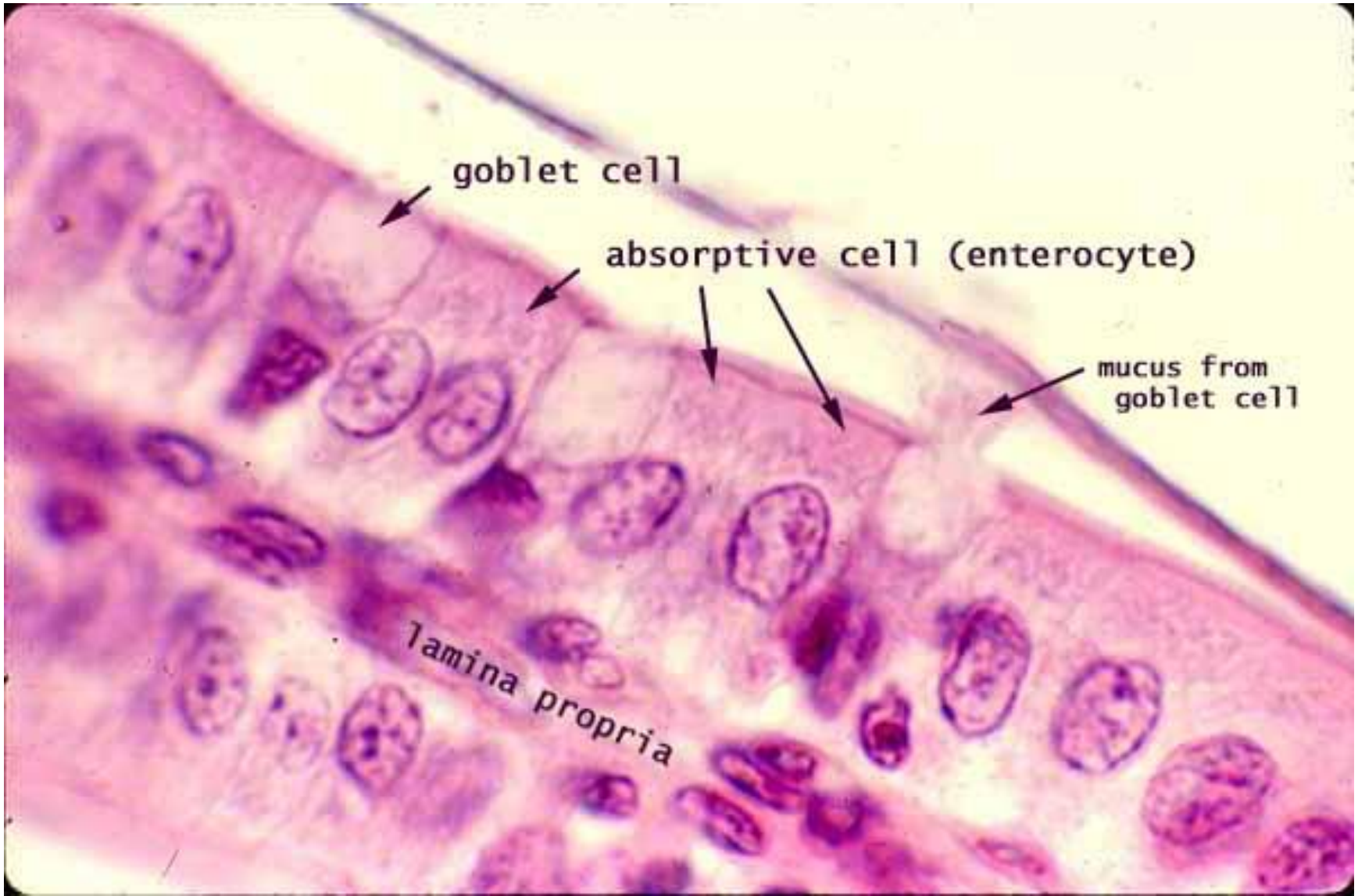

Temporalis
Masseter
jaw joint
Dog (*Canis*)
Temporalis
Masseter
Horse (*Equus*)
Temporalis
Masseter
Human (*Homo*)
jaw joint
level of tooth row

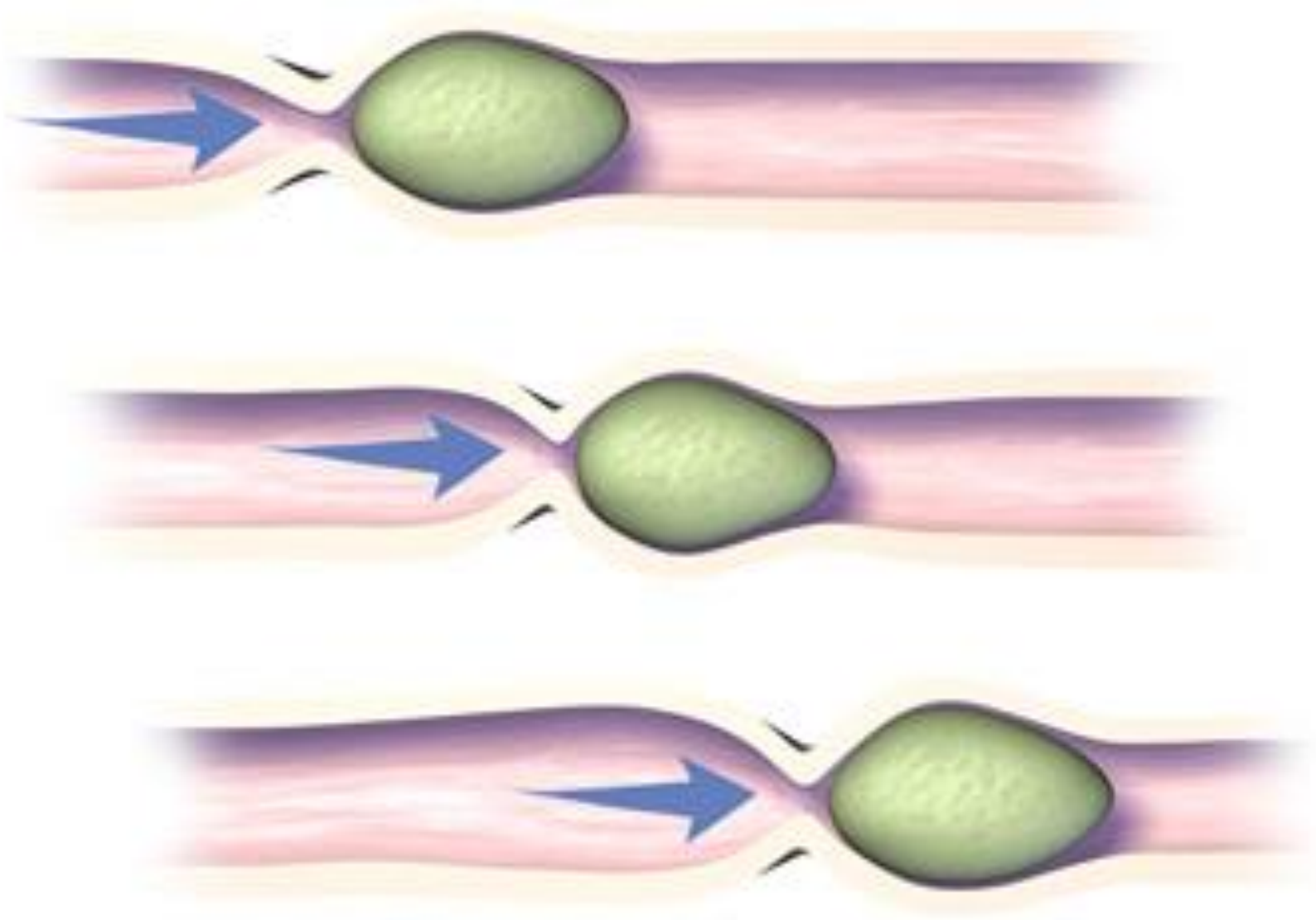

Gizzard
Proventriculus
Duodenum
Pancreas

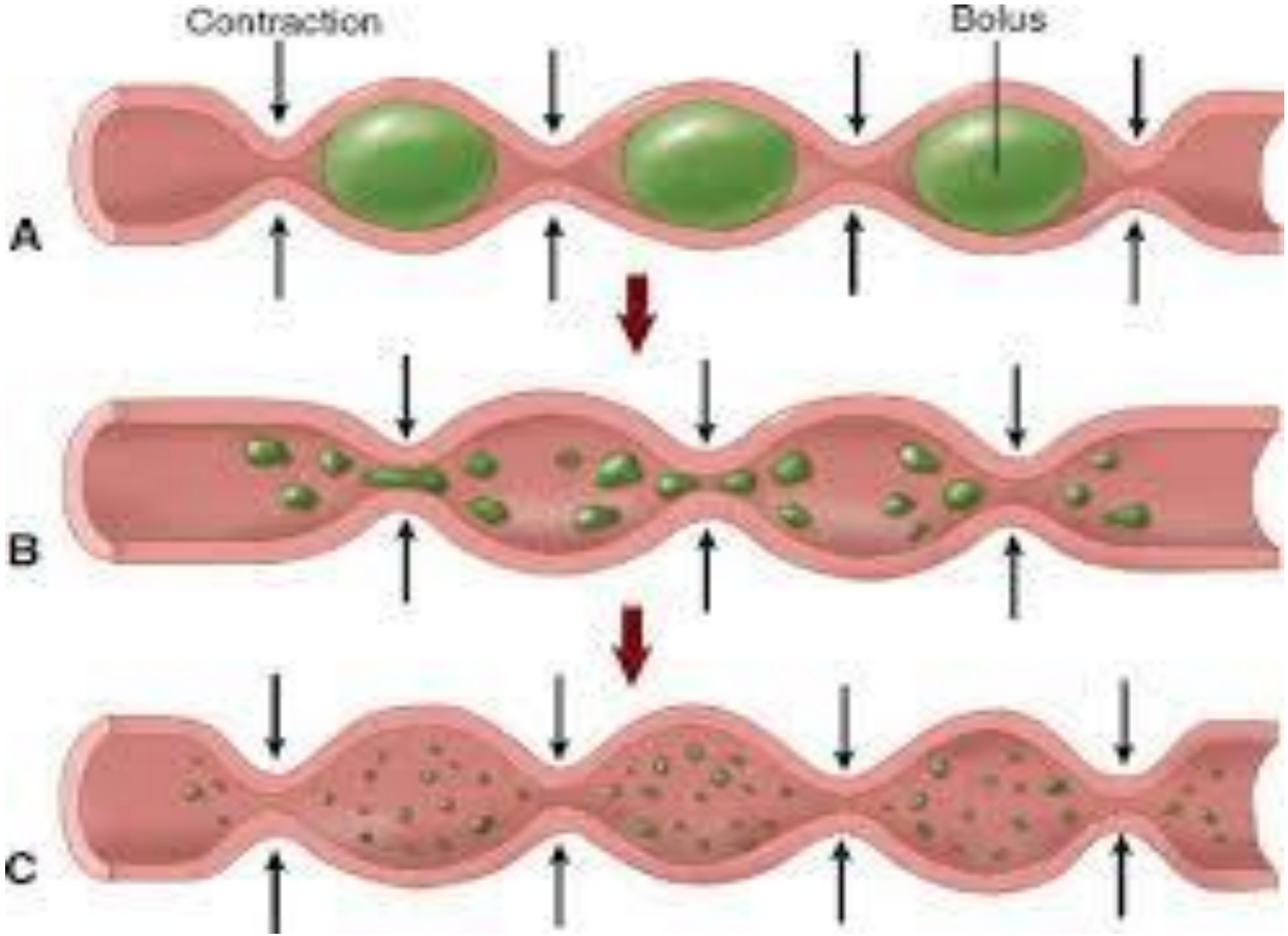

Carbohydrates
Amylase
Sucrase-isomaltase
Maltase
Lactase
Sugars
Proteins
Pepsin
Trypsin
Peptidase
Amino acids
Oil
Fats
Lipase
Fatty acids

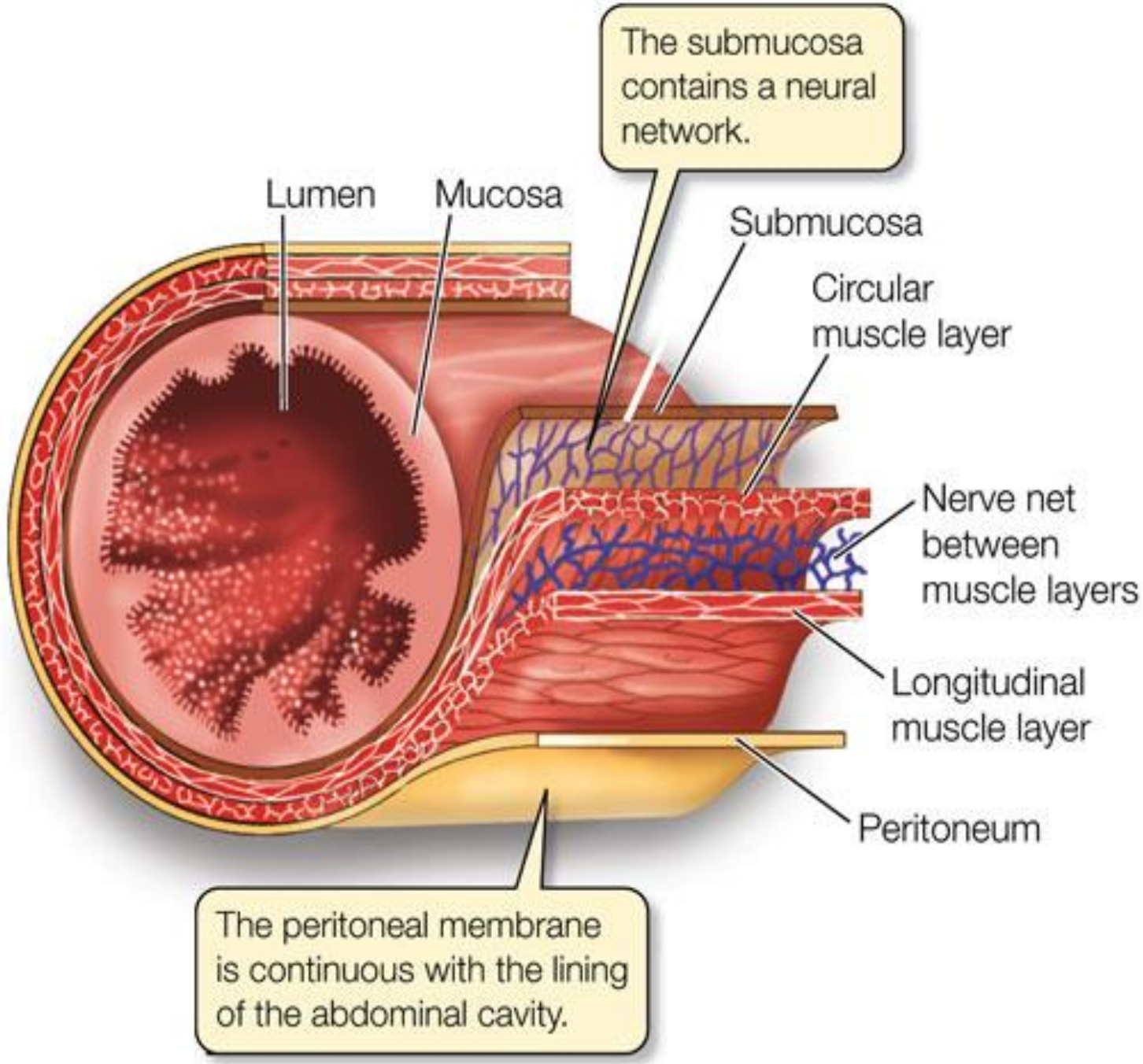


Luminal, Membranous & Cellular Digestion

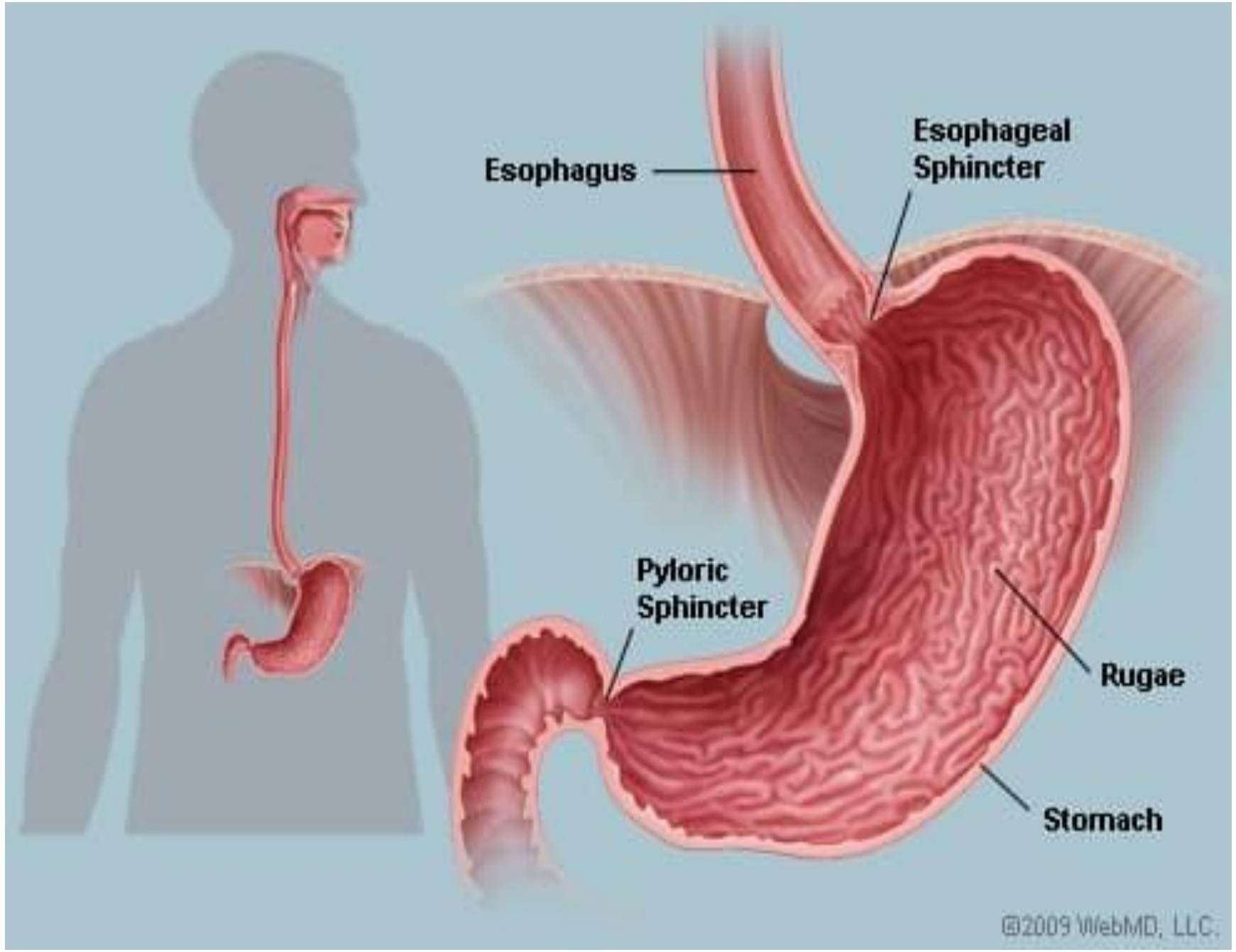





Contraction
Bolus
A
B
C



***LIFE 8e*, Figure 50.11**


Esophagus
Esophageal Sphincter
Pyloric Sphincter
Rugae
Stomach
©2009 WebMD, LLC.

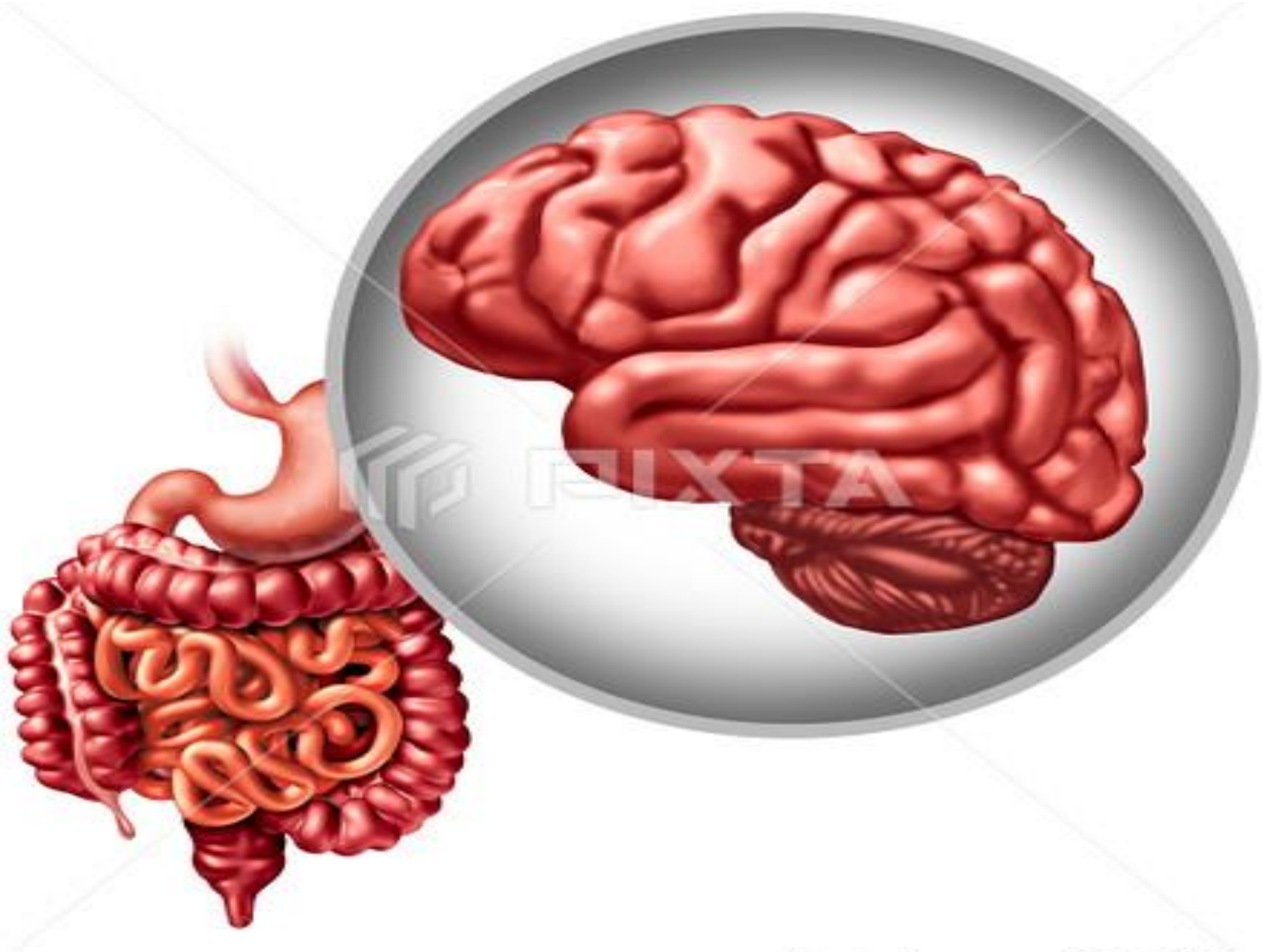
فیزیولوژی دو، جلسه دهم

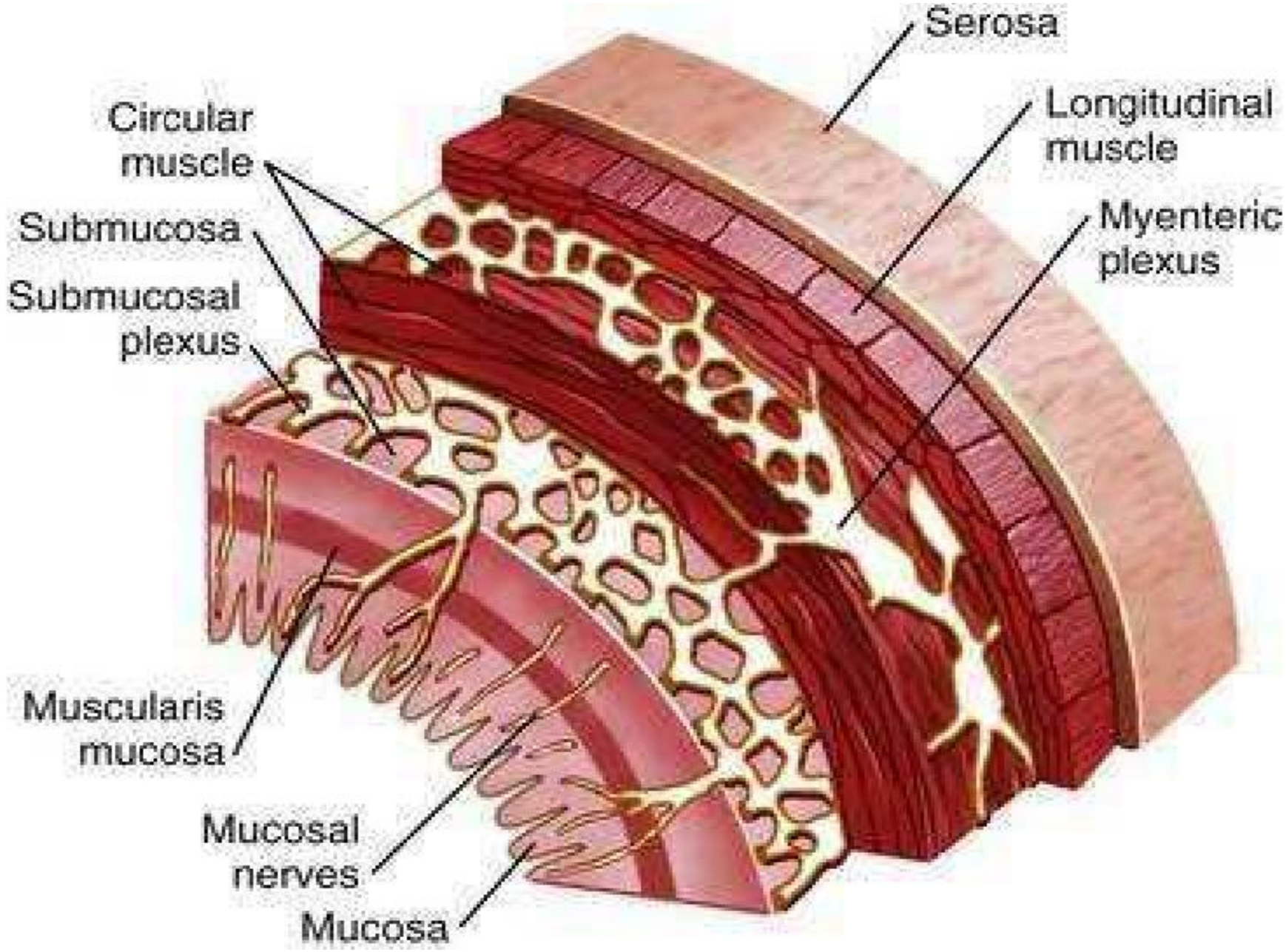
تنظیم های عصبی و هورمونی دستگاه گوارش

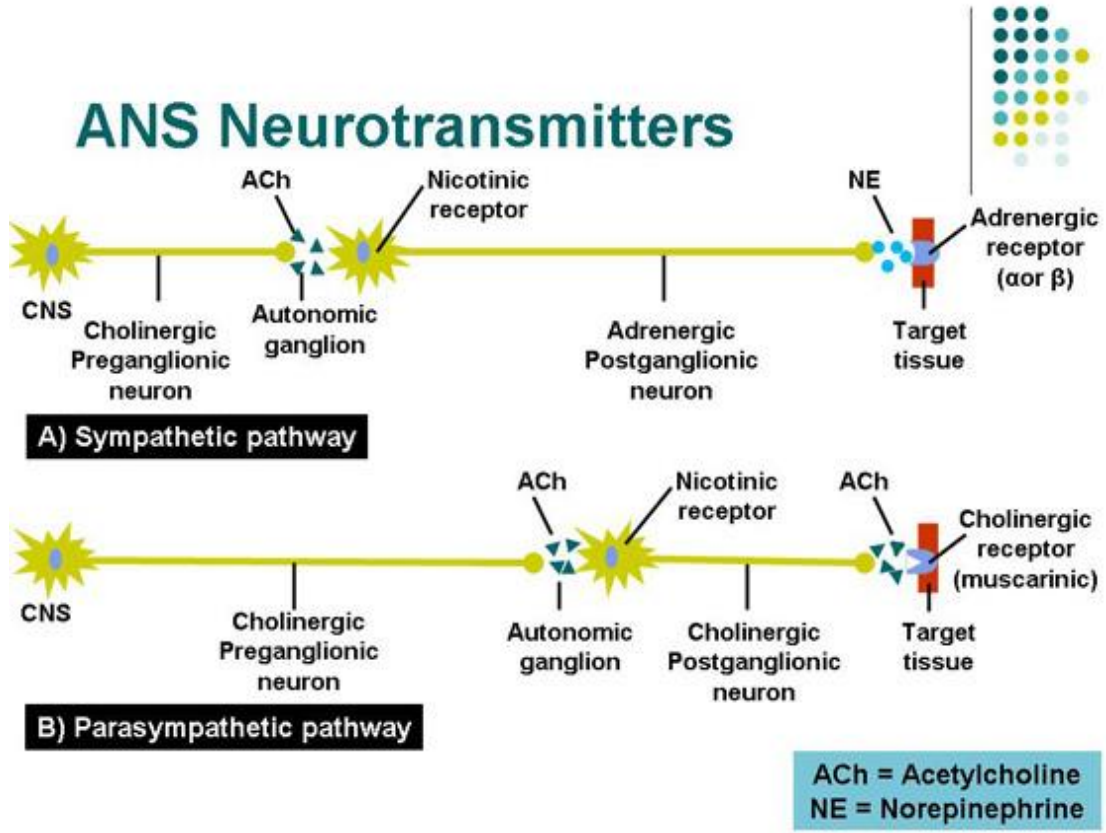
دستگاه عصبی آنتریک

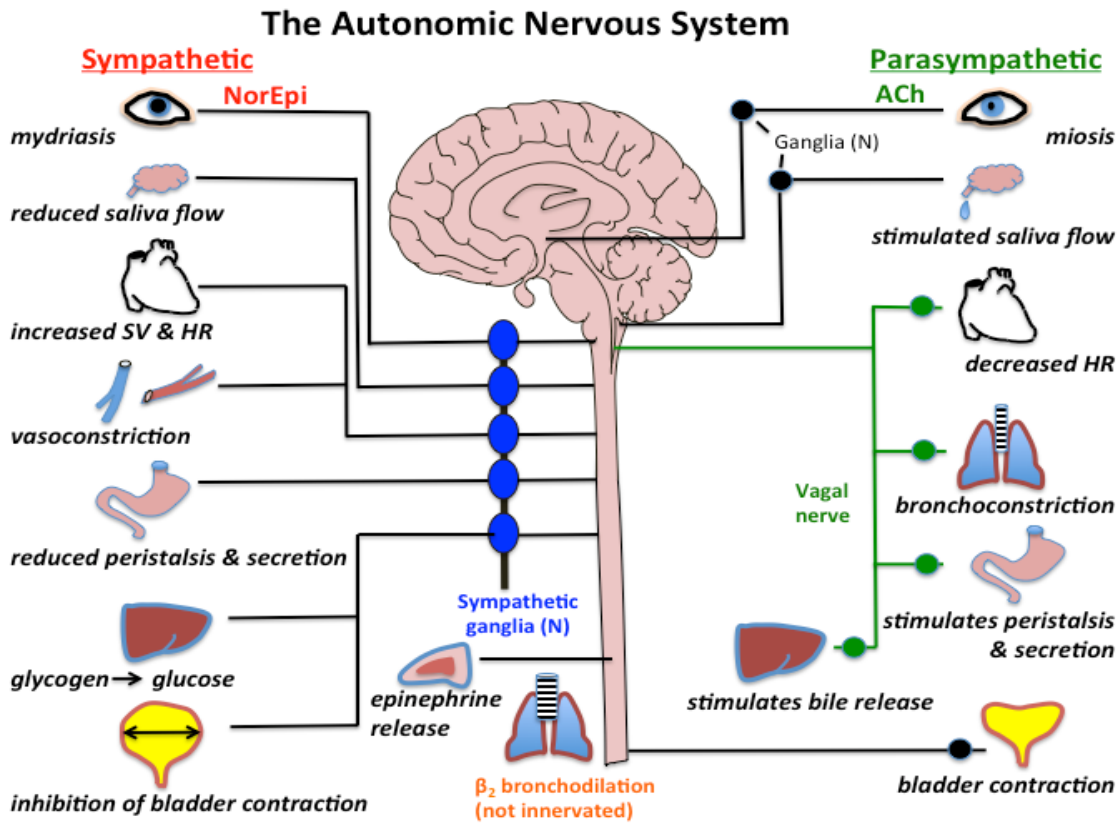
نقش دستگاه عصبی خودمختار در تنظیم عملکرد دستگاه گوارش

رفلکس های گوارشی

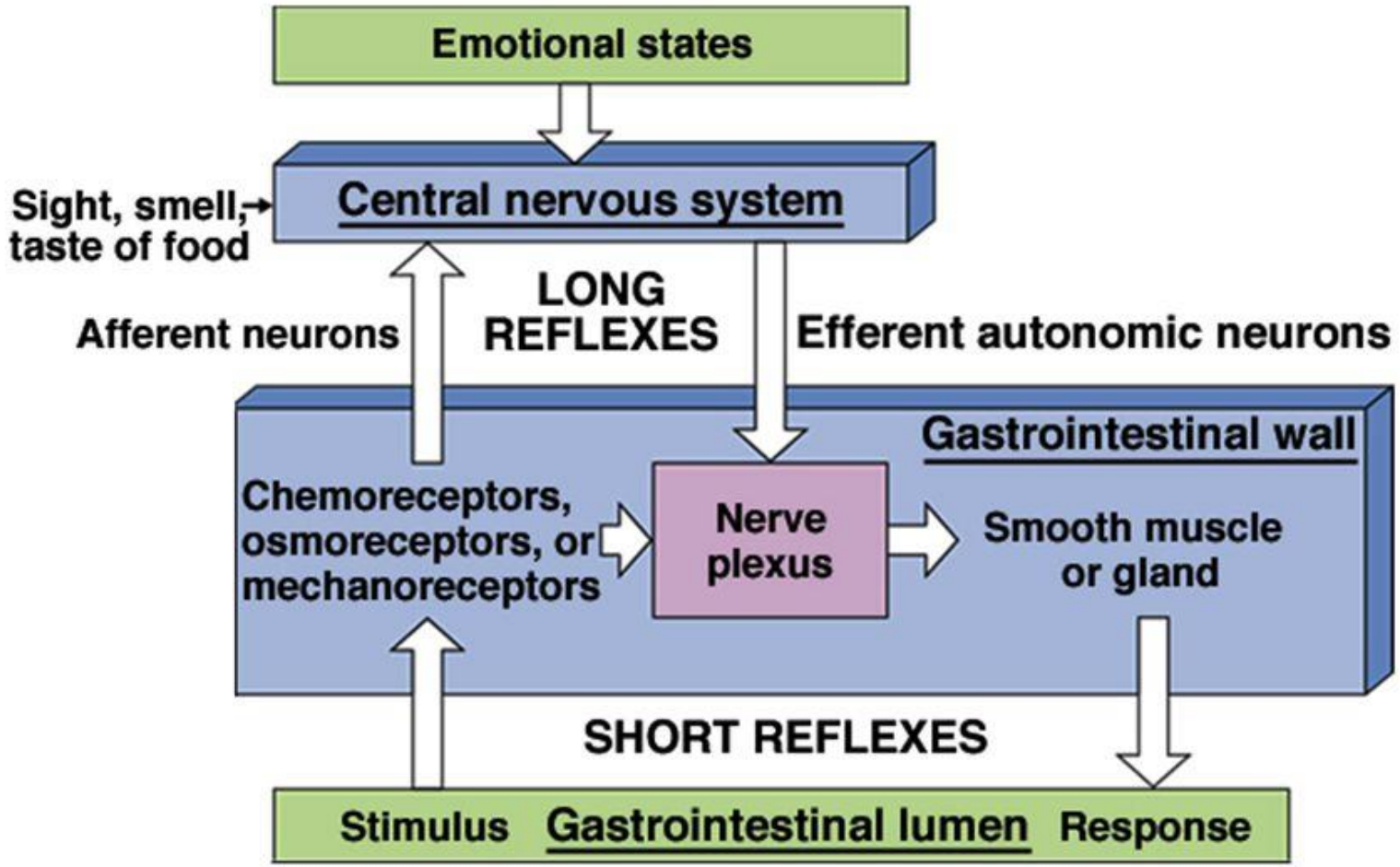

pixtastock.com - 59686733

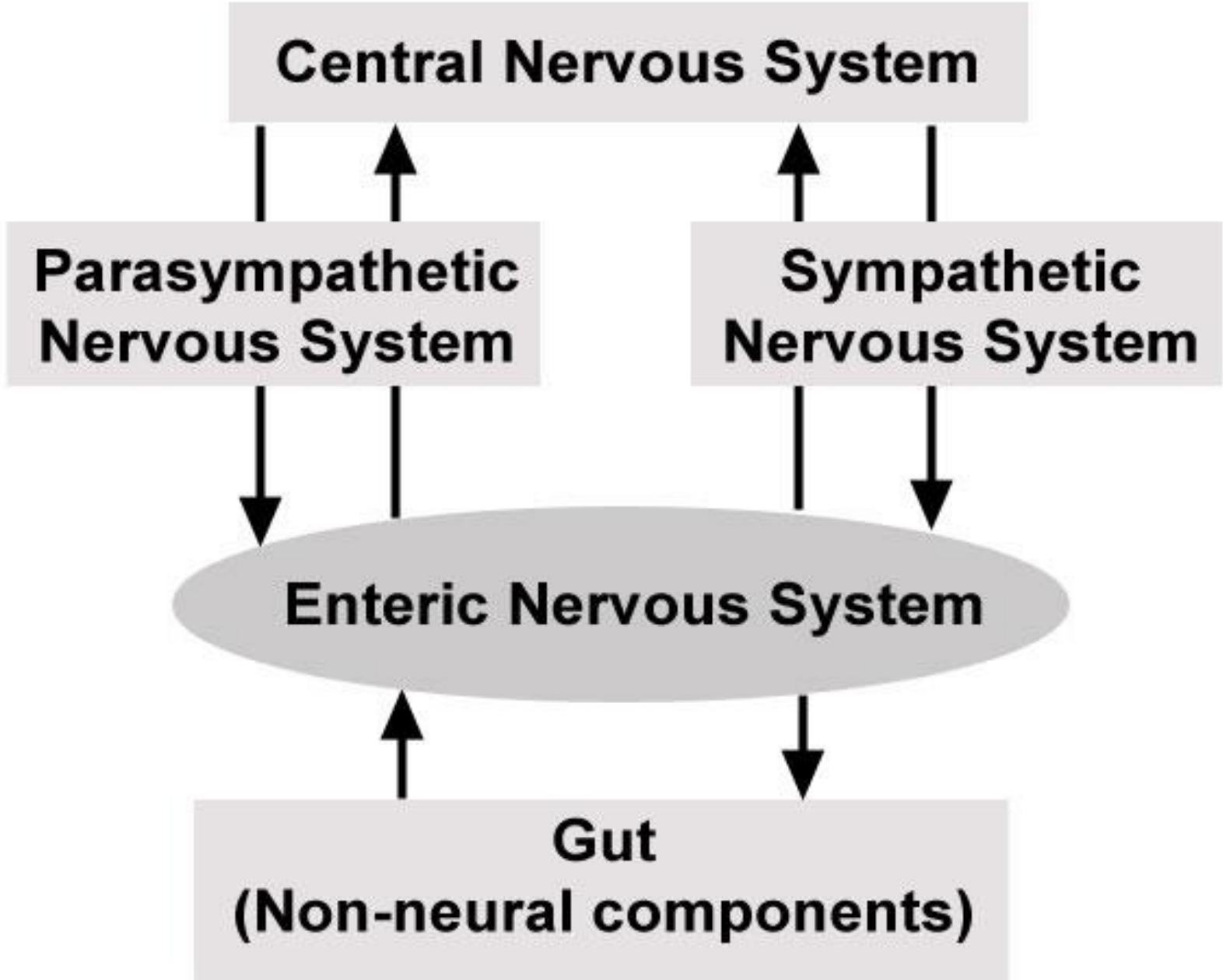

Serosa
Longitudinal muscle
Myenteric plexus
Circular muscle
Submucosa
Submucosal plexus
Muscularis mucosa
Mucosal nerves
Mucosa


ANS Neurotransmitters
ACh
Nicotinic receptor
NE
Adrenergic receptor (αor β)
CNS
Cholinergic Preganglionic neuron
Autonomic ganglion
Adrenergic Postganglionic neuron
Target tissue
A) Sympathetic pathway
ACh
Nicotinic receptor
ACh
Cholinergic receptor (muscarinic)
CNS
Cholinergic Preganglionic neuron
Autonomic ganglion
Cholinergic Postganglionic neuron
Target tissue
B) Parasympathetic pathway
ACh = Acetylcholine
NE = Norepinephrine


The Autonomic Nervous System
Sympathetic
NorEpi
Parasympathetic
ACh
mydriasis
miosis
Ganglia (N)
reduced saliva flow
stimulated saliva flow
increased SV & HR
decreased HR
vasoconstriction
Vagal nerve
bronchoconstriction
reduced peristalsis & secretion
stimulates peristalsis & secretion
Sympathetic ganglia (N)
glycogen → glucose
epinephrine release
stimulates bile release
inhibition of bladder contraction
β2 bronchodilation (not innervated)
bladder contraction

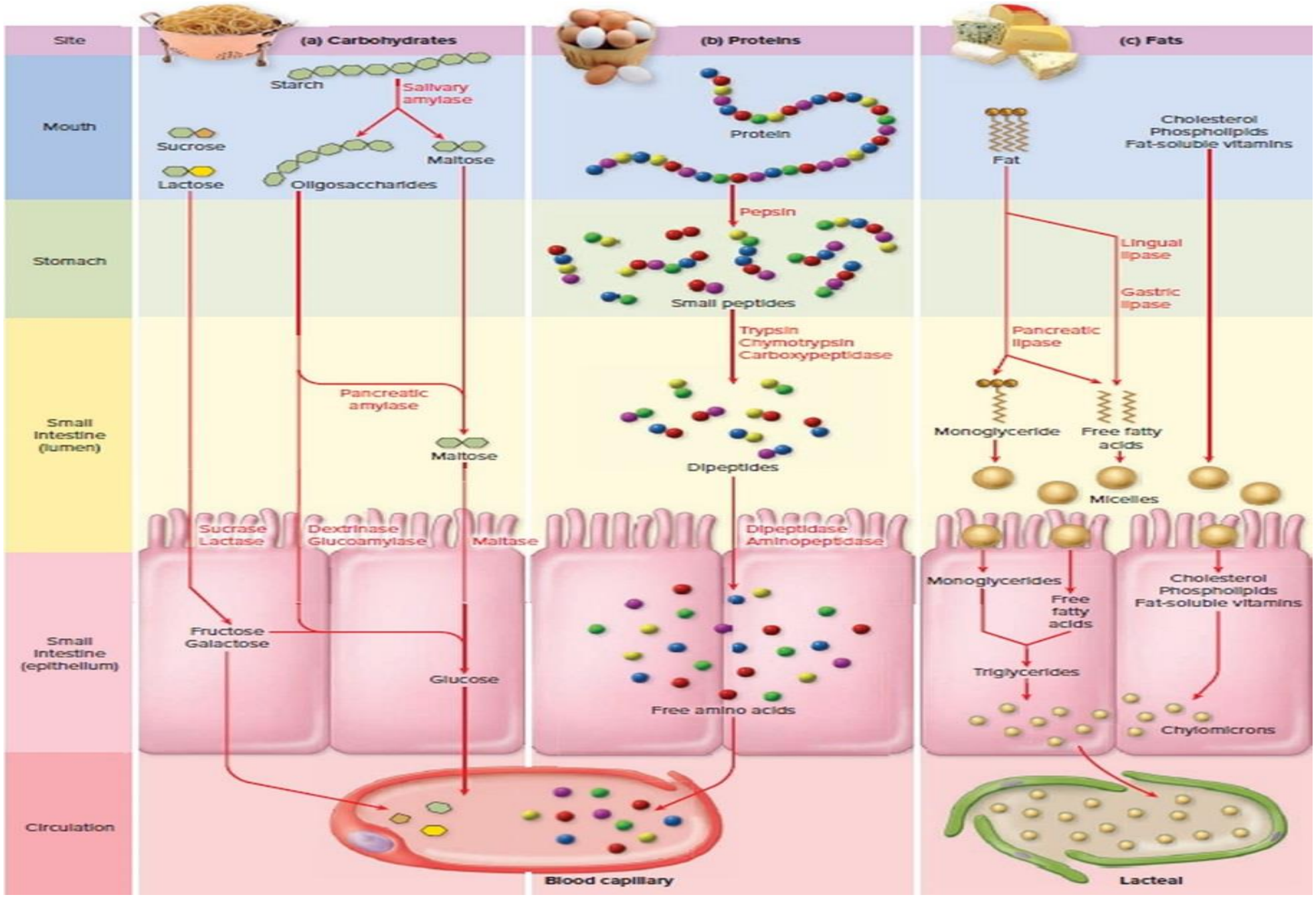
Long/short neural reflex pathways




Central Nervous System
Parasympathetic Nervous System
Sympathetic Nervous System
Enteric Nervous System
Gut
(Non-neural components)

فیزیولوژی دو، جلسه یازدهم

نگرشی مقایسه ای بر هضم آنزیمی کربوهیدراتها، پروتئین ها و چربیها در برخی جانوران

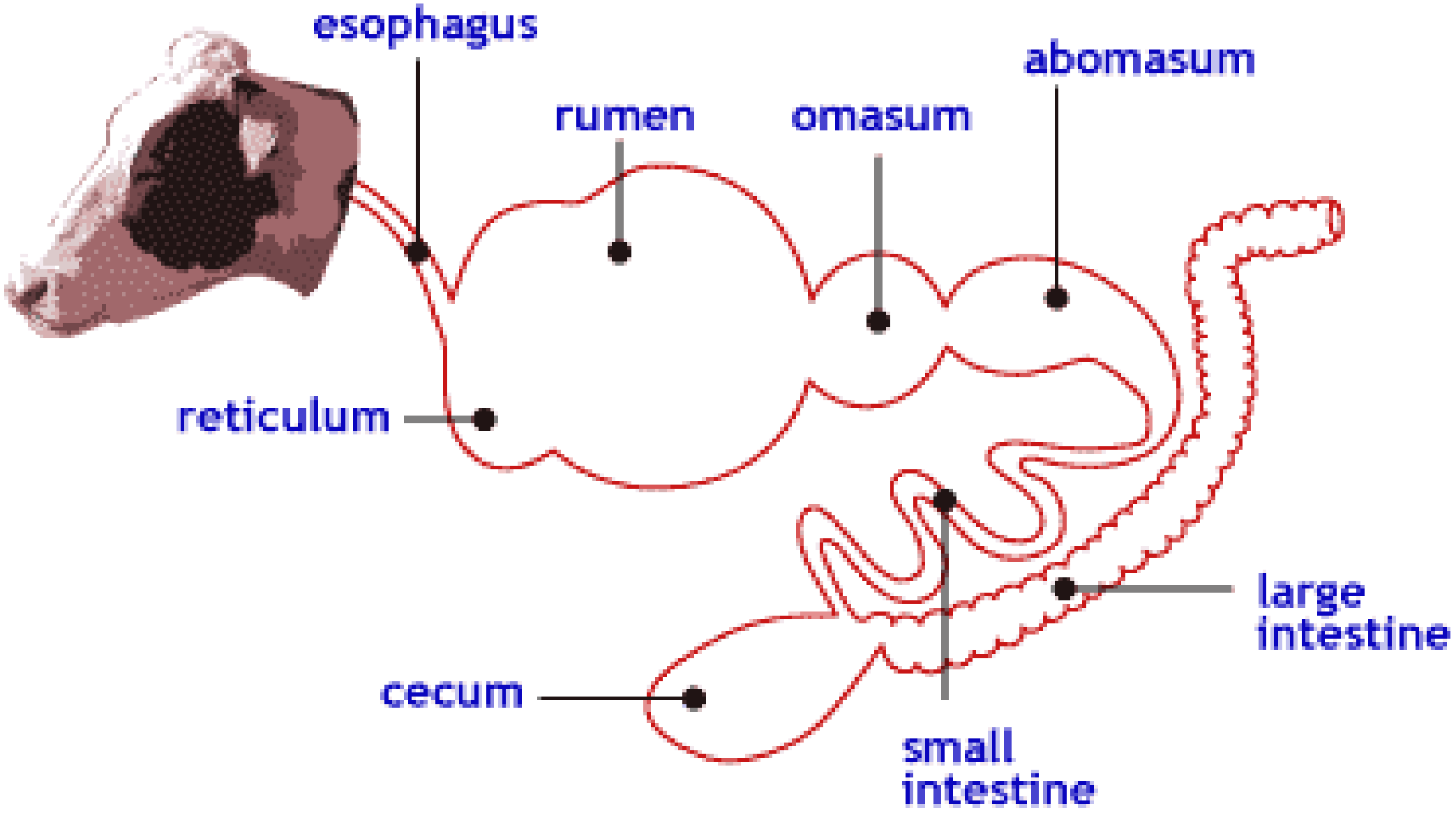

Site
(a) Carbohydrates
(b) Proteins
(c) Fats
Mouth
Stomach
Small Intestine (lumen)
Small Intestine (epithelium)
Circulation
Starch
Salivary amylase
Sucrose
Lactose
Maltose
Oligosaccharides
Protein
Pepsin
Small peptides
Fat
Cholesterol
Phospholipids
Fat-soluble vitamins
Lingual lipase
Gastric lipase
Pancreatic lipase
Trypsin
Chymotrypsin
Carboxypeptidase
Pancreatic amylase
Maltose
Dipeptides
Monoglyceride
Free fatty acids
Micelles
Sucrase
Lactase
Dextrinase
Glucoamylase
Maltase
Dipeptidase
Aminopeptidase
Monoglycerides
Free fatty acids
Triglycerides
Cholesterol
Phospholipids
Fat-soluble vitamins
Fructose
Galactose
Glucose
Free amino acids
Chylomicrons
Blood capillary
Lacteal

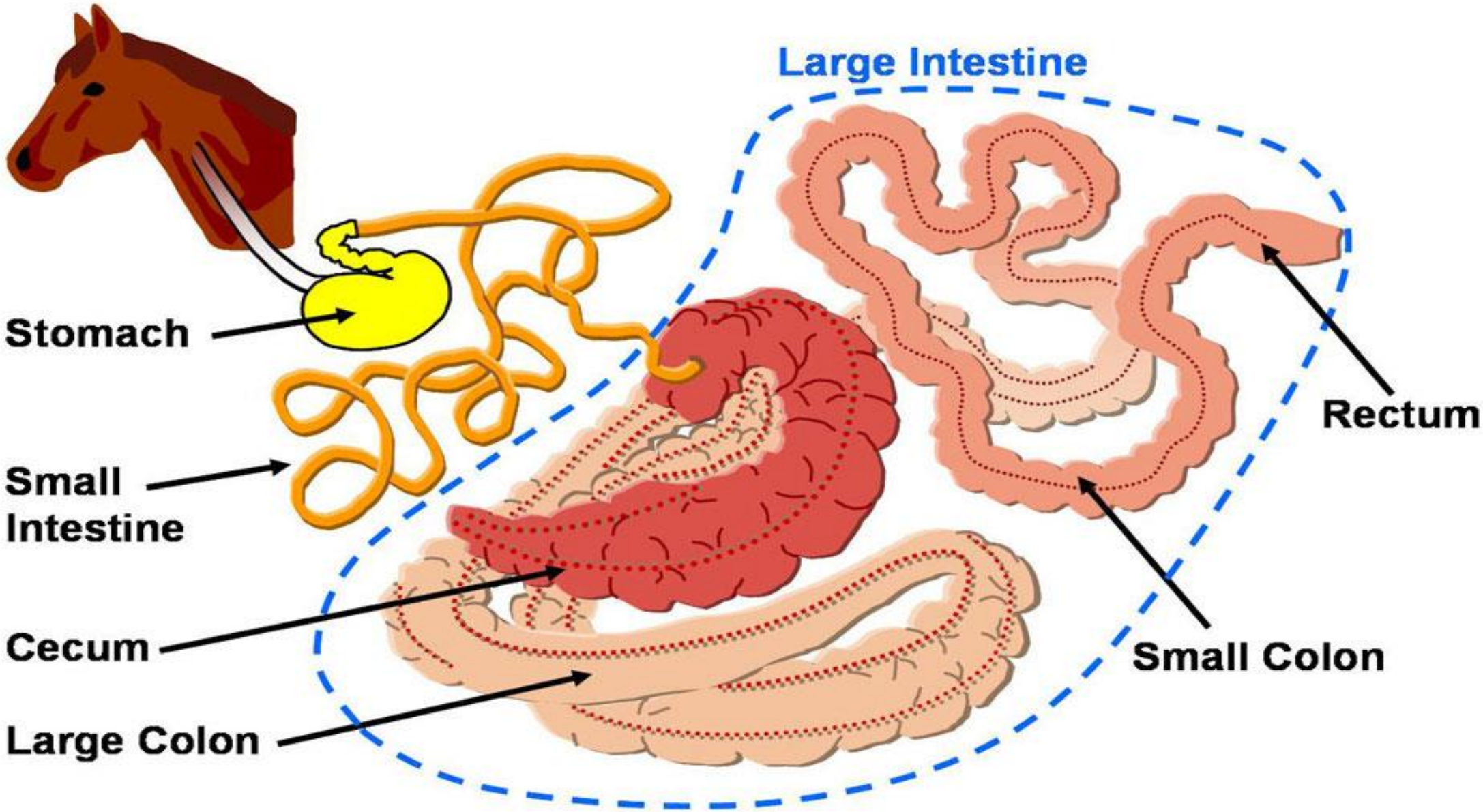
فیزیولوژی دو، جلسه دوازدهم

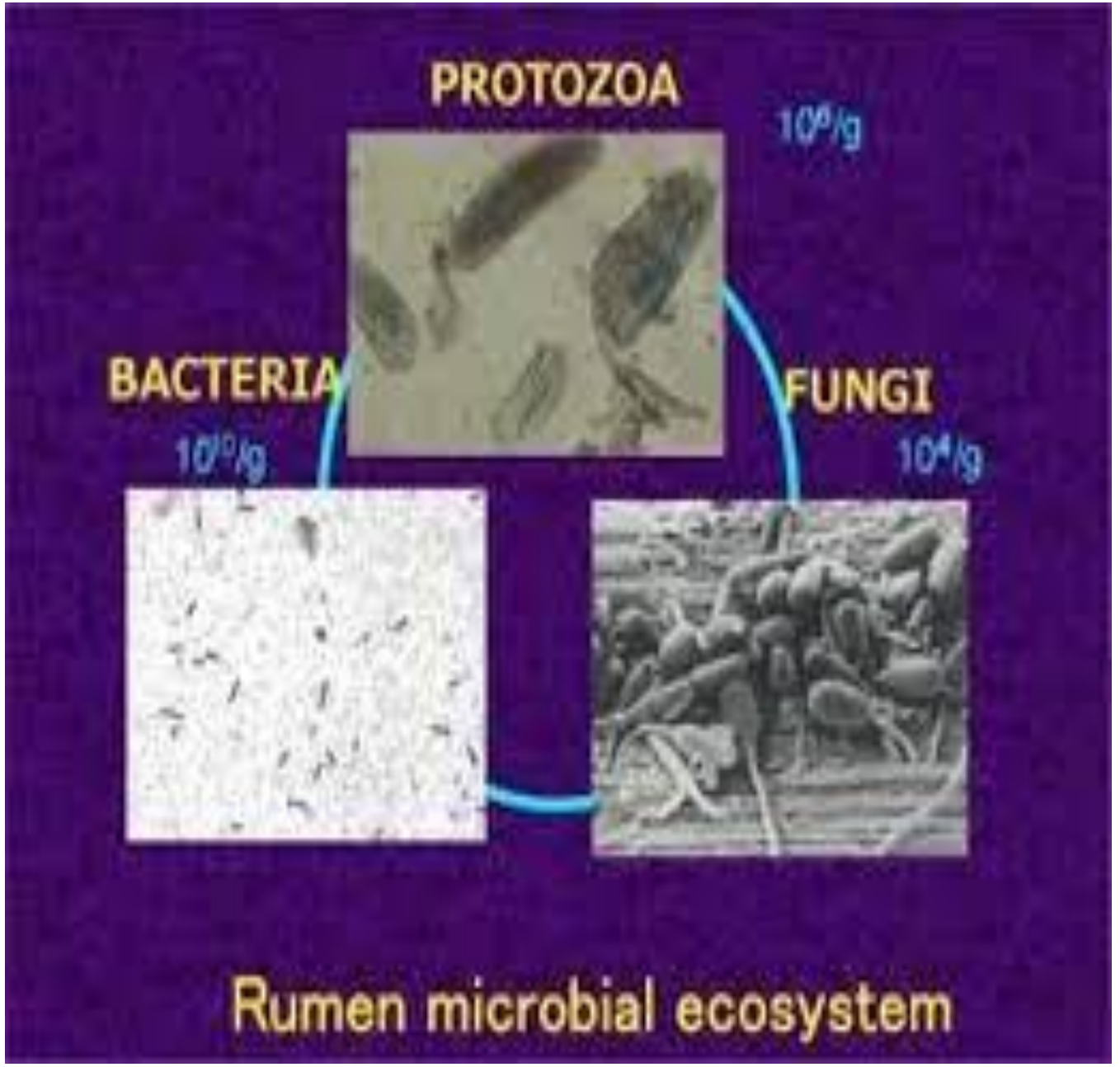
لوله گوارشی در علفخوار نشخوارکننده و غیر نشخوارکننده

تخمیر و هضم میکروارگانیسمی

اهمیت غدد بزاقی در نشخوارکننده و لوزالمعده درعلفخوار غیر نشخوارکننده


esophagus
rumen
omasum
abomasum
reticulum
large
intestine
cecum
small
intestine


Large Intestine
Stomach
Small Intestine
Cecum
Large Colon
Rectum
Small Colon


PROTOZOA
10^6/g
BACTERIA
10^{10}/g
FUNGI
10^4/g
Rumen microbial ecosystem

The rumen microbes

- Bacteria- gram-positive and gram-negative
  - most numerous group of microbes in the rumen
  - Substrates are fermented to form volatile fatty acids (Acetate, Propionate, Butyrate and others) and C02 and CH4
- Protozoa
  - Generally larger than bacteria but present in small no.
  - Fibre digestion
  - Negatively influence protein utilization – predation and reduce outflow of microbial protein
  - Ruminants can survive with out protozoa
- Fungi
  - recently discovered ruminal MOs
  - Degrade the lignin-containing tissues than bacteria

فیزیولوژی دو، جلسه سیزدهم

پیش معده نشخوارکنندگان و اعمال حرکتی آن

نشخوار و انقباضات ضد دودی

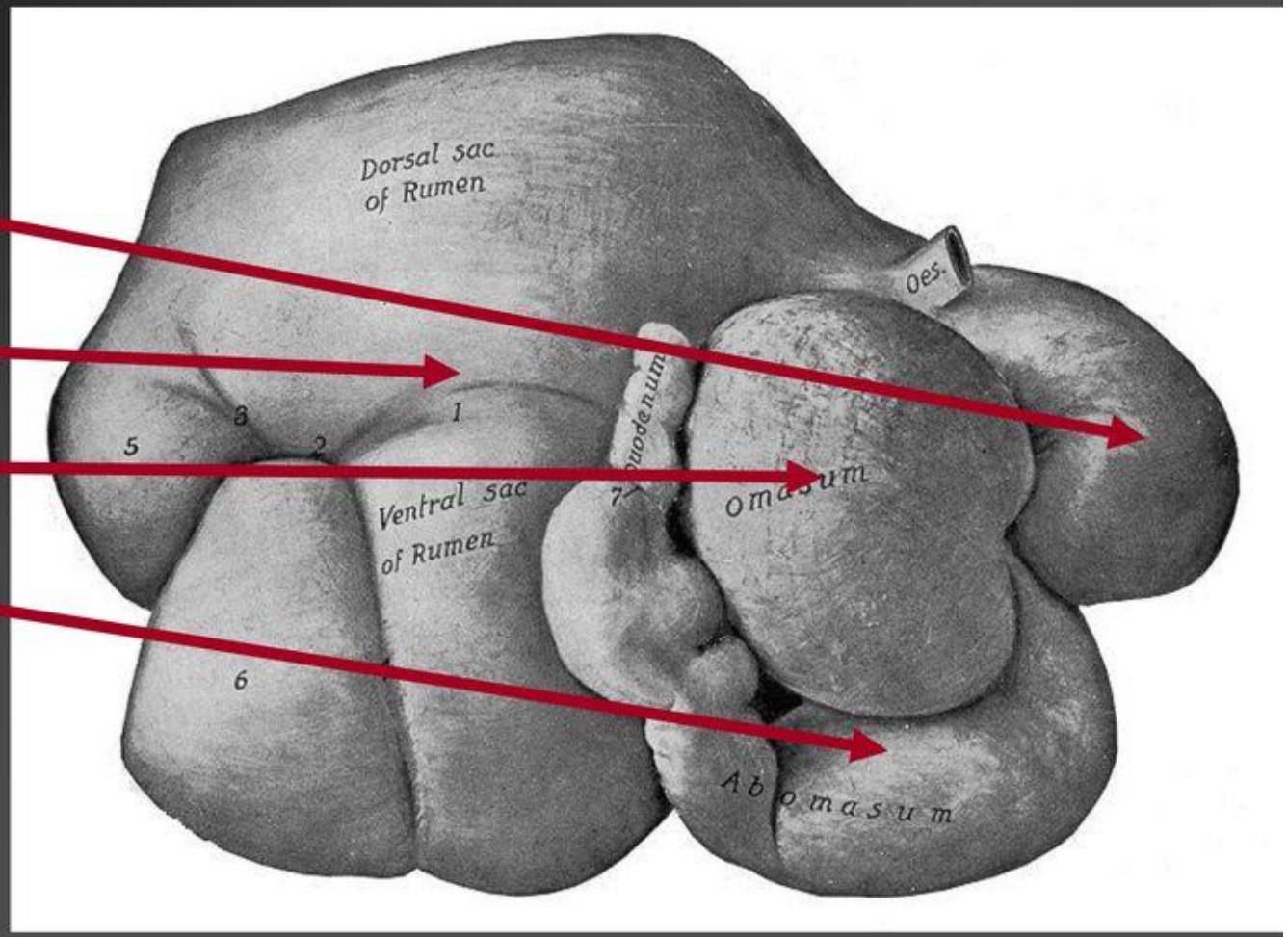
مقایسه شیردان نشخوارکننده با معده جانوران تک معده ای

نشخوار کننده کاذب

Ruminant Stomach

Anatomy:

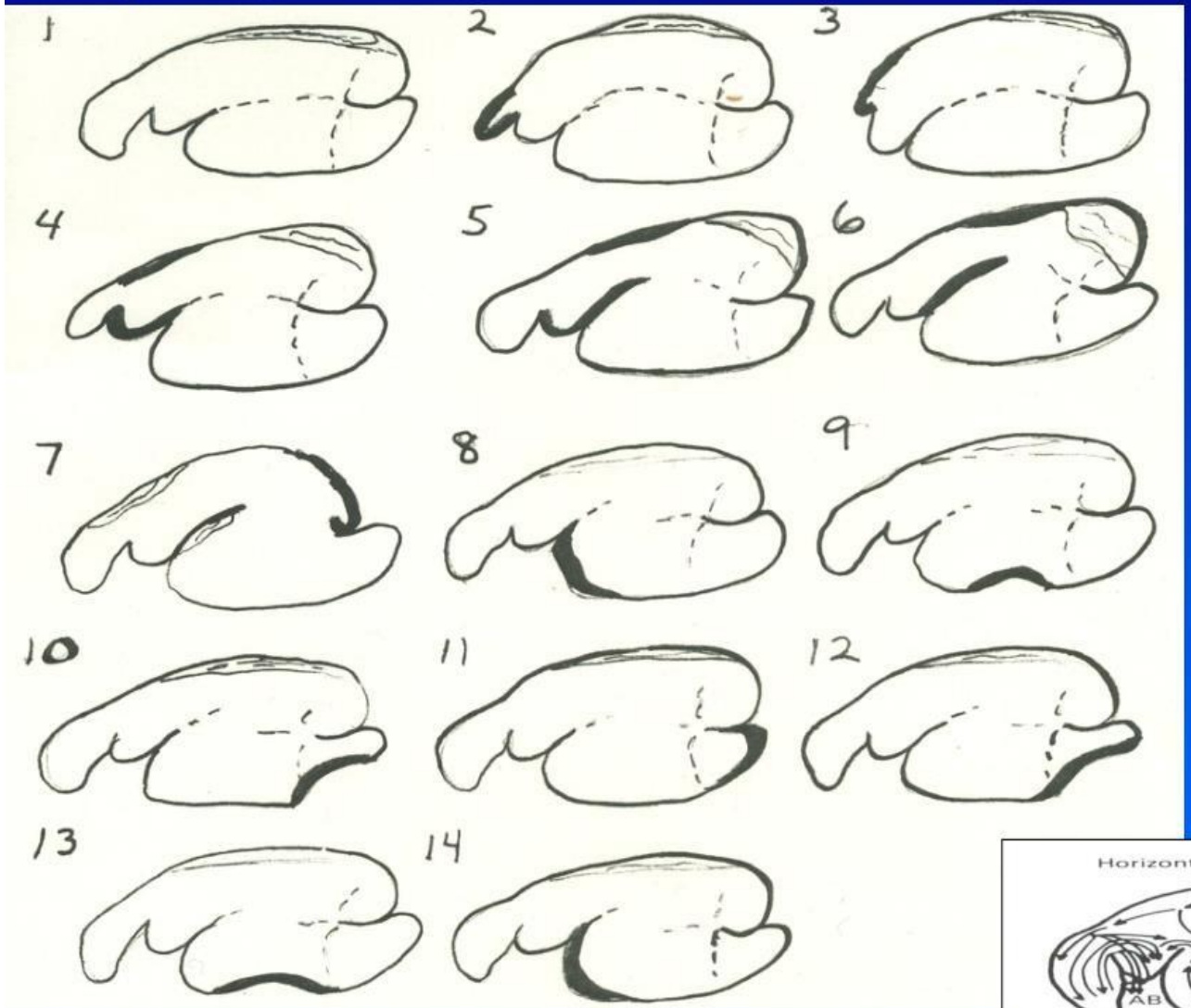
- Reticulum
- Rumen
- Omasum
- Abomasum

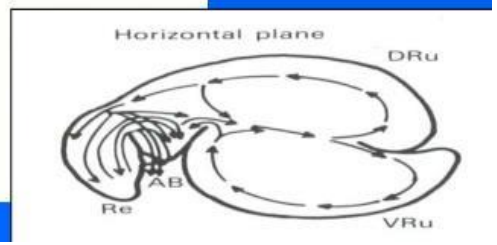


Types of ruminal contractions

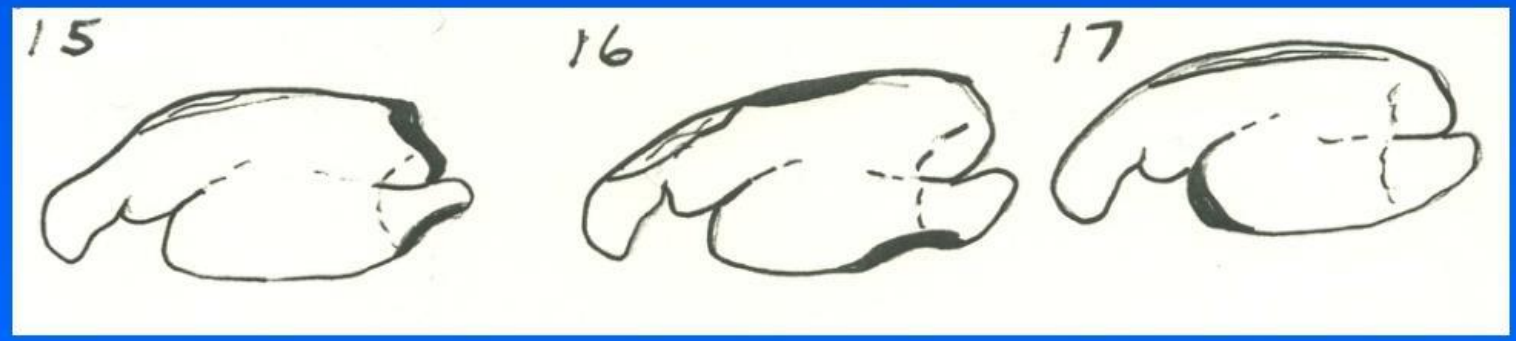
- Primary contraction
  - Also called A-wave or backward moving
  - Action
    - A biphasic contraction of the reticulum
    - Anterior pillar contracts lifting the anterior sac.
      - Anterior fold rises to form barrier
    - Contraction moves across dorsal sac to dorsal blind sac from contraction of longitudinal pillar and dorsal coronary pillar
    - Dorsal blind sac contracts and dorsal sac relaxes from dorsal coronary pillar
    - Ventral sac contracts along longitudinal pillar
    - Ventral sac relaxed and Ventral blind sac contracts
      - Ventral contraction absent during rumination
  - Functions of the primary contraction
    - Mixing and inoculation of digesta
    - Particle sorting across the reticuloruminal and anterior folds
  - Duration of contraction
    - Fed animal – 30 to 50 seconds
    - Fasted animal – 12 to 18 seconds

The primary contraction of the rumen





- **Secondary contraction**
  - Also called the B-wave or forward-moving contraction
  - Usually occurs after a primary contraction
  - Action
    - Contraction of the ventral blind sac continuing up through the dorsal blind sac using the dorsal coronary pillar
    - Contraction proceeds across dorsal sac forcing gas pocket to the cardiac sphincter
  - Function
    - Eructation
  - Duration
    - 30 seconds



فیزیولوژی دو، جلسه چهاردهم

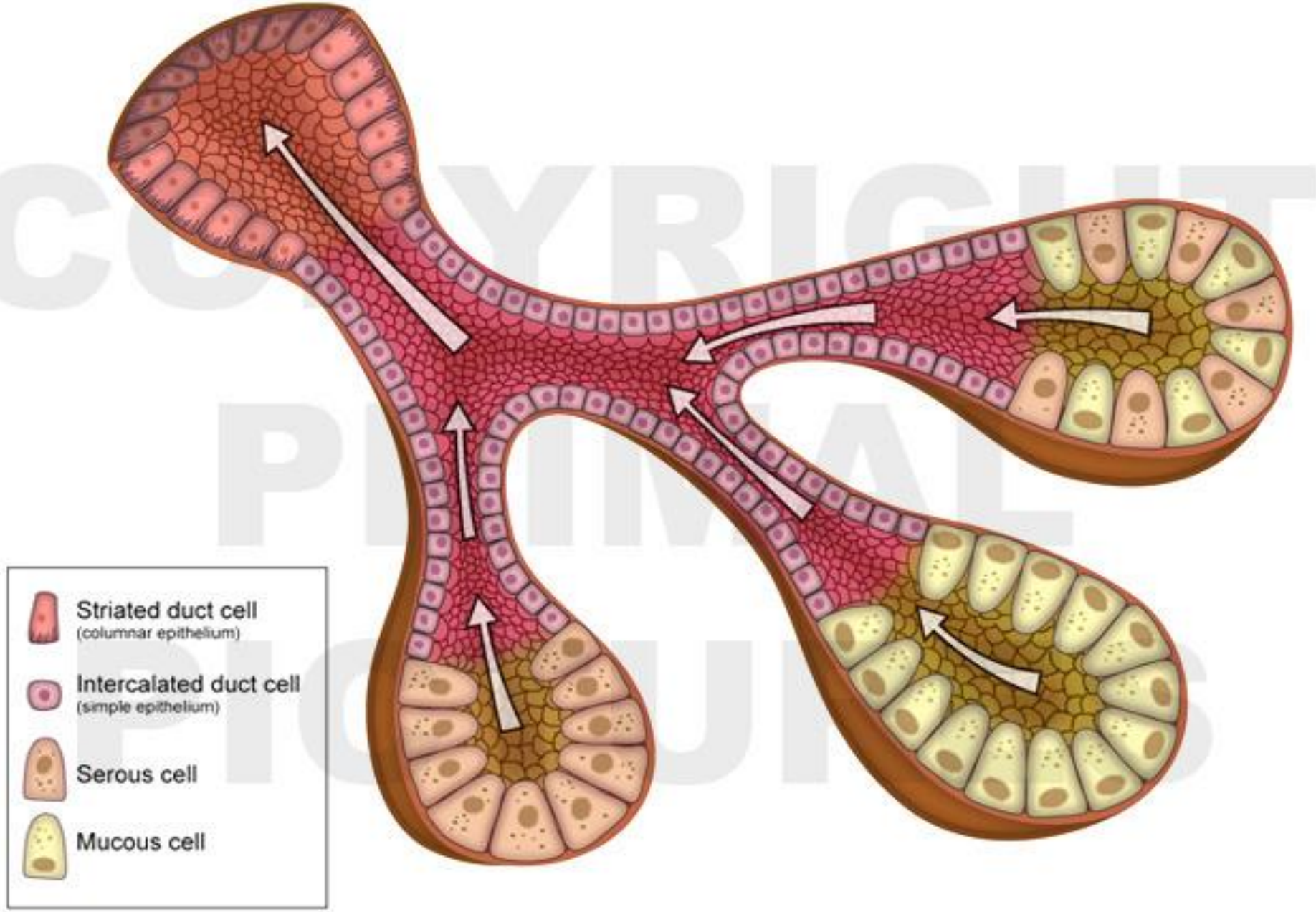
غدد بزاقی

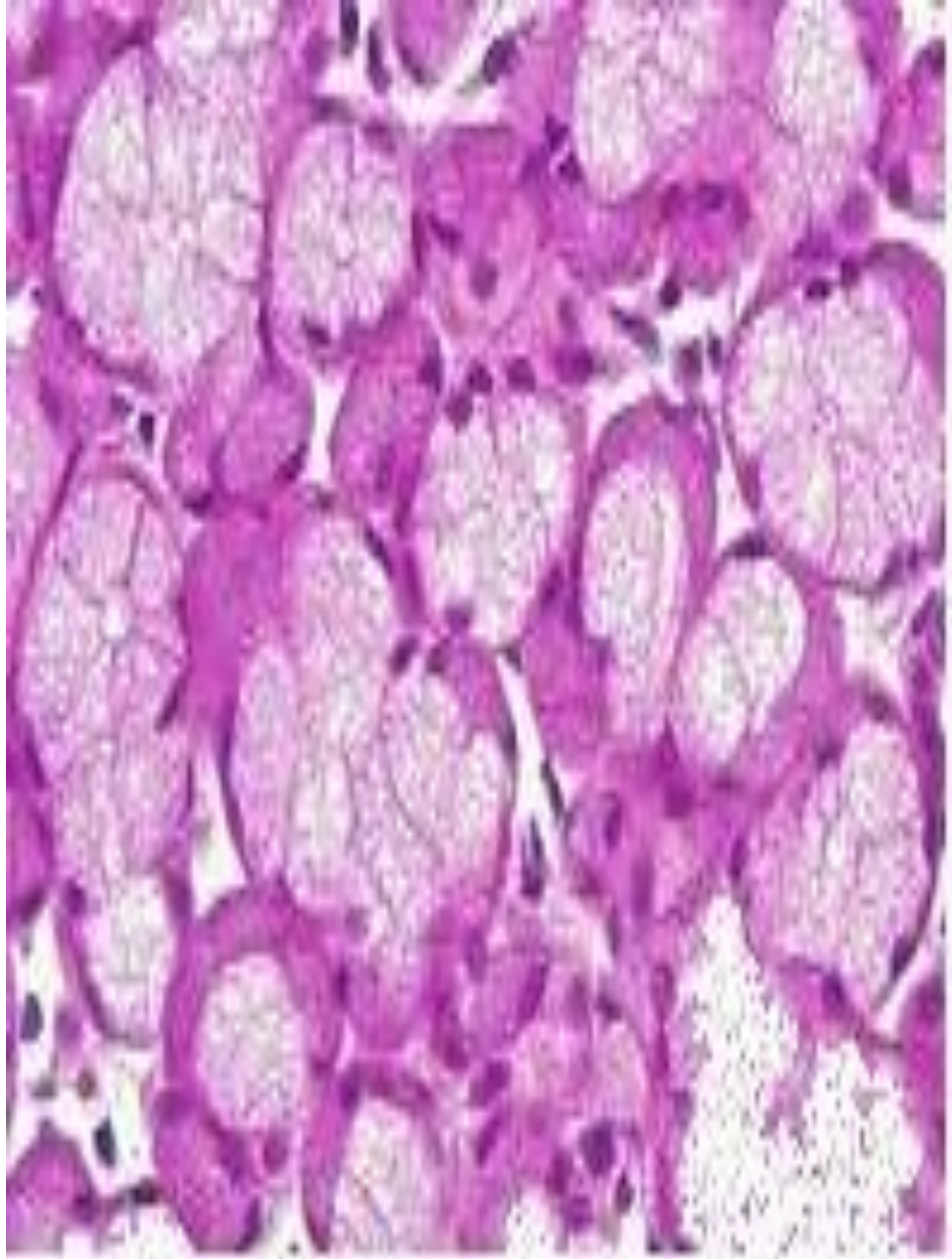
لوزالمعده

کبد

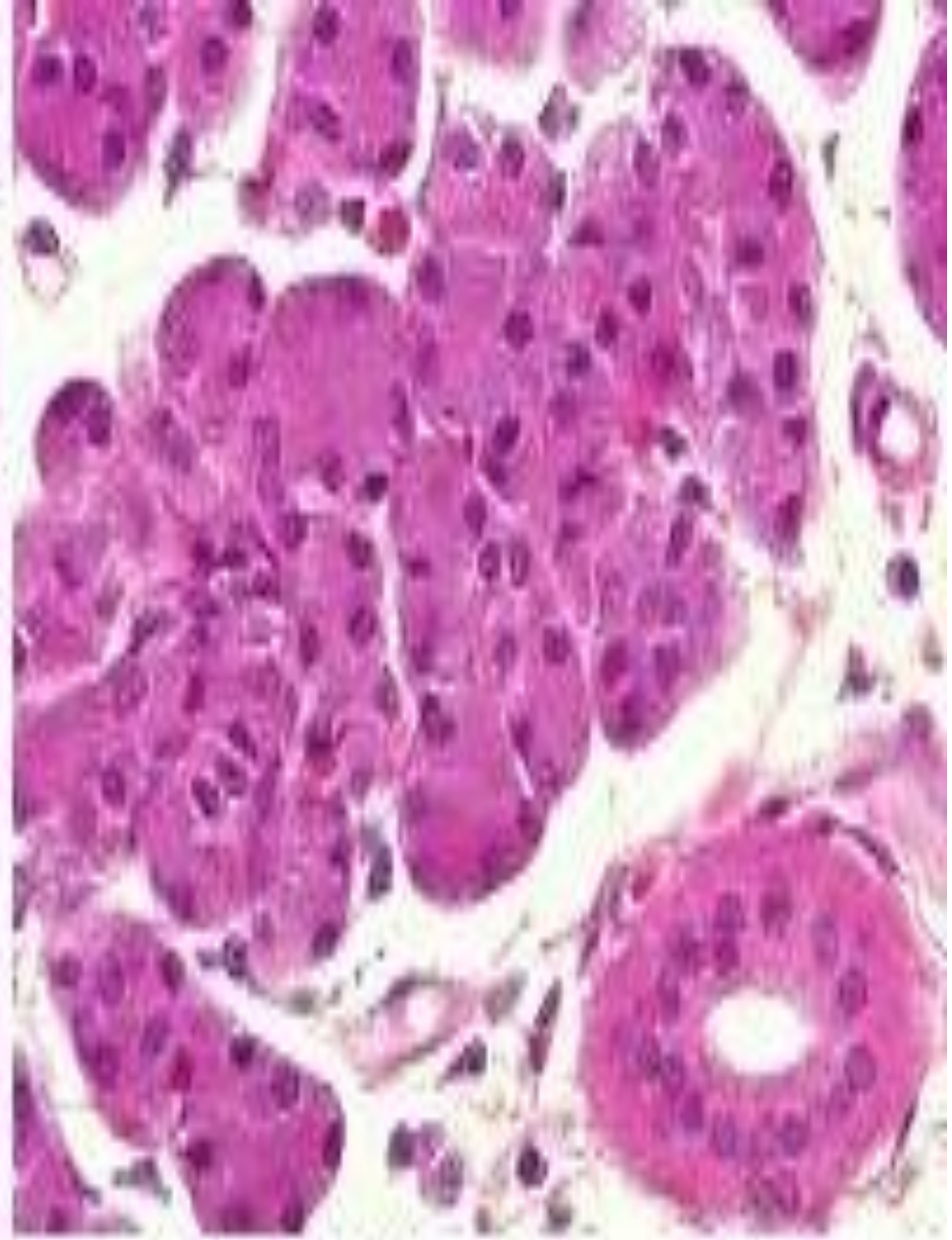
جذب در لوله گوارشی

نگرشی بر دستگاه گوارش پرندگان

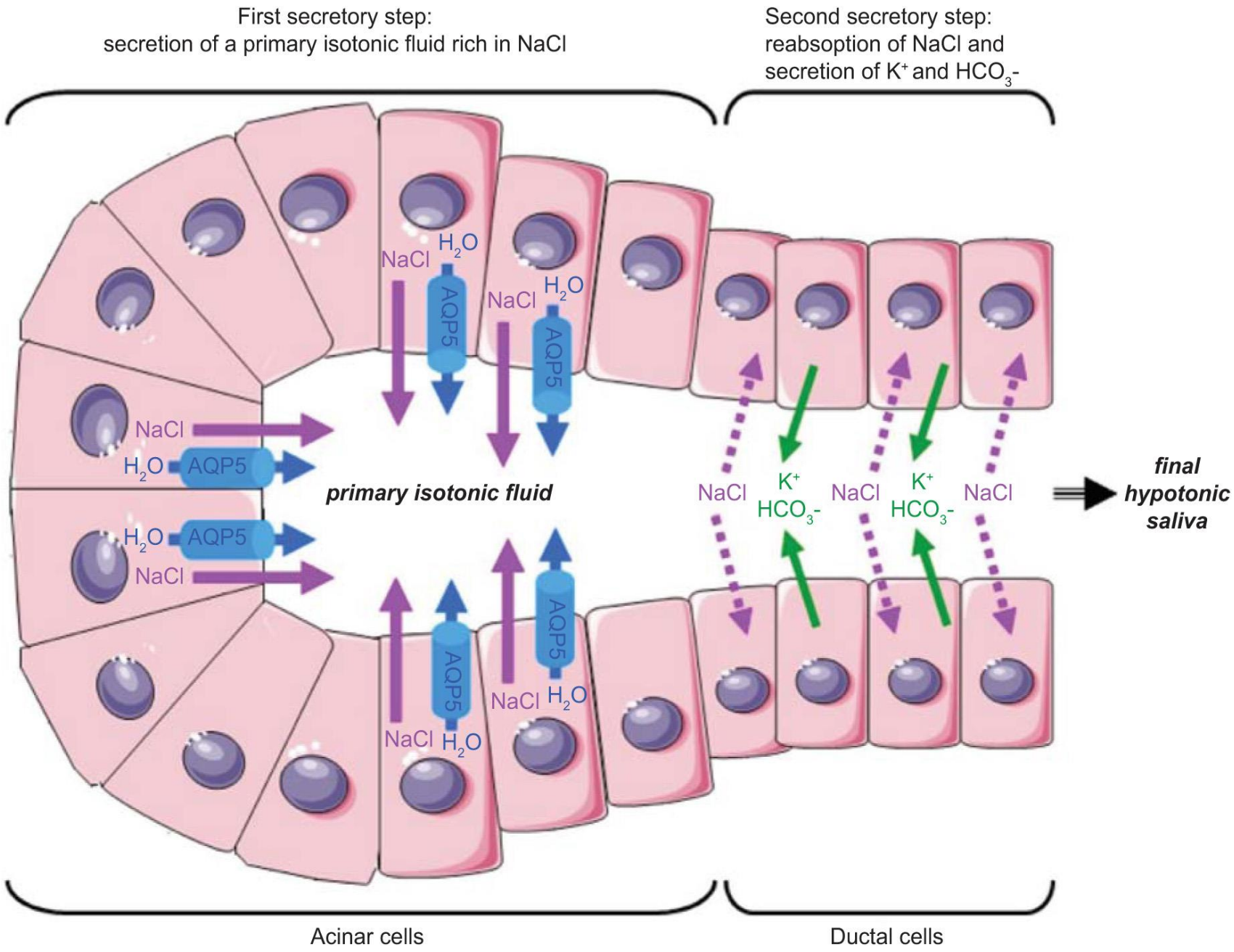

Striated duct cell
(columnar epithelium)
Intercalated duct cell
(simple epithelium)
Serous cell
Mucous cell



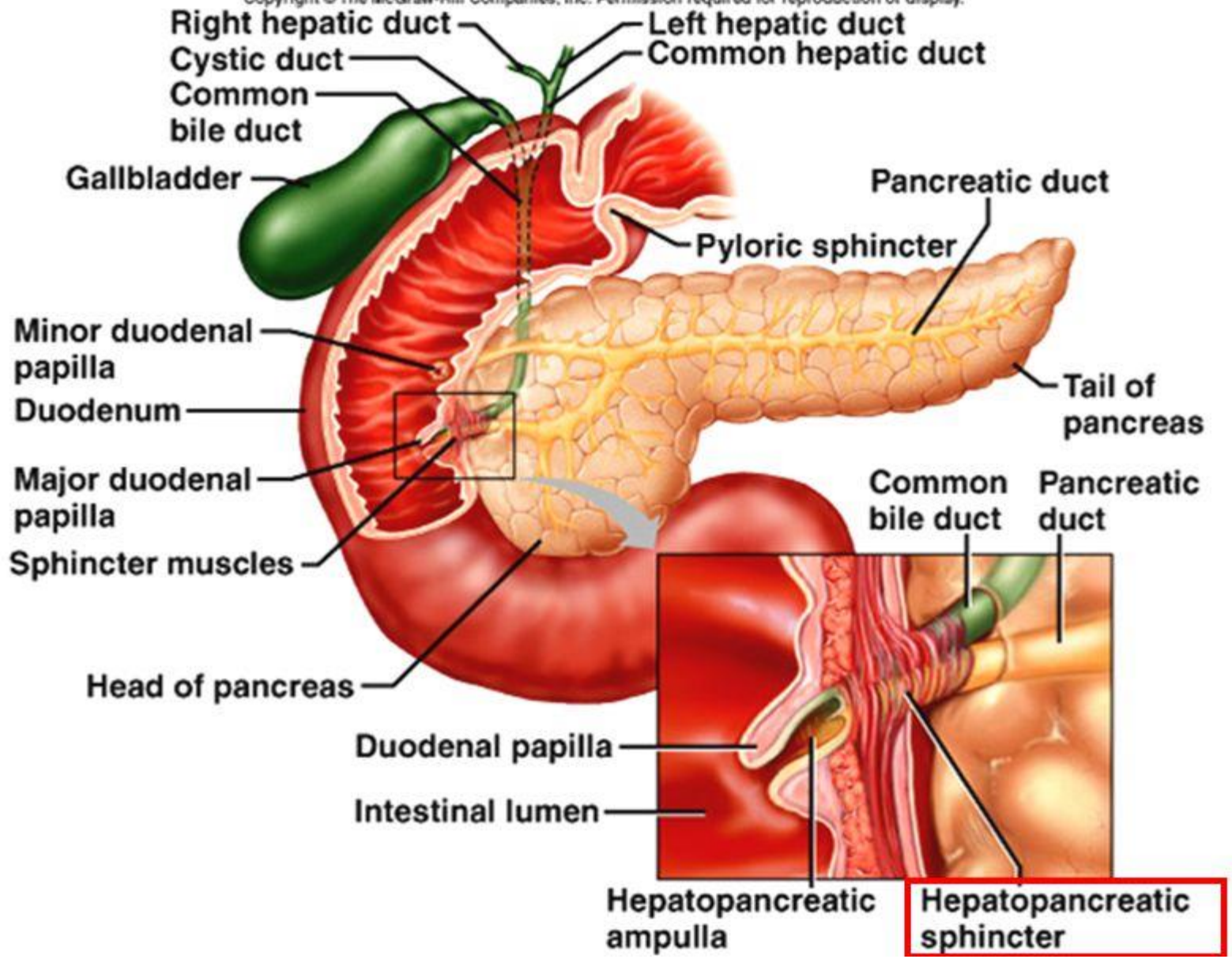
Mandibular gland (mixed)



Parotid gland (serous)


First secretory step:
secretion of a primary isotonic fluid rich in NaCl
Second secretory step:
reabsoption of NaCl and
secretion of K+ and HCO3-
NaCl
H2O
AQP5
primary isotonic fluid
K+
HCO3-
final
hypotonic
saliva
Acinar cells
Ductal cells

Pancreas

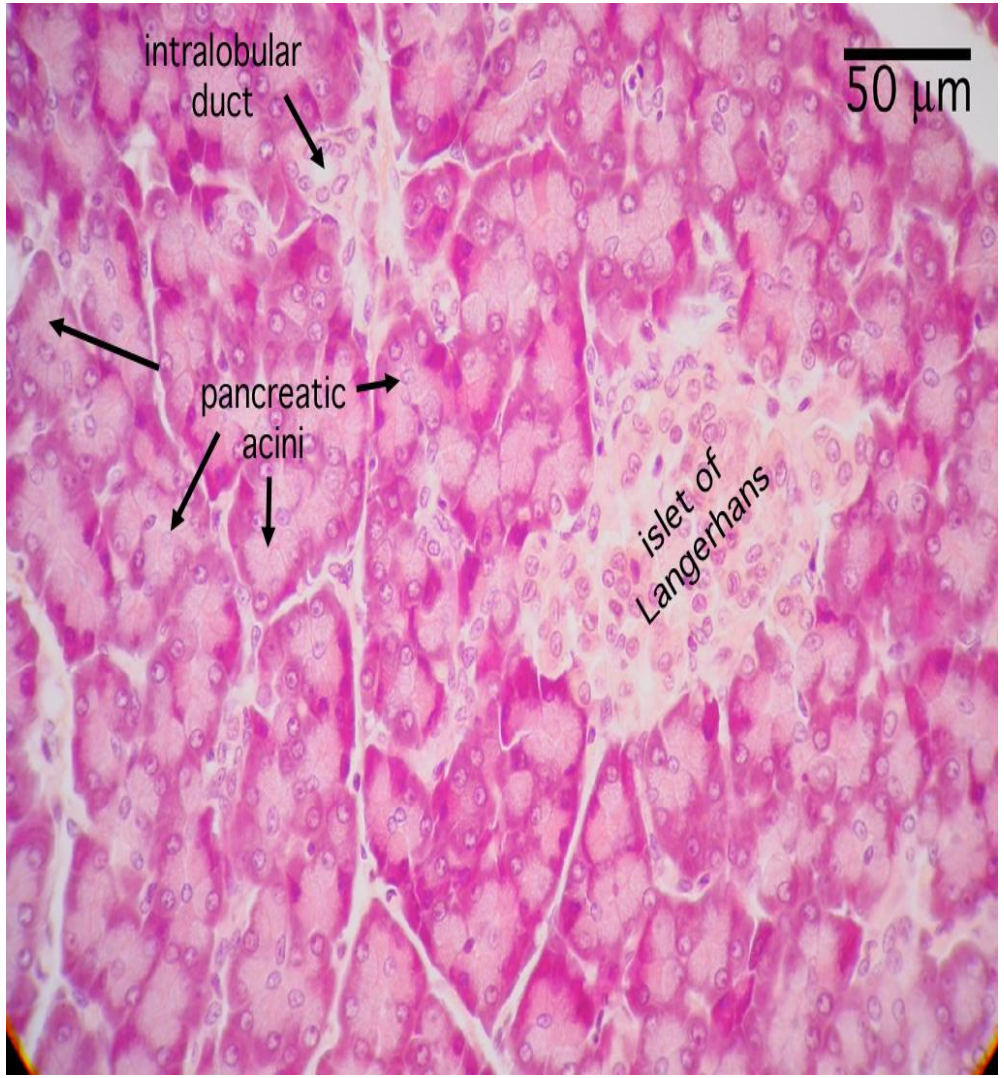


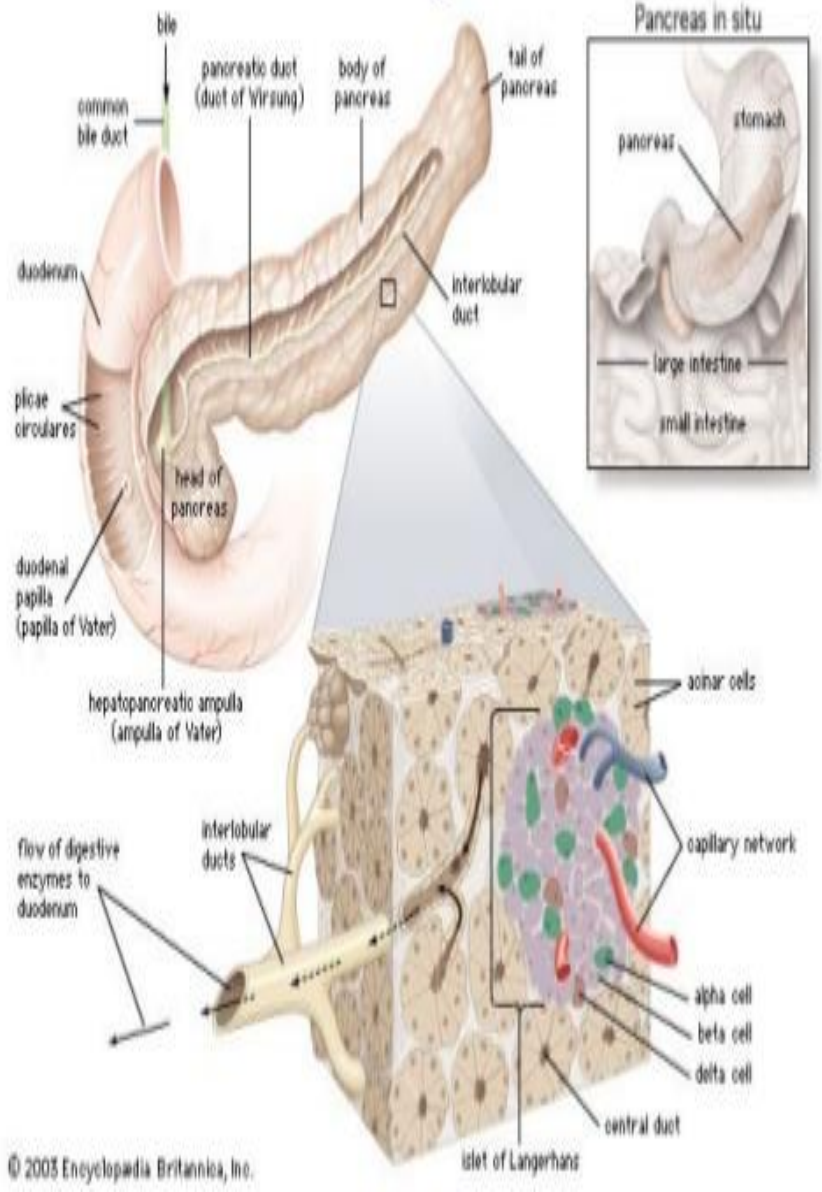
Exocrine (digestive) and endocrine (metabolic) functions

Completes digestion of proteins that was started in the stomach

Functional Anatomy of Pancreas

-an exocrine and endocrine gland.





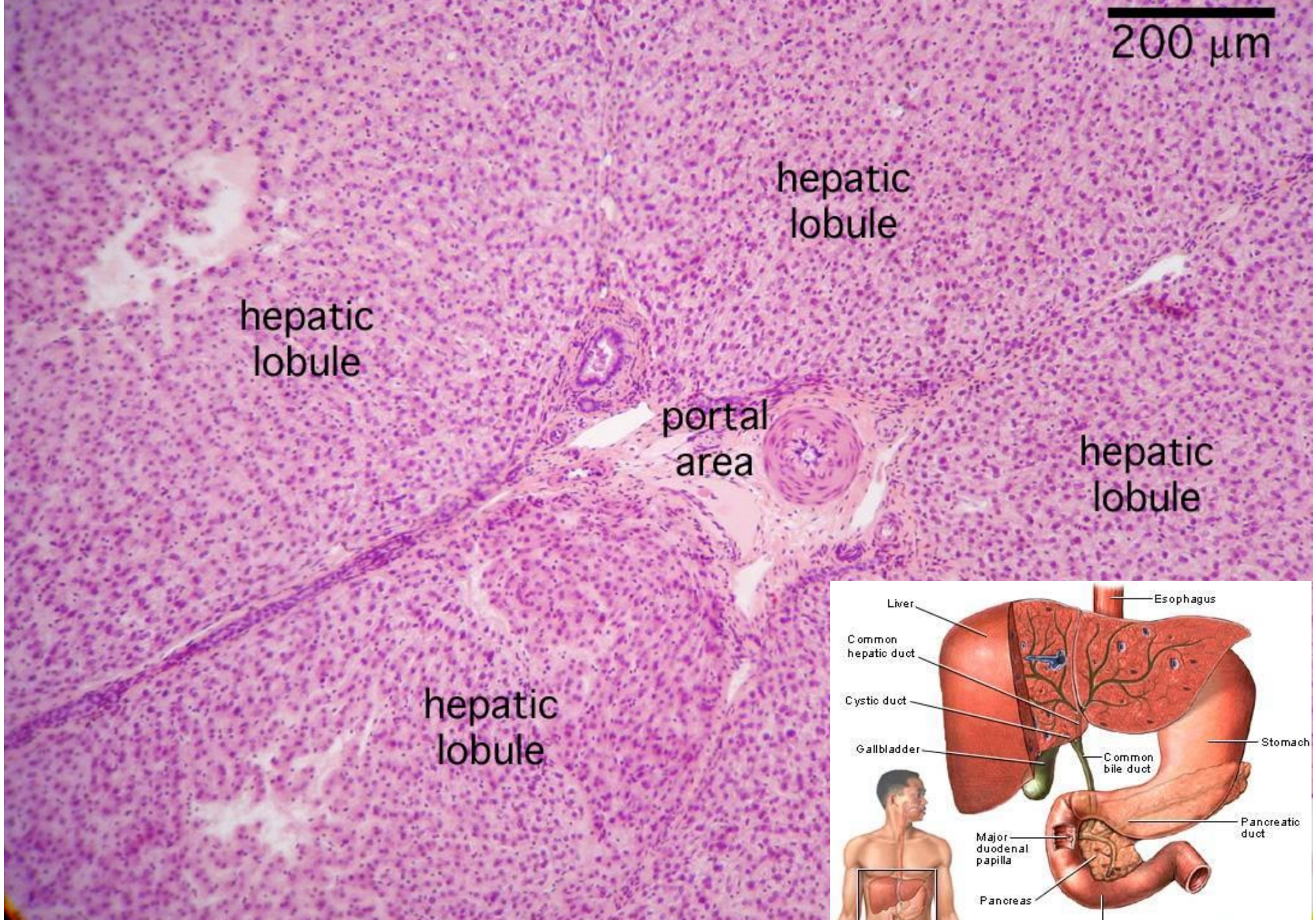
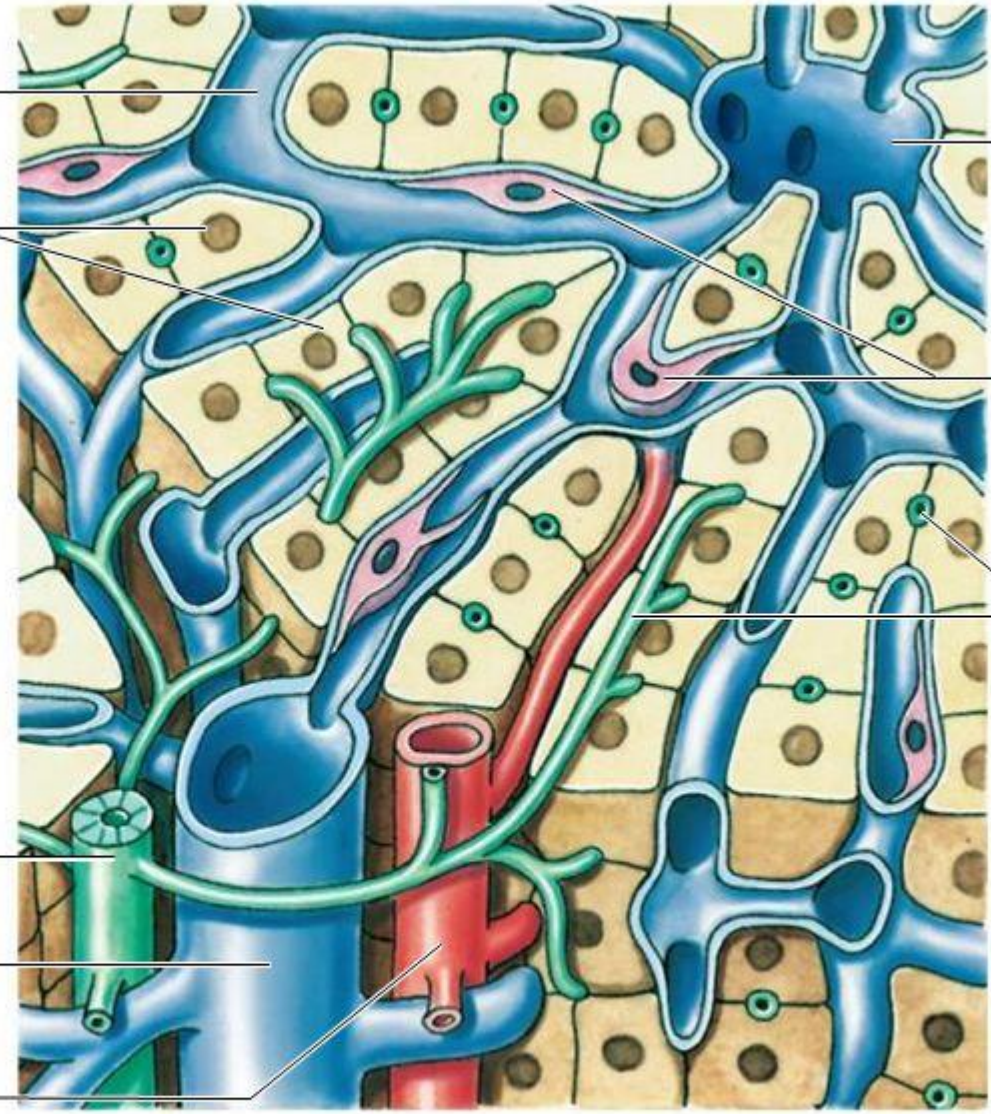

200 µm
hepatic lobule
hepatic lobule
hepatic lobule
portal area
hepatic lobule
Liver
Esophagus
Common hepatic duct
Cystic duct
Gallbladder
Stomach
Common bile duct
Pancreatic duct
Major duodenal papilla
Pancreas

Figure 24-20b Liver Histology.



b A single liver lobule and its cellular components

p. 911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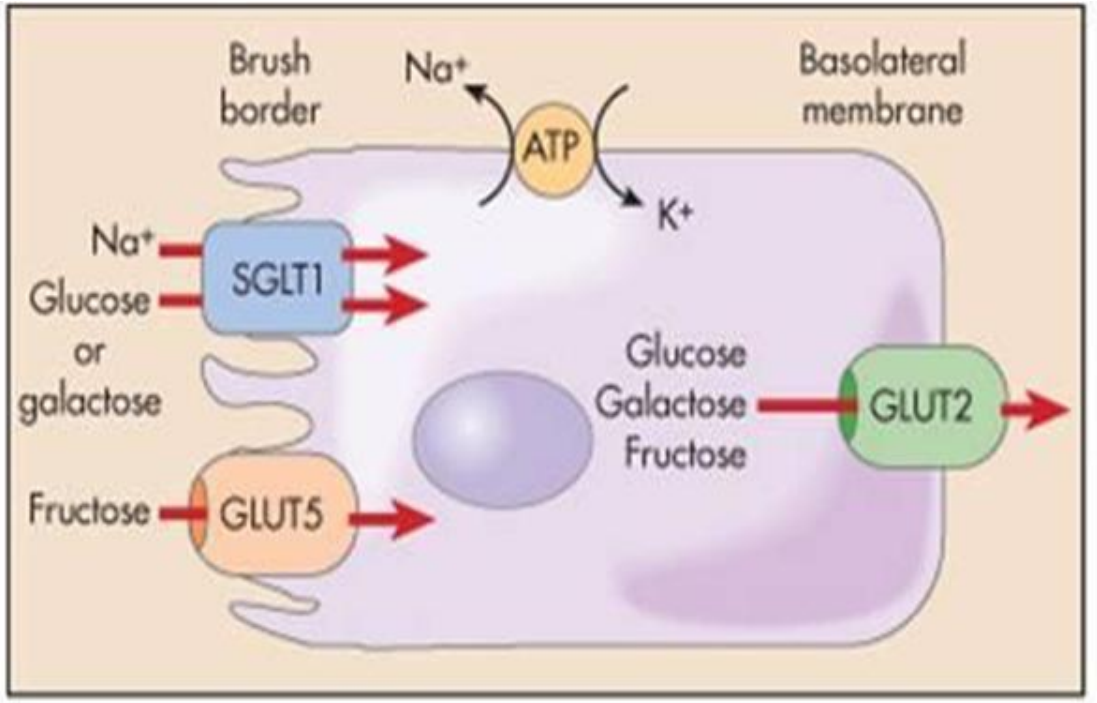
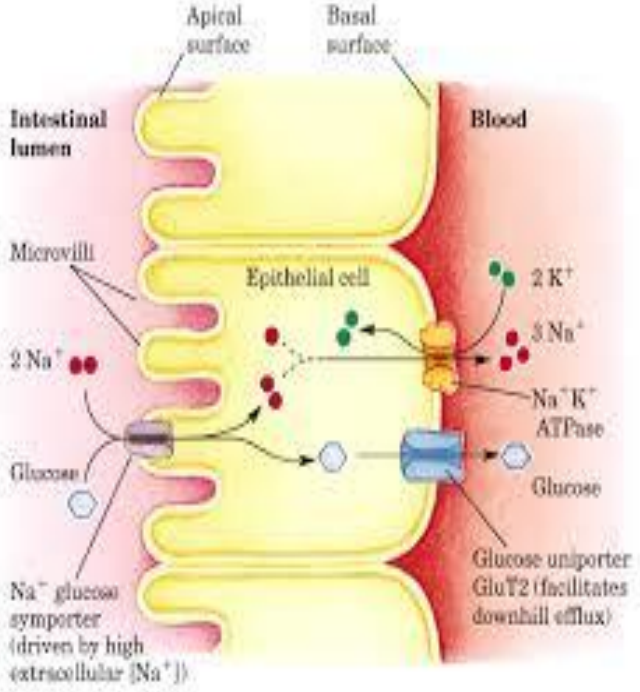
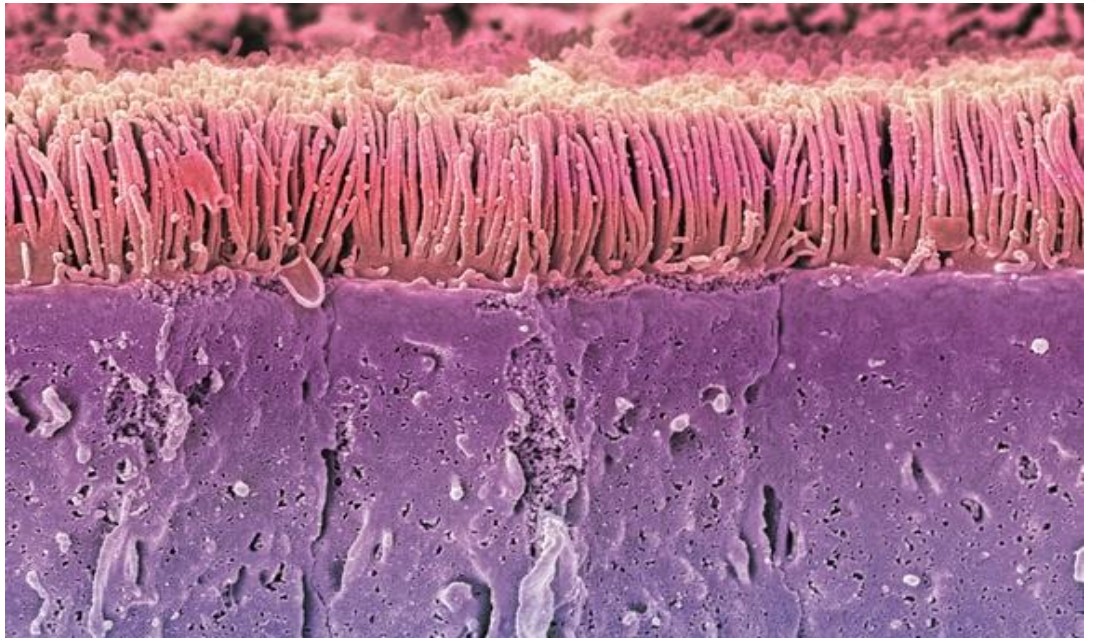
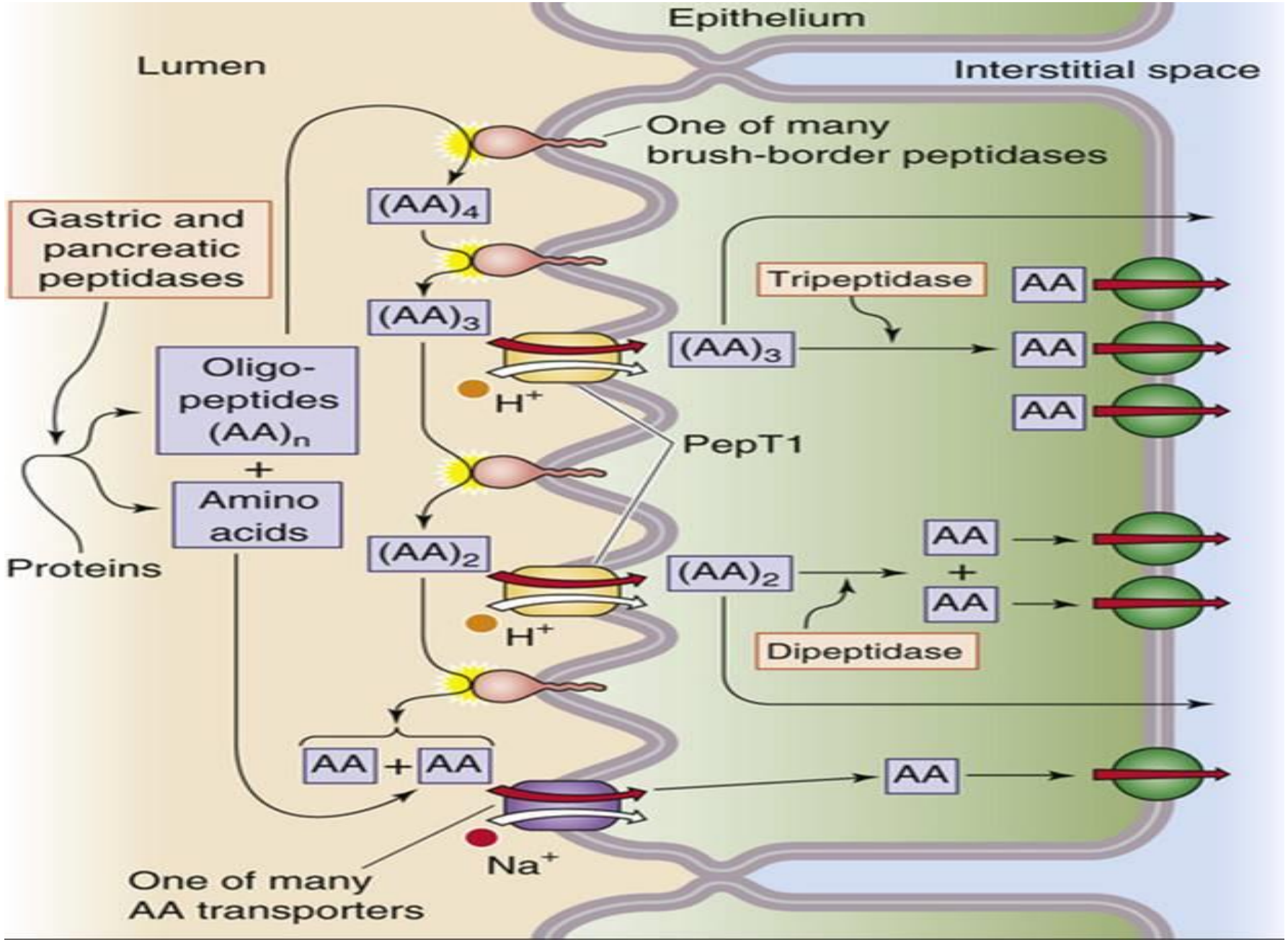
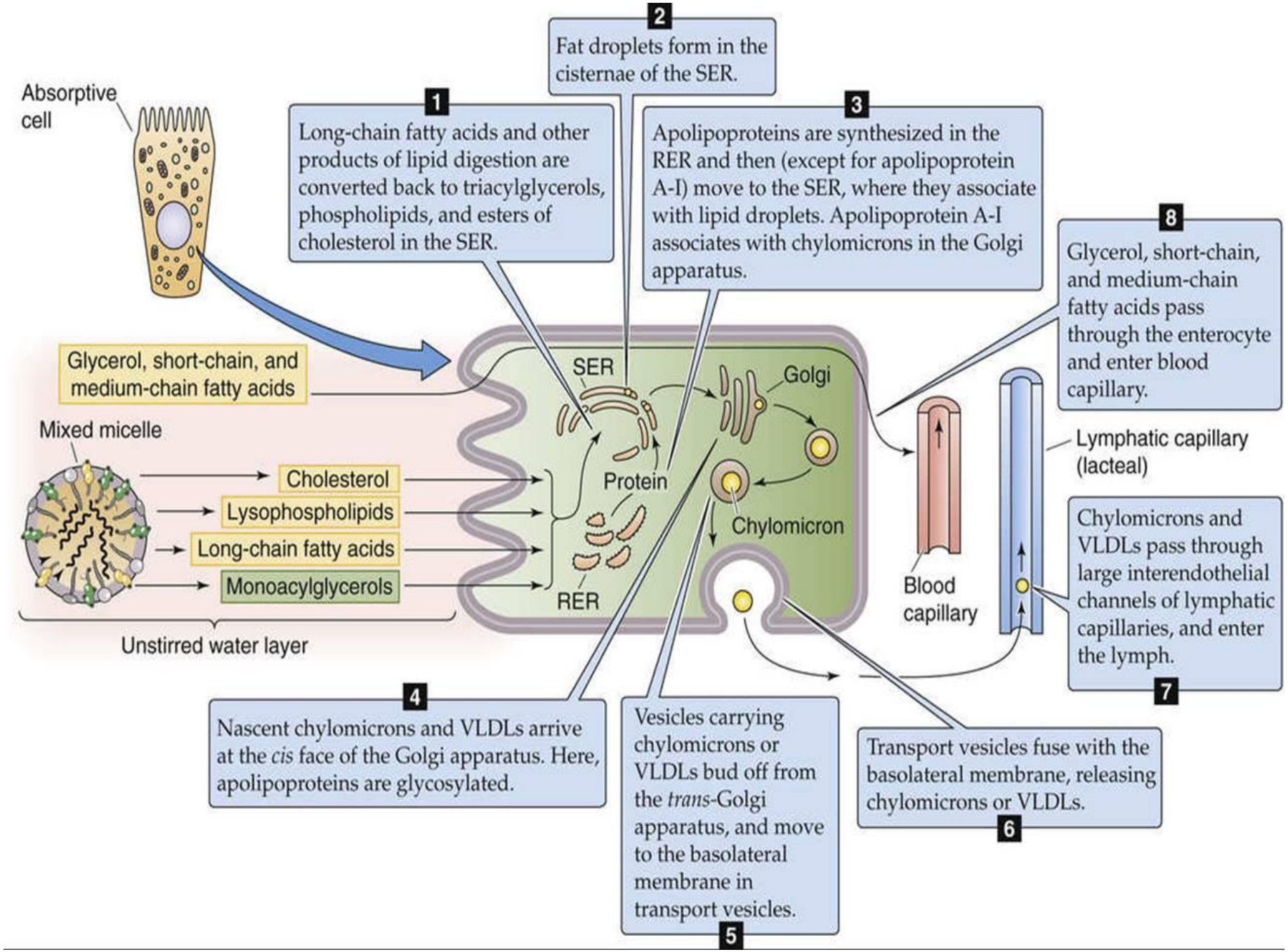

Brush border
Na+
ATP
Basolateral membrane
K+
Na+
Glucose or galactose
SGLT1
Glucose
Galactose
Fructose
GLUT2
Fructose
GLUT5


Apical surface
Basal surface
Intestinal lumen
Blood
Microvilli
Epithelial cell
2 K+
3 Na+
2 Na+
Na+K+ ATPase
Glucose
Glucose
Glucose uniporter GluT2 (facilitates downhill efflux)
Na+ glucose symporter (driven by high extracellular [Na+])




Epithelium
Lumen
Interstitial space
One of many
brush-border peptidases
Gastric and
pancreatic
peptidases
(AA)4
(AA)3
Oligo-
peptides
(AA)n
+
Amino
acids
Proteins
H+
PepT1
Tripeptidase
AA
AA
AA
(AA)3
(AA)2
AA
+
AA
H+
Dipeptidase
AA + AA
AA
Na+
One of many
AA transporters

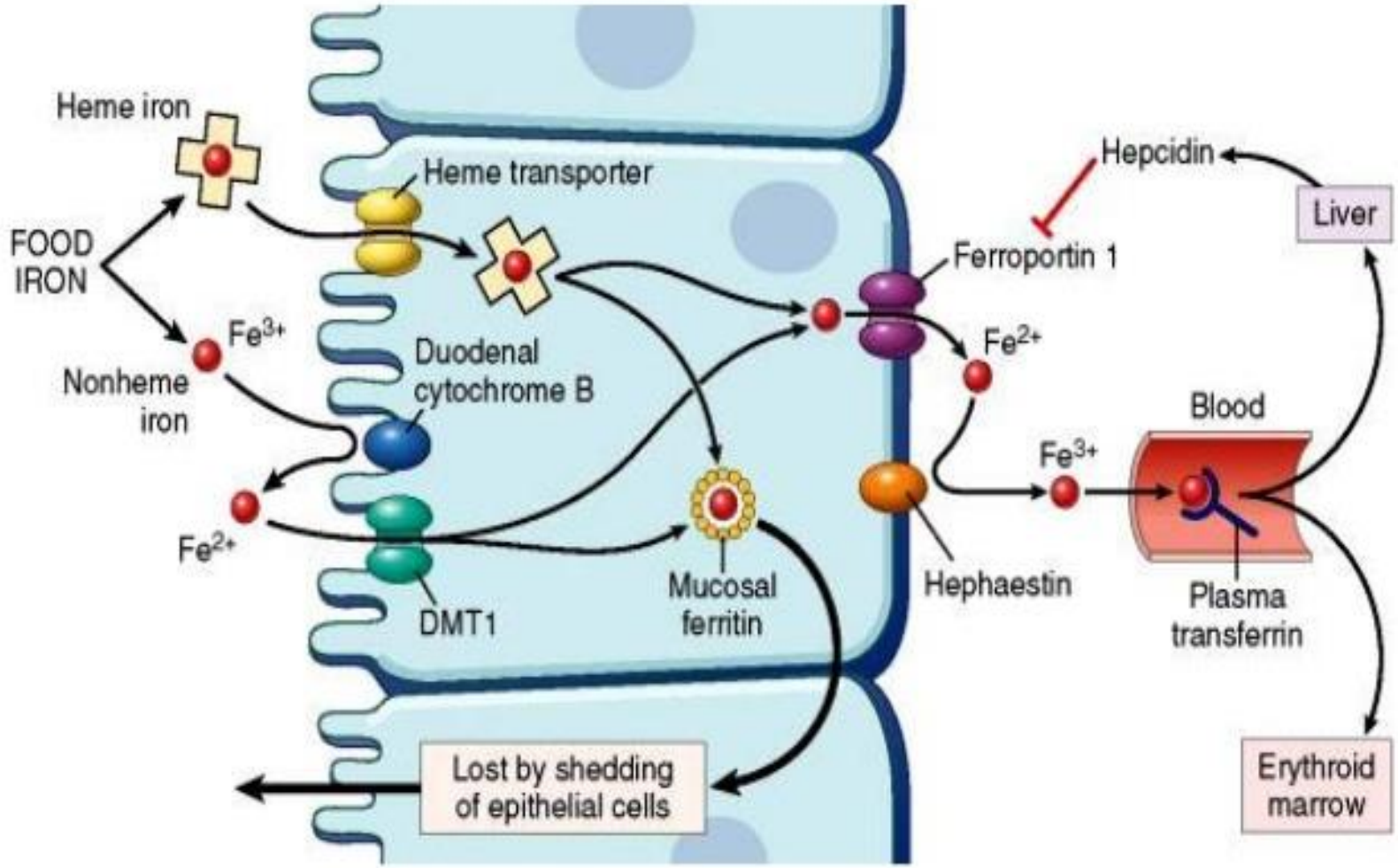

Absorptive cell
1
Long-chain fatty acids and other products of lipid digestion are converted back to triacylglycerols, phospholipids, and esters of cholesterol in the SER.
2
Fat droplets form in the cisternae of the SER.
3
Apolipoproteins are synthesized in the RER and then (except for apolipoprotein A-I) move to the SER, where they associate with lipid droplets. Apolipoprotein A-I associates with chylomicrons in the Golgi apparatus.
8
Glycerol, short-chain, and medium-chain fatty acids pass through the enterocyte and enter blood capillary.
Glycerol, short-chain, and medium-chain fatty acids
Mixed micelle
Cholesterol
Lysophospholipids
Long-chain fatty acids
Monoacylglycerols
Unstirred water layer
SER
Golgi
Protein
Chylomicron
RER
Blood capillary
Lymphatic capillary (lacteal)
Chylomicrons and VLDLs pass through large interendothelial channels of lymphatic capillaries, and enter the lymph.
7
4
Nascent chylomicrons and VLDLs arrive at the *cis* face of the Golgi apparatus. Here, apolipoproteins are glycosylated.
5
Vesicles carrying chylomicrons or VLDLs bud off from the *trans*-Golgi apparatus, and move to the basolateral membrane in transport vesicles.
6
Transport vesicles fuse with the basolateral membrane, releasing chylomicrons or VLDLs.

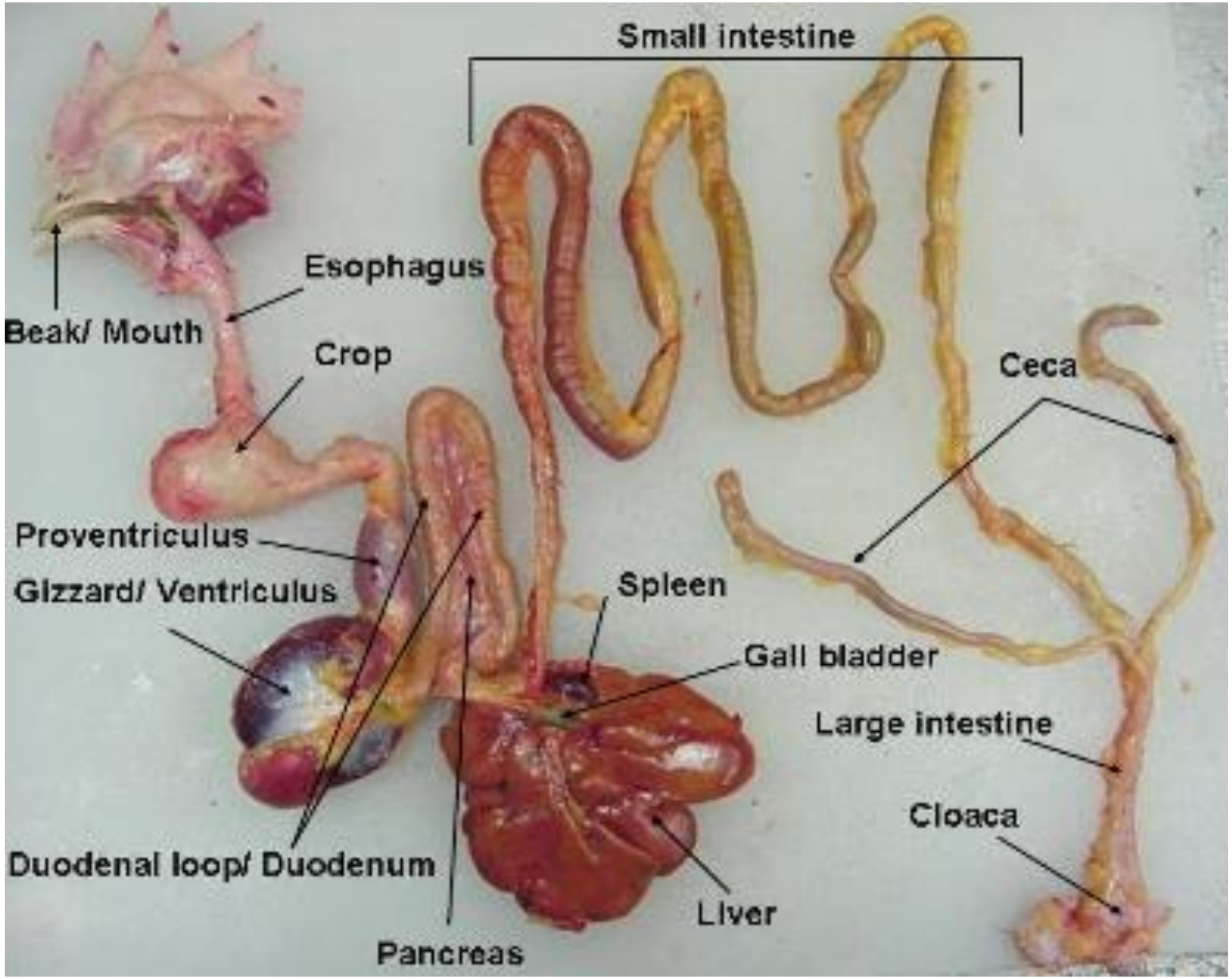
Absorption of vitamins

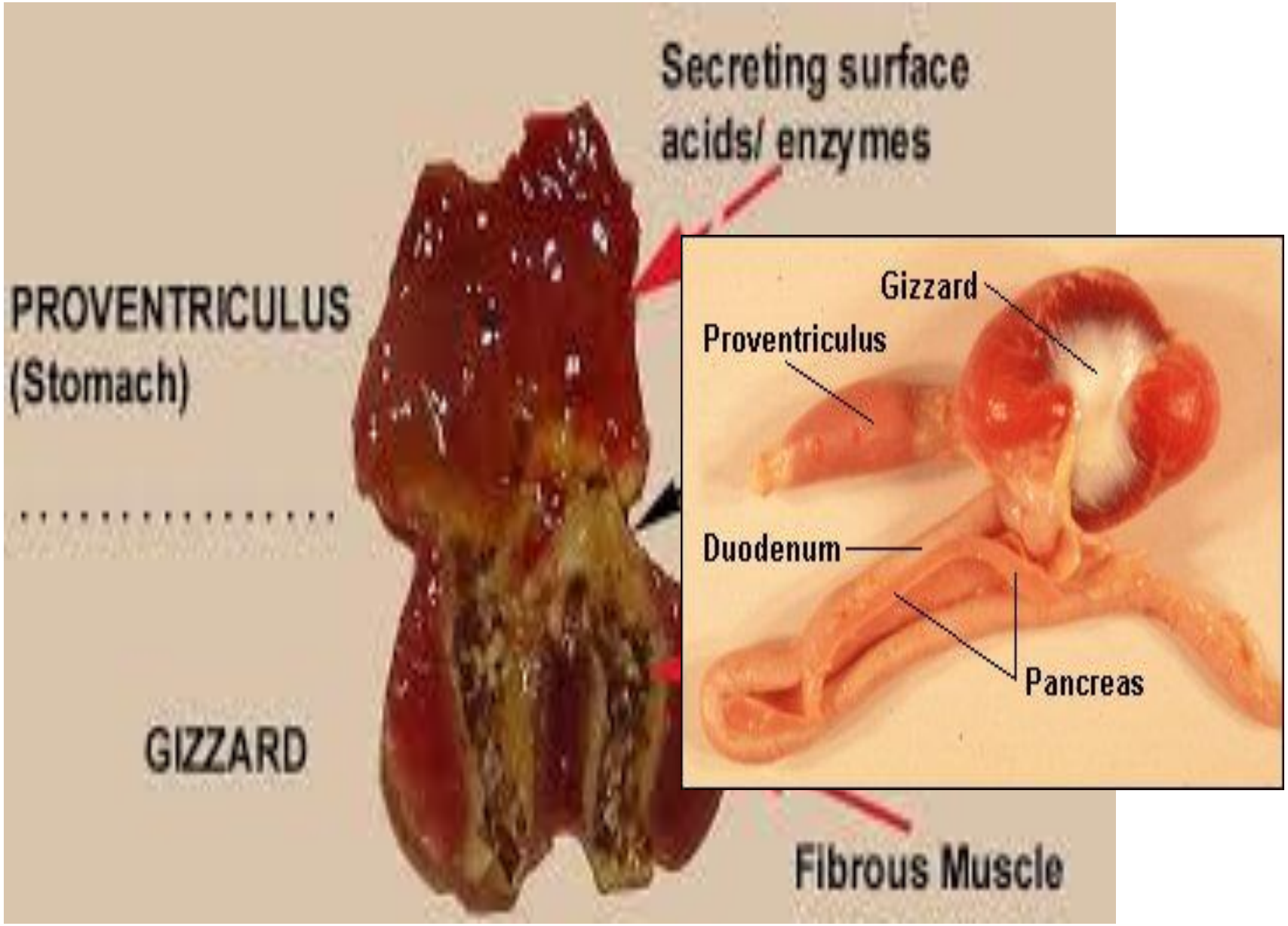
- Fat-soluble vitamins (A, D, E, & K) are incorporated into micelles and absorbed along with other lipids.
- Most water-soluble vitamins (C, B1, B2, B6, and folic acid) are absorbed by Na-dependent co-transport mechanisms.
- Vitamin B_{12} is absorbed in the ileum and requires intrinsic factor.

➢ Gastrectomy results in the loss of parietal cells and loss of intrinsic factor ⟶ pernicious anemia.

Regulation of iron absorption




Small intestine
Esophagus
Beak/ Mouth
Crop
Ceca
Proventriculus
Gizzard/ Ventriculus
Spleen
Gall bladder
Large intestine
Cloaca
Duodenal loop/ Duodenum
Liver
Pancreas


Secreting surface
acids/ enzymes
PROVENTRICULUS
(Stomach)
GIZZARD
Fibrous Muscle
Gizzard
Proventriculus
Duodenum
Pancreas