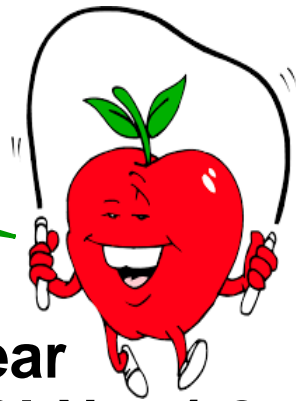


BI 358 Lecture 4

Heck yeah! Nutrition Lab on Tuesday!
Move more, eat smart, weigh less!



- I. Announcements Dr. Bovee feedback due < 5 pm today. Outline + Quiz 1 update? Quiz Key posted near lab. Next T *Nutritional Analyses*. Record diet ≥ 1 d DLN p 4-8. <https://www.supertracker.usda.gov/> <https://cronometer.com/>
- II. Addiction Medicine Follow-up Vaping linked to host of new health risks. ETOH dependence-endocannabinoid link?
- III. Nutritional Physiology in the News Eye-Mouth Gap? UCB Wellness 2007 + Zuti & Golding, Diet vs. Exercise 1976!
- IV. Metabolic Lab Research cf: Dietary Intake Estimation
- V. Gastrointestinal Physiology G&H ch 62, 63, 64, 65 + LS2
 - A. Digestion overview + alimentary tract fig 62-1 p 753-4
 - B. Gut cross section, histology + plexi fig 62-2 pp 754-9
 - C. Secretions+phases tab 64-1, fig 64-1,64-2,64-7 pp 775-87
 - D. Hydrolysis: Central theme of digestion ch 65 p 789-93
 1. Carbohydrate fig 65-1 p 790
 2. Fat fig 65-3 p 791, fig 65-4 p 792
 3. Protein fig 65-2 p 791

WOW!



SUPER



~ TOP 5-10!

EXCELLENT!!



~ TOP 15!

GREAT EFFORT



~ TOP 20-25!

Vaping Linked to Host of New Health Risks



<https://www.sciencenews.org/article/vaping-linked-host-new-health-risks>

ETOH Dependence + Link to Endocannabinoids?

Suspect Genes?

Dopaminergic Receptor DA D2
ETOH Dehydrogenase
Aldehyde Dehydrogenase
Fatty Acid Amide Hydrolase (FAAH)
G- vs A-allele μ -Opioid Receptor (OPRM 1)
Cation Transport & Synaptic Transmission

Membrane-bound
enzyme

Metabolizes Anandamide + Δ 9-THC
Anandamide Deficient \rightarrow Anxiety



*e.g., Delete Gene for FAAH or Block
FAAH Action by URB597 (KDS4103)*

1. \uparrow Preference for ETOH
2. \uparrow Sensitivity to ETOH Sedation
3. \uparrow Recovery from ETOH Motor Incoordination

e.g., G- vs A-Allele for OPRM 1

1. \uparrow Feelings of Intoxication/Sedation
2. \uparrow Happiness/Euphoria
3. Naltrexone more effective in patients with G-allele?

<http://www.ncbi.nlm.nih.gov/pubmed/26756798>

<http://www.ncbi.nlm.nih.gov/pubmed/24325918>

<http://www.ncbi.nlm.nih.gov/pubmed/24268660>

The Eye-Mouth Gap? UC Berkeley Wellness Engagement Calendar, September 2007



Ask people what they ate yesterday or even today, and the odds are that they'll underestimate the amount. This discrepancy is called the *eye-mouth gap*.

One study found that some obese people actually ate twice as much as they reported. Research has shown that perhaps 80% of us – even lean and athletic people – underestimate our food intake.



The Eye-Mouth Gap?

Yikes!



Adults underestimate, on average, their daily intakes by 800 calories.

> 1 ½ lb per wk!!

They overestimate intakes of fruit & dairy products, but underestimate amounts of sweets, refined grains, oils, and other fats they eat.

Misreporting is seldom a deliberate deception – it's likely an unconscious response perhaps to social & family pressure, combined with wishful thinking.

People don't know how much food they put on their plates.

The Eye-Mouth Gap Bottom Line

If you're trying to lose weight or improve your diet, don't trust your eyes.

Weigh or measure the food you eat to get a good sense of how much you're really eating ??



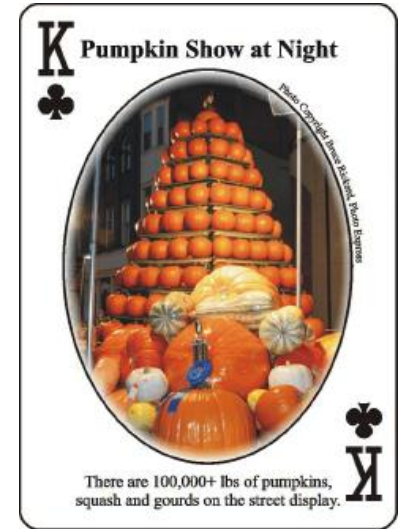
Lombo editorial comments:

- 1. Train yourself to make good guesses/estimates rather than weigh everything.*
- 2. Train yourself...that is...
Exercise! Exercise!! Exercise!!!*

4 oz → 3 oz



Deck of Cards



or

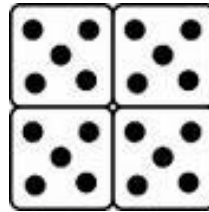


≡ 1 c

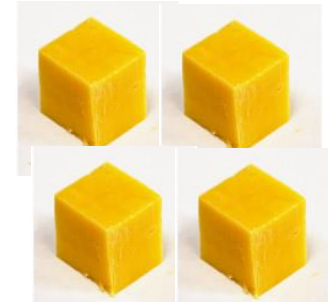
raw → cooked



≡ 1/3 c



≡ 1 oz



≡ 1/4 c



≡ 1.5 oz



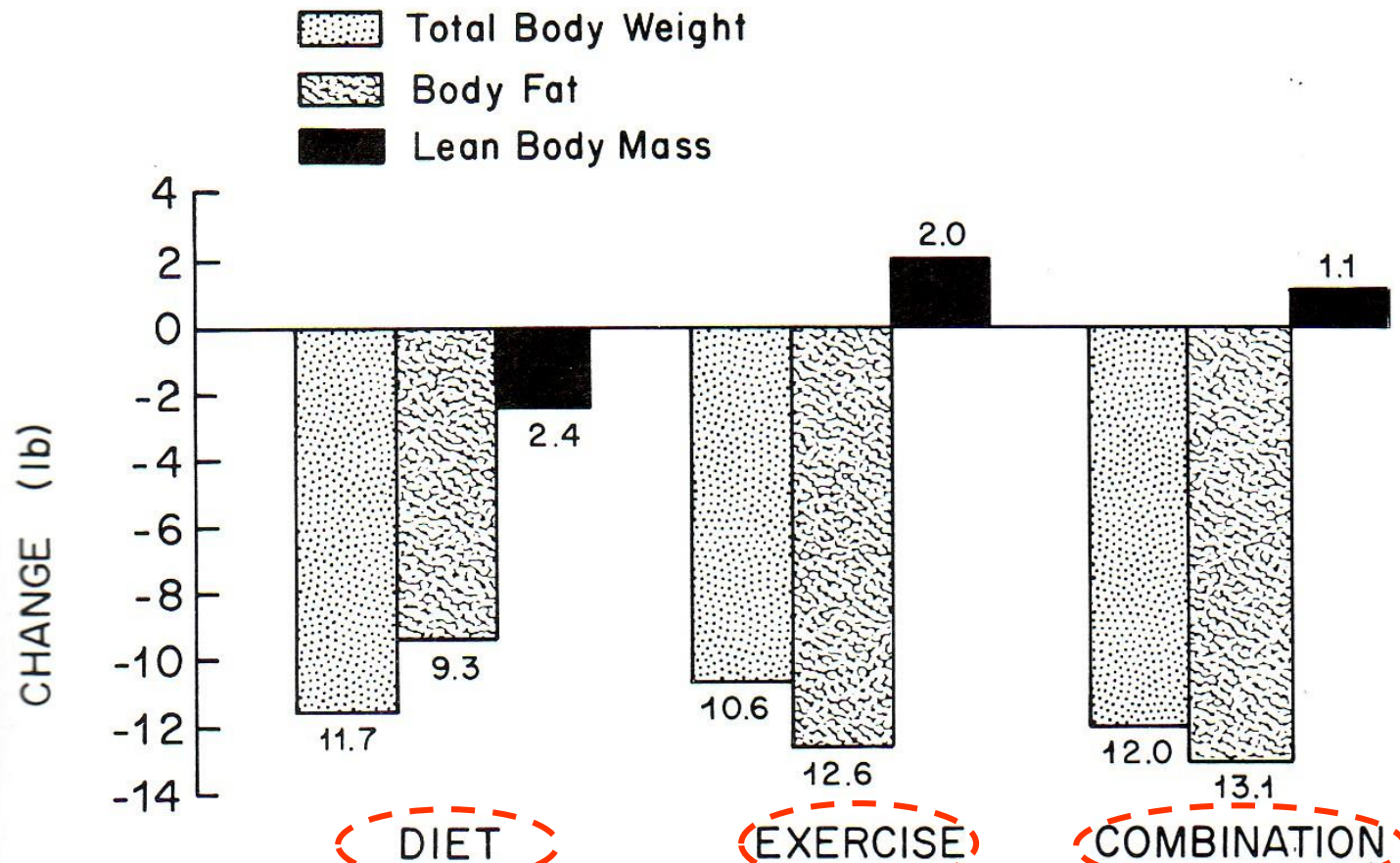


Figure 4-9. Changes in body weight, body fat, and lean body weight for diet, exercise, and combination groups. (From Zuti W. B., and Golding, L. A.: Comparing diet and exercise as weight reduction tools. *Phys. Sportsmed.* 4:49-53, 1976.)

NB: Each group 500 kcal deficit/day, 16 weeks



Exercise is better than dieting in lowering body fat & preserving muscles!



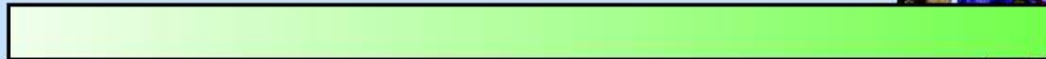
Dietary Composition & Physical Endurance

eg, Atkins!

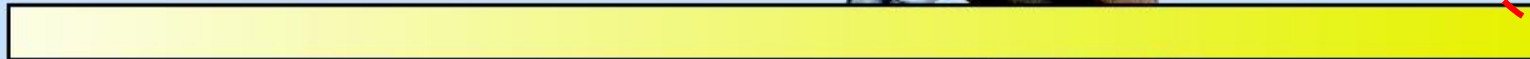
High-fat diet



Normal mixed diet



High-carbohydrate diet



~ 1/3 endurance!

Maximum endurance time:

57 min

114 min

167 min



Tedium of Metabolic Lab & Dietary Research

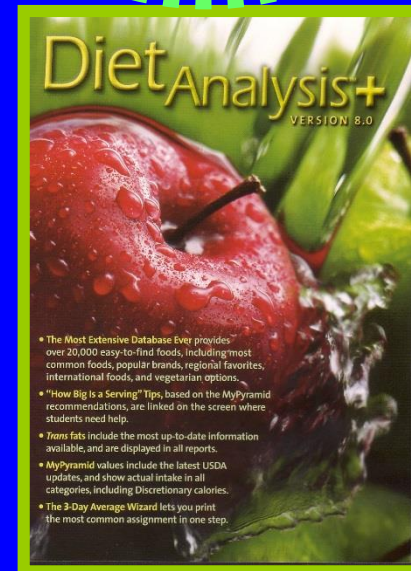


Discussion/Lab 4: Nutritional Analyses via 2 Programs



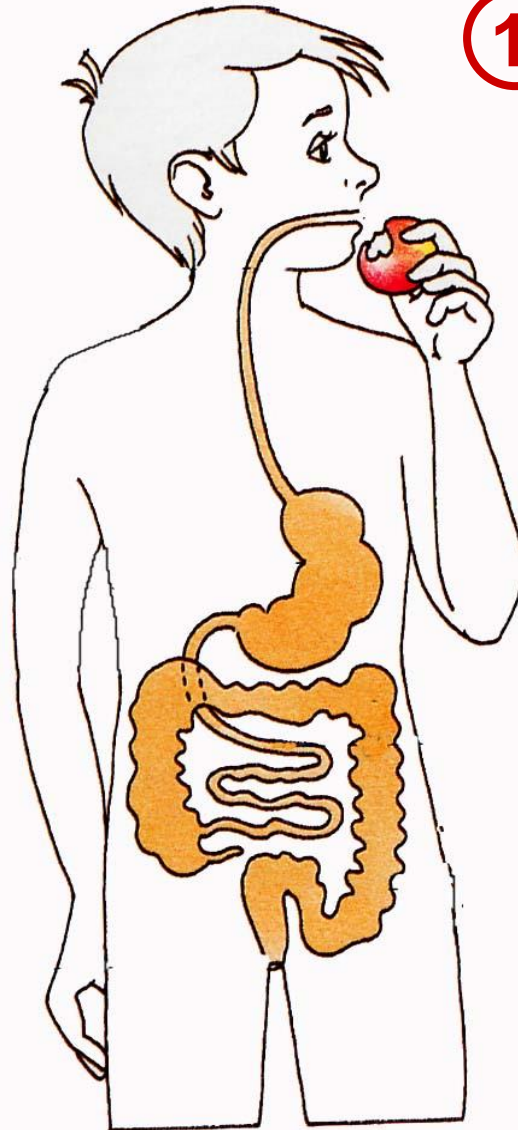
<https://www.supertracker.usda.gov/>

+



<https://cronometer.com/>

Digestion Steps



① Ingestion

② Mechanical Digestion

③ Chemical Digestion

④ Peristalsis

⑤ Absorption

⑥ Storage

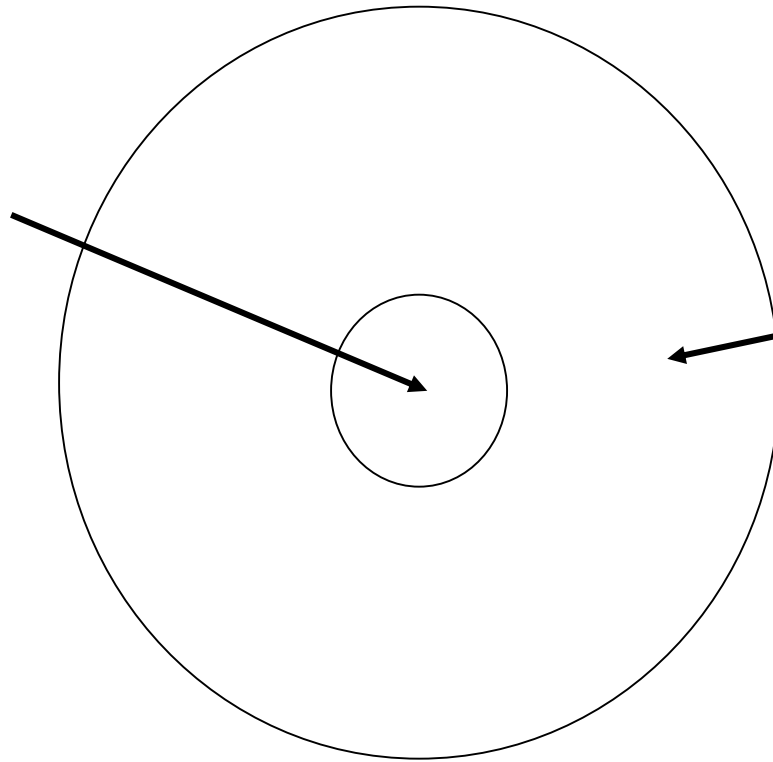
⑦ Defecation



GI-Doughnut Analogy



GI Lumen

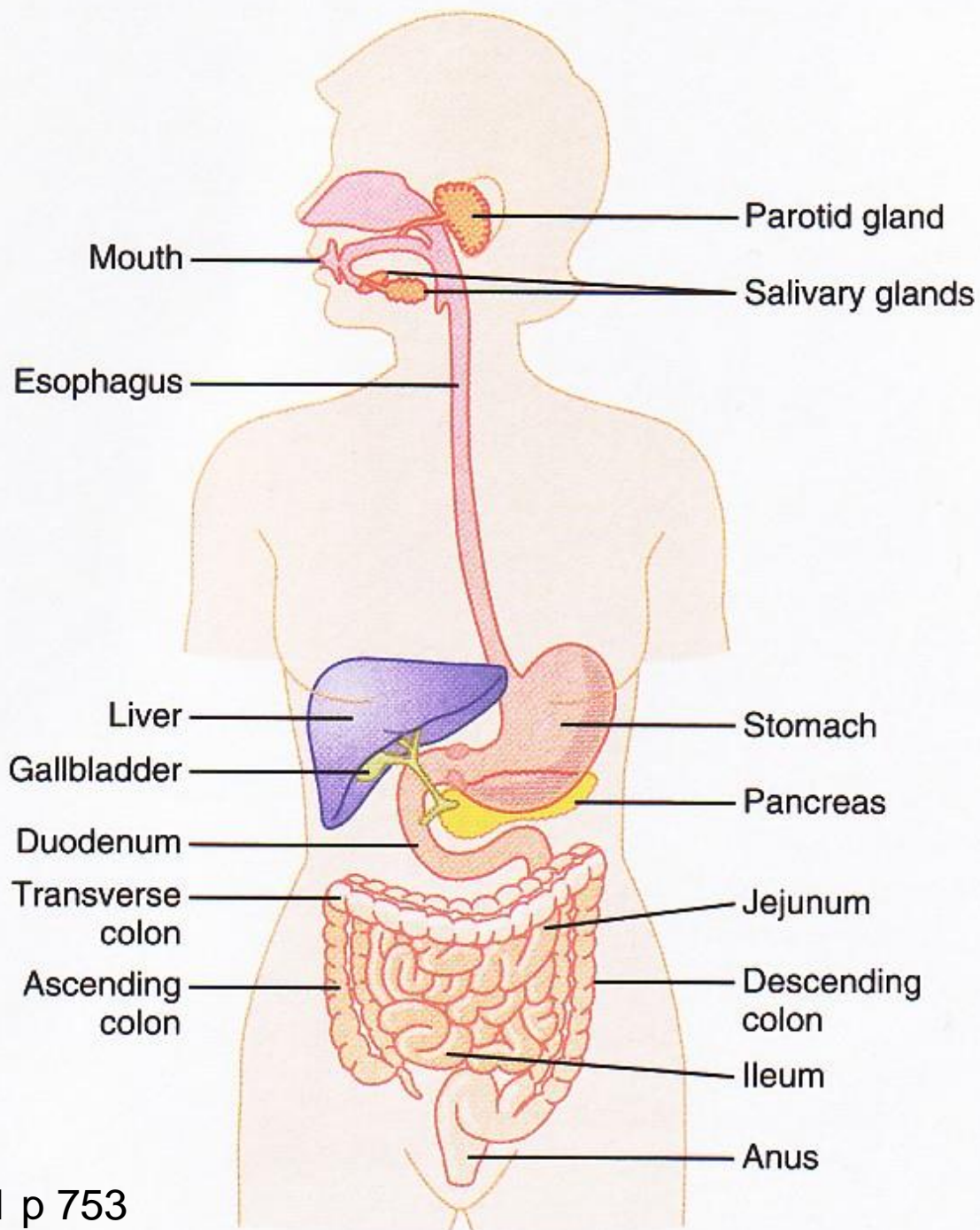


Body



Me
?





GI Regulation

1. Local/Intrinsic → autoregulation

rapid { 2. Nervous

{ 3. Hormonal

→ extrinsic

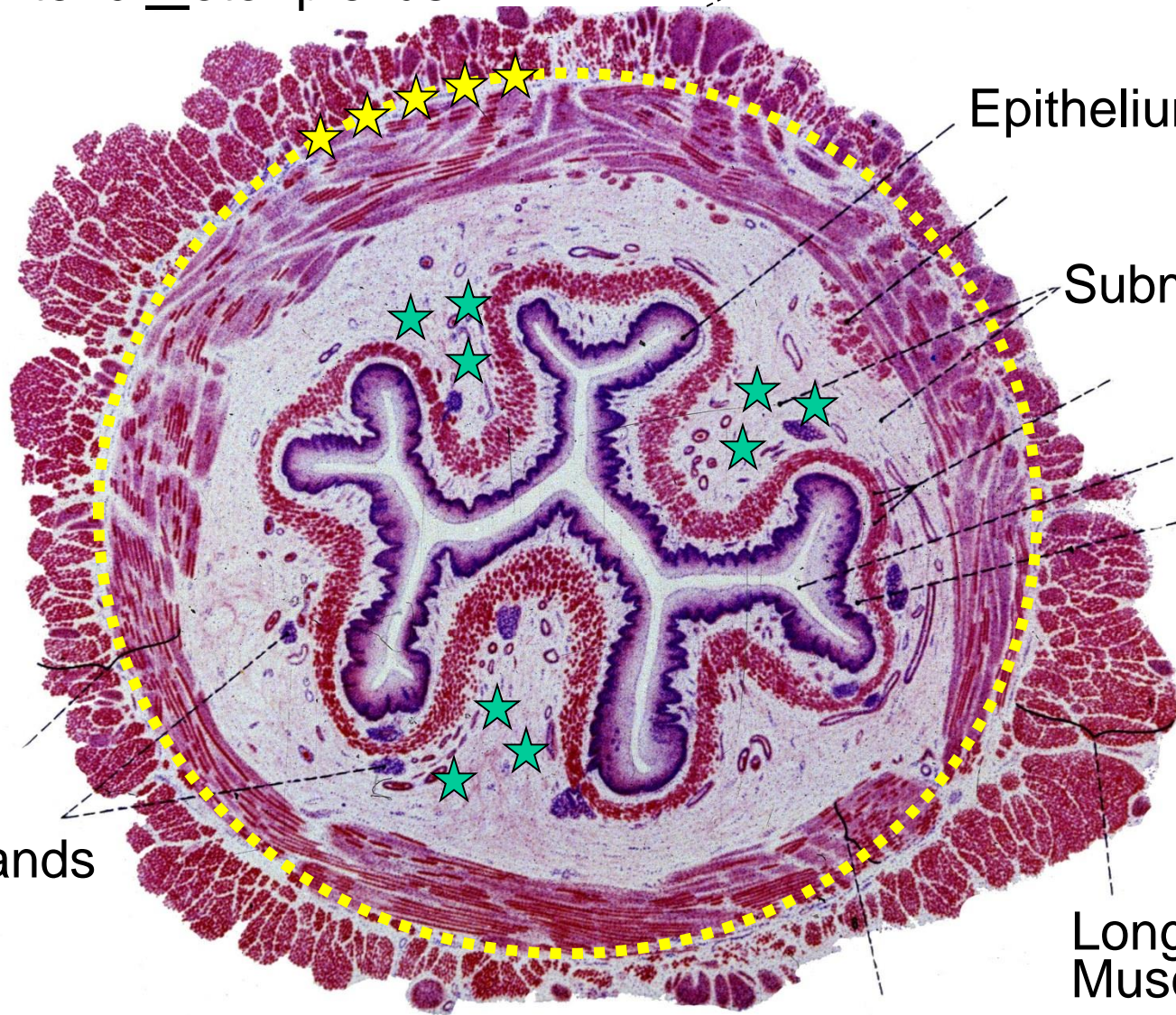
Slower,
but longer
lasting!

★ Myenteric motor plexus!

Serosa

cf: G&H fig 62-2

LOCAL



Epithelium

Submucosa

Lumen

Lamina
Propria

Muscularis
Externa

Glands

Longitudinal
Muscle

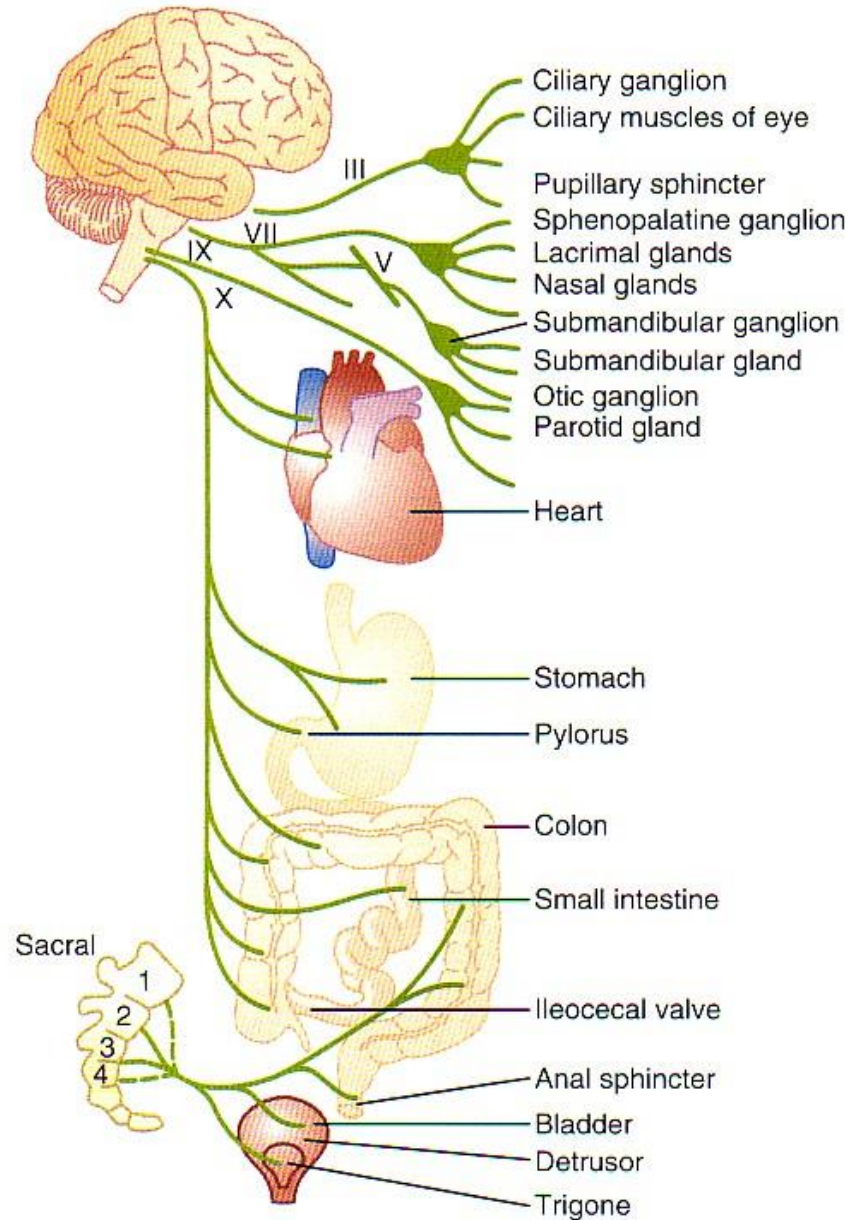
Circular
Muscle

★ Meissner's sensery &
secretory plexus!

H Howard 1990

Parasympathetic Branch Activates the Gut!

NERVOUS



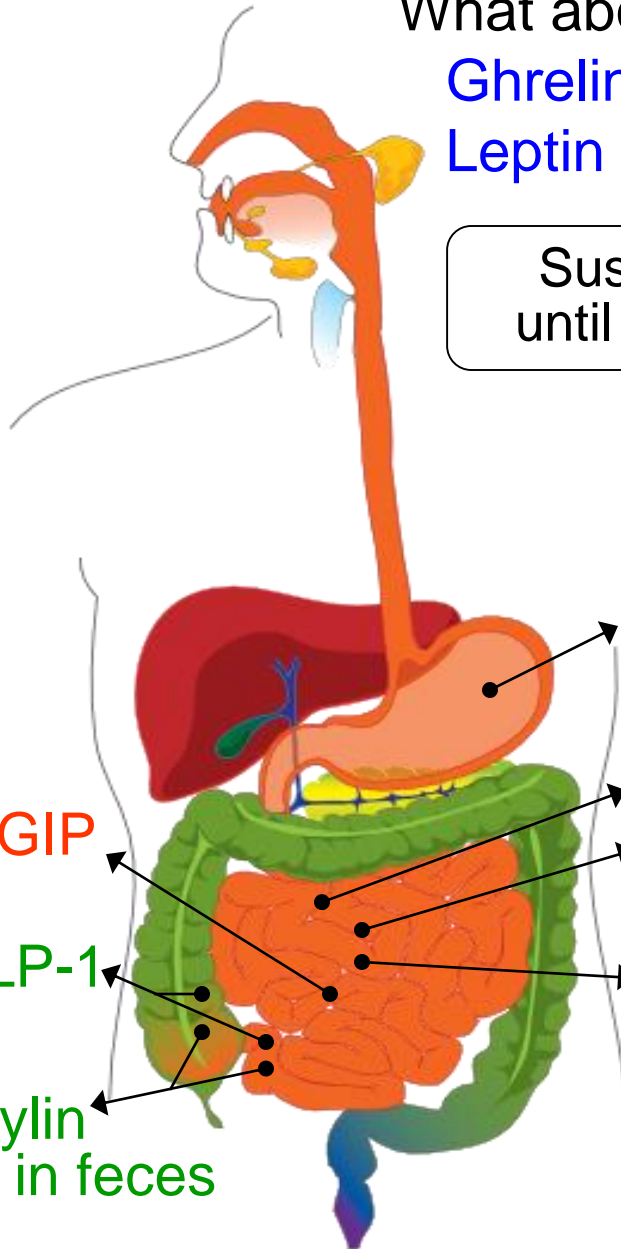
HORMONAL

What about feedback for hunger-satiety?

Ghrelin (stomach fundus, pancreas,...)

Leptin (adipocytes)

Suspense –
until next time!



Gastrin → HCl, Pepsinogen
by stomach

Motilin → ↑ Motility

Secretin → HCO_3^- , H_2O
by pancreas

Cholecystokinin → Gallbladder
contraction +
Pancreatic
enzymes

↓ Motility ← GIP
↑ Insulin

↓ Motility ← GLP-1
↑ Insulin

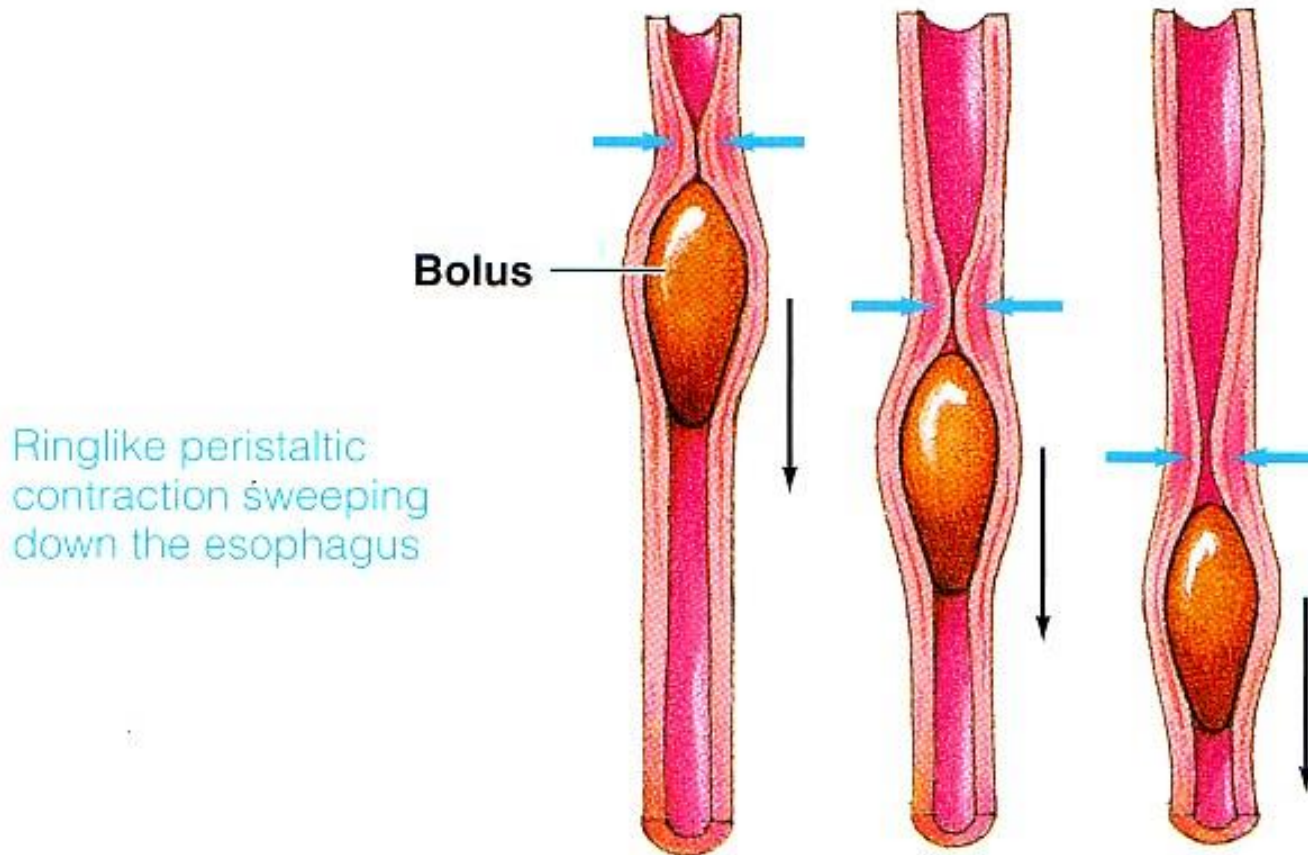
↑ Cl^- ← Guanylin
↑ $\text{NaCl} + \text{H}_2\text{O}$ in feces

● **FIGURE 15-6**

Peristalsis in the esophagus. As the wave of peristaltic contraction sweeps down the esophagus, it pushes the bolus ahead of it toward the stomach.



For an animation of this figure, click the Gastrointestinal Motility tab in the Gastrointestinal Physiology tutorial on the CD-ROM.



Gut Secretions

Secretion

Release Site

1. Mucus

into GI Lumen

2. Enzymes

into GI Lumen

3. H₂O, acids, bases+

into GI Lumen

4. Hormones

into Blood

Table 64-1 Daily Secretion of Intestinal Juices

	Daily Volume (ml)	pH
Saliva	1000	6.0-7.0
Gastric secretion	1500	1.0-3.5
Pancreatic secretion	1000	8.0-8.3
Bile	1000	7.8
Small intestine secretion	1800	7.5-8.0
Brunner's gland secretion	200	8.0-8.9
Large intestinal secretion	200	7.5-8.0
Total	6700	

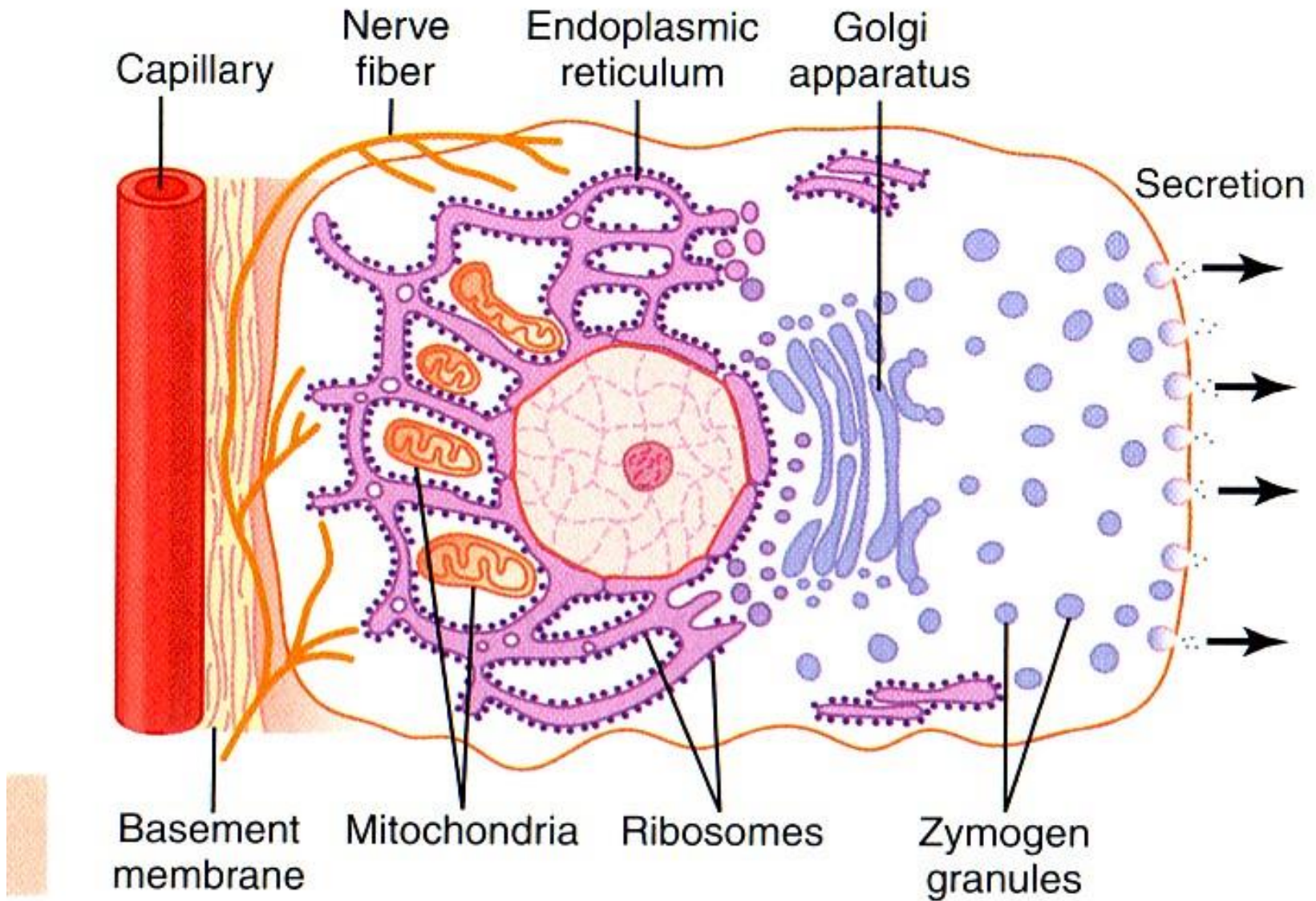


Figure 64-1 Typical function of a glandular cell for formation and secretion of enzymes and other secretory substances.

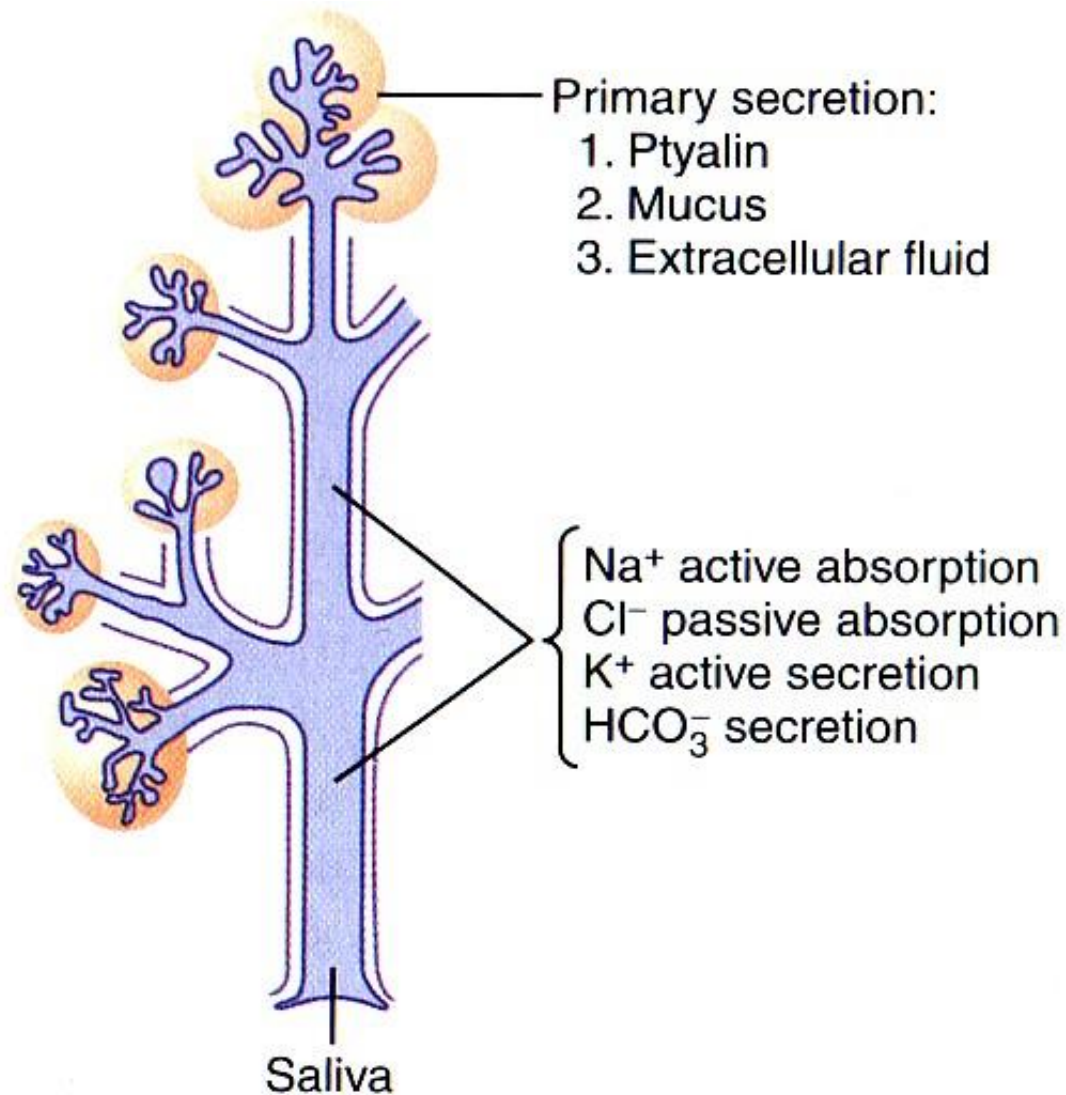


Figure 64-2 Formation and secretion of saliva by a submandibular salivary gland.

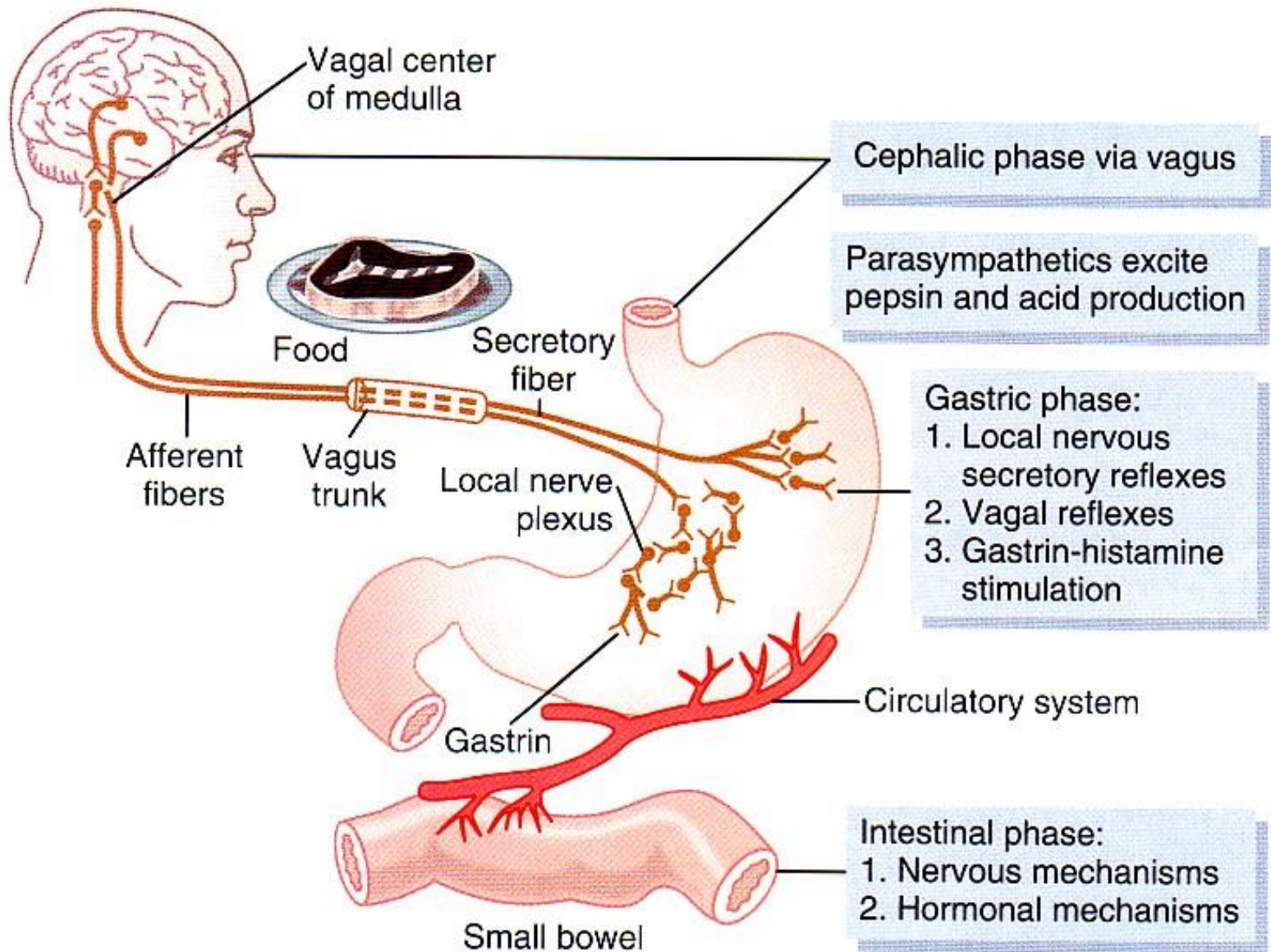


Figure 64-7 Phases of gastric secretion & their regulation. G&H 2011 p 780.

Hydrolysis of Energy Nutrients

...Central-linking theme!!

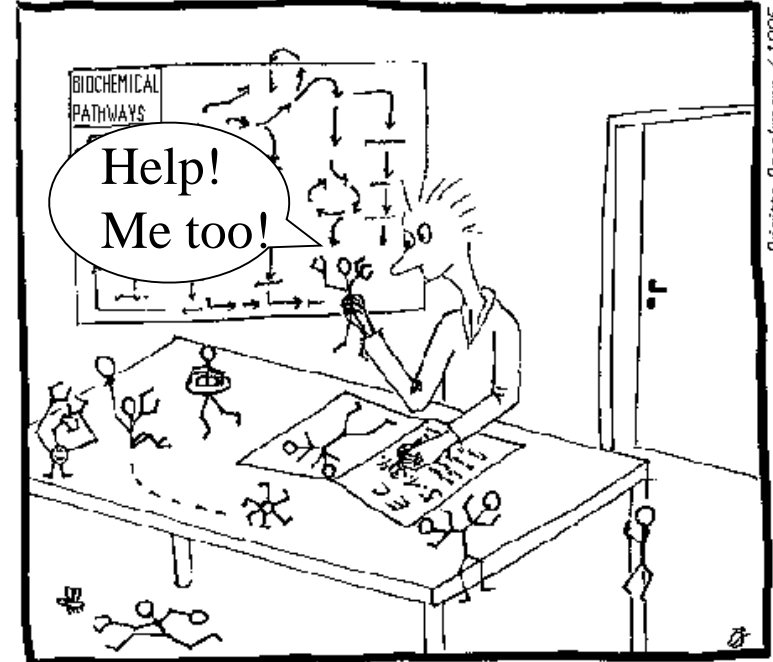


Hi gang!!
You need me
for digestion!!



+

The ENZYME data bank



H₂O

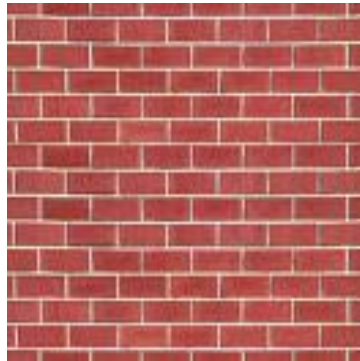
+

Enzyme

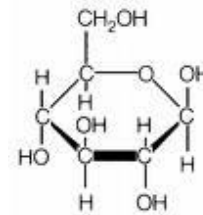
Polymer to Monomer (Many to One)



...Central-linking theme, again!!

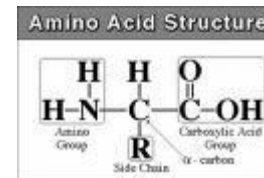


Carbohydrate

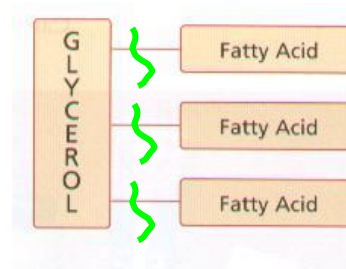


Glucose

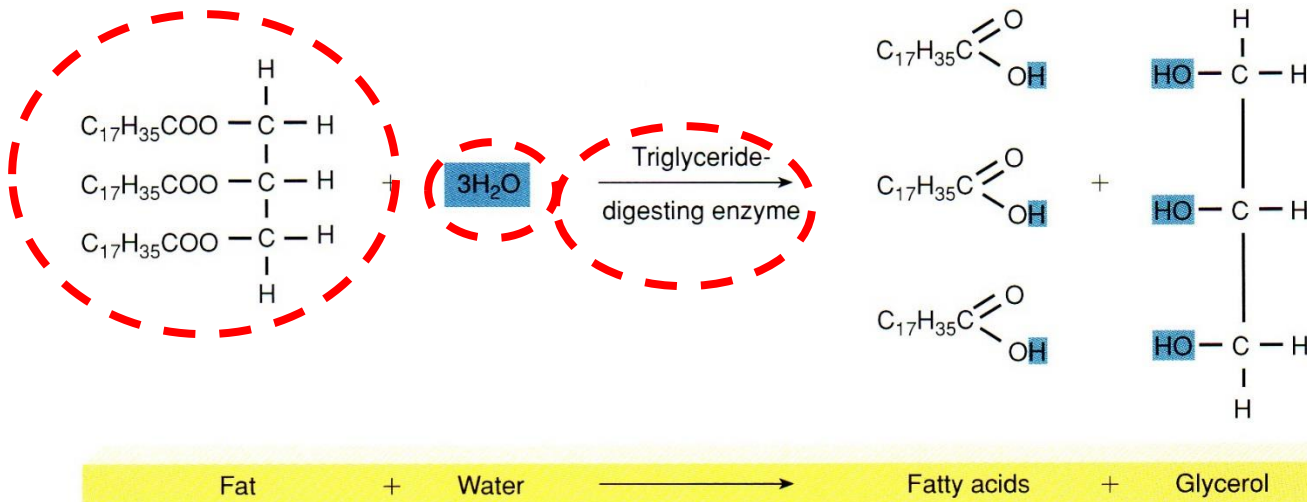
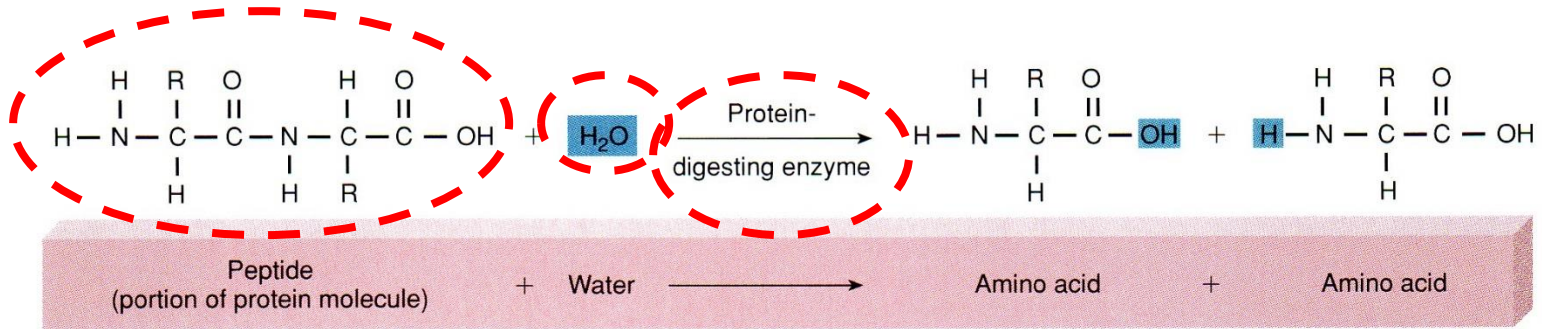
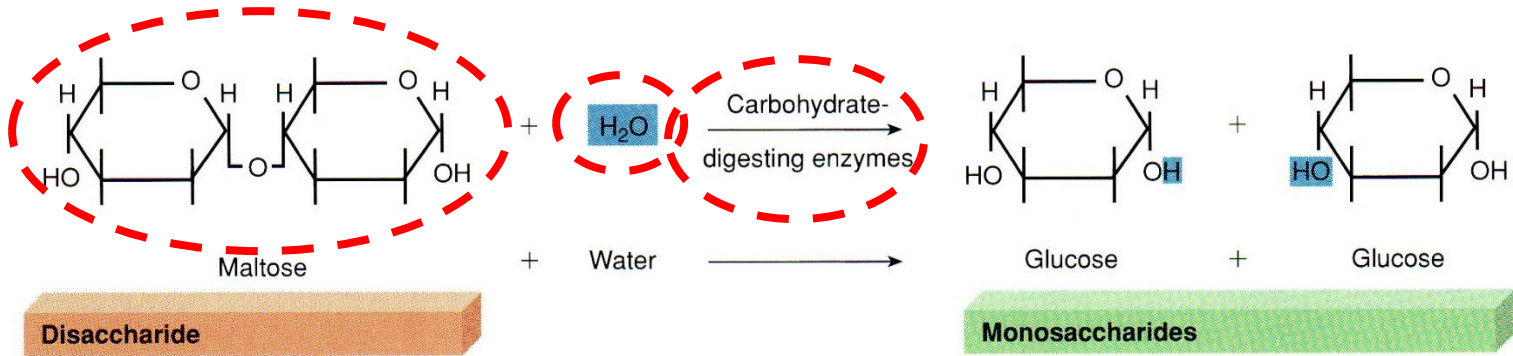
Protein
+
Fat



Amino Acids



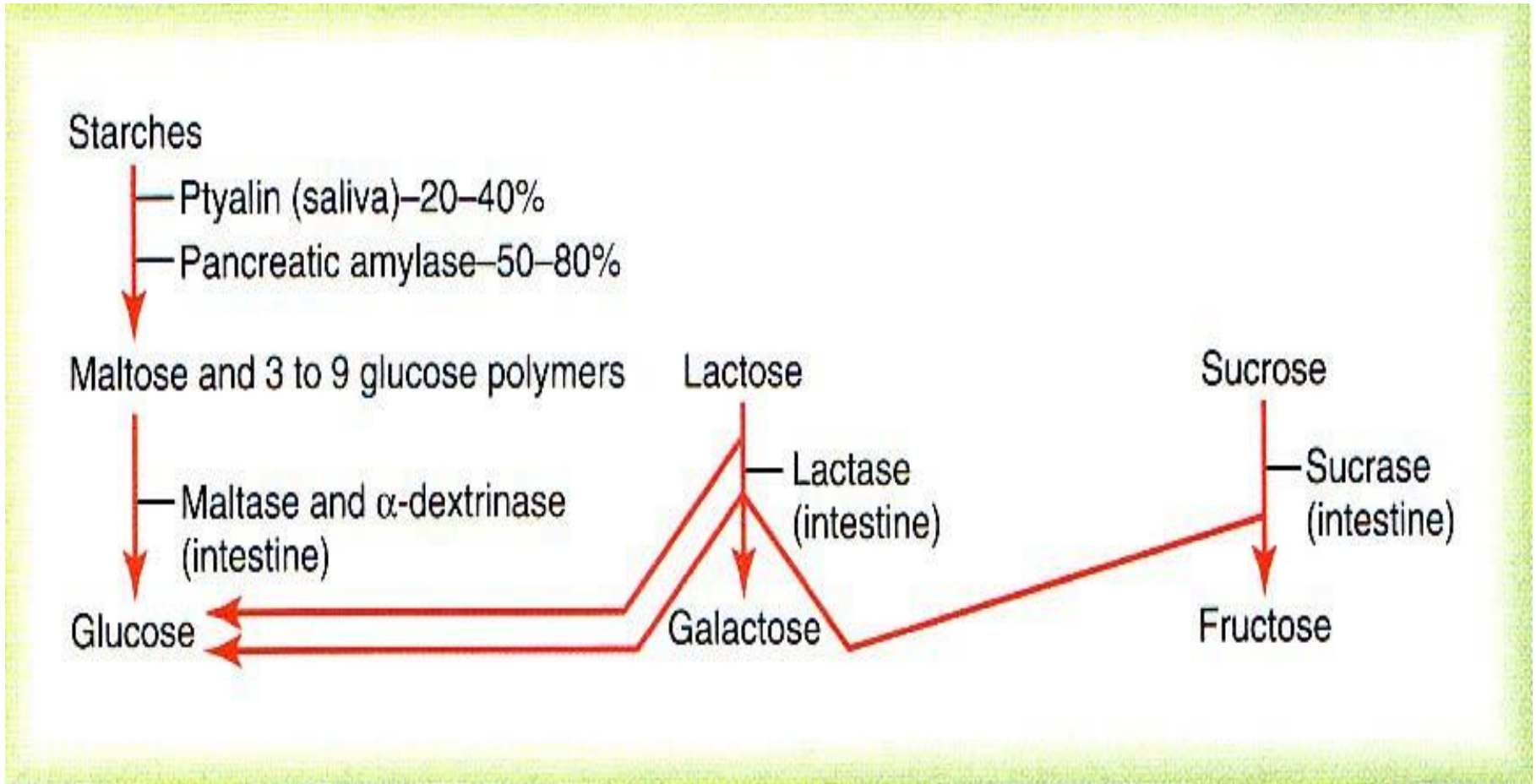
Fatty Acids
+
Glycerol



Carbohydrates in foods



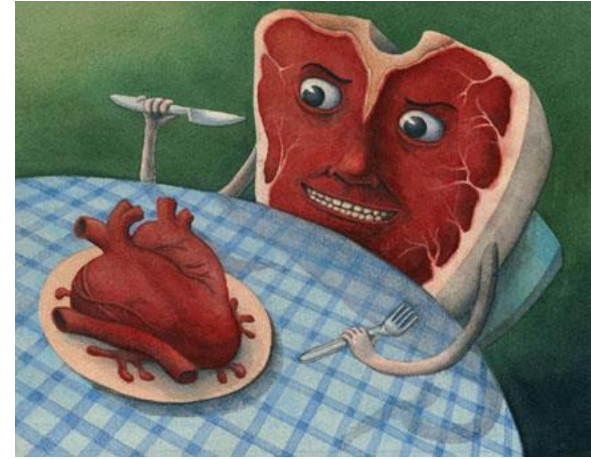
Carbohydrate Digestion = 1^o Energy Nutrient



Why Do Some People Have Trouble Digesting Milk?

- Ability to digest milk carbohydrates varies
 - Lactase
 - Made by small intestine
- Symptoms of intolerance
 - Gas, diarrhea, pain, nausea?
- Milk allergy?
- Nutritional consequences
- Milk tolerance and strategies

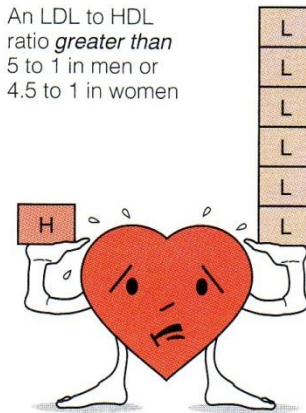




HIGH FAT FOODS



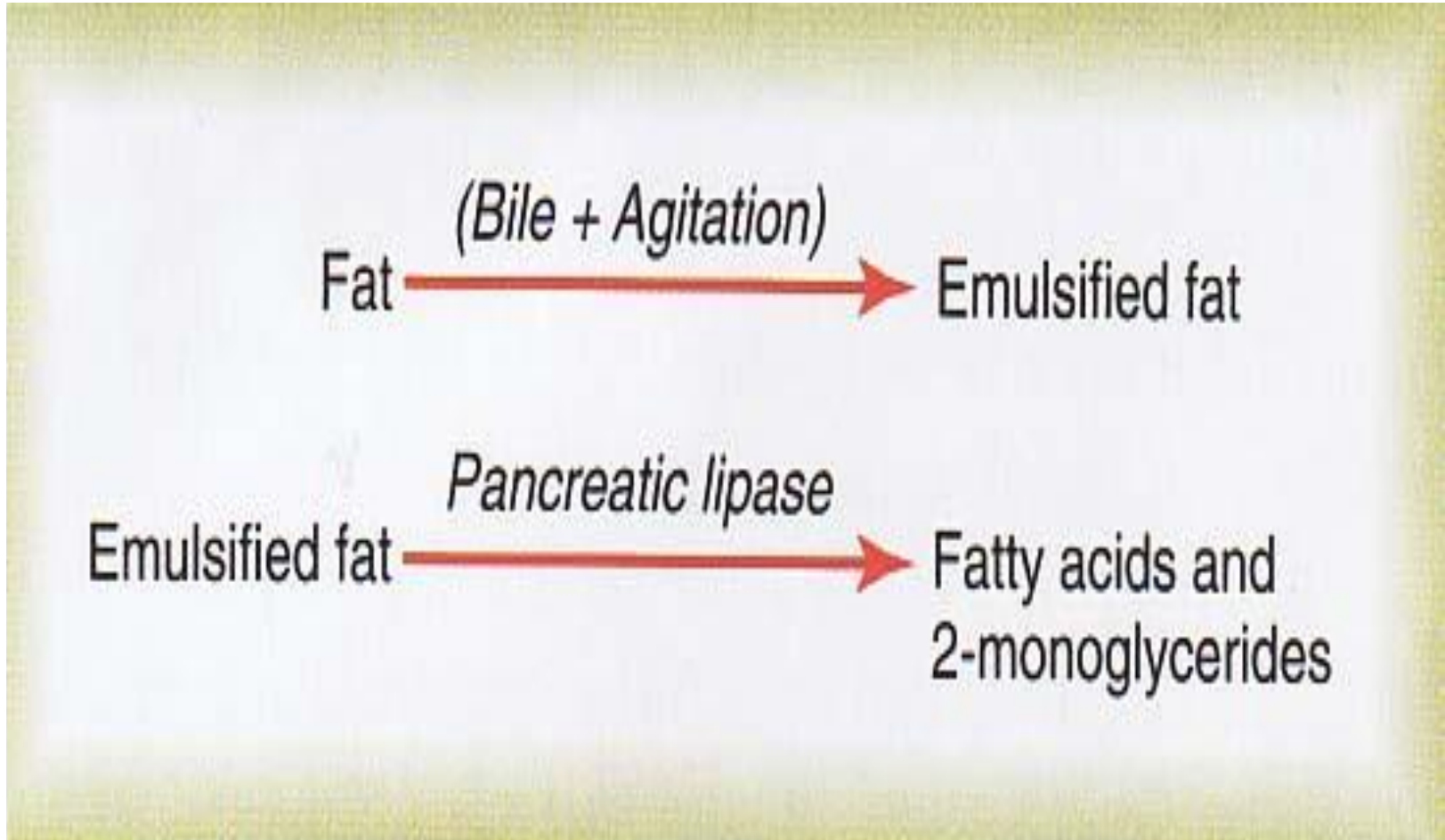
An LDL to HDL ratio *greater than* 5 to 1 in men or 4.5 to 1 in women

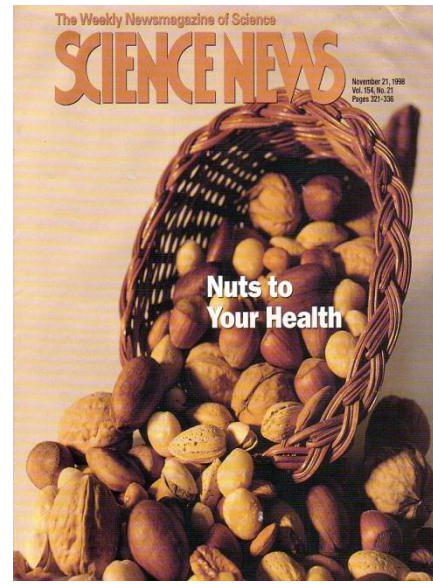


Increased risk of heart disease



Fat Digestion = 2^o Energy Nutrient

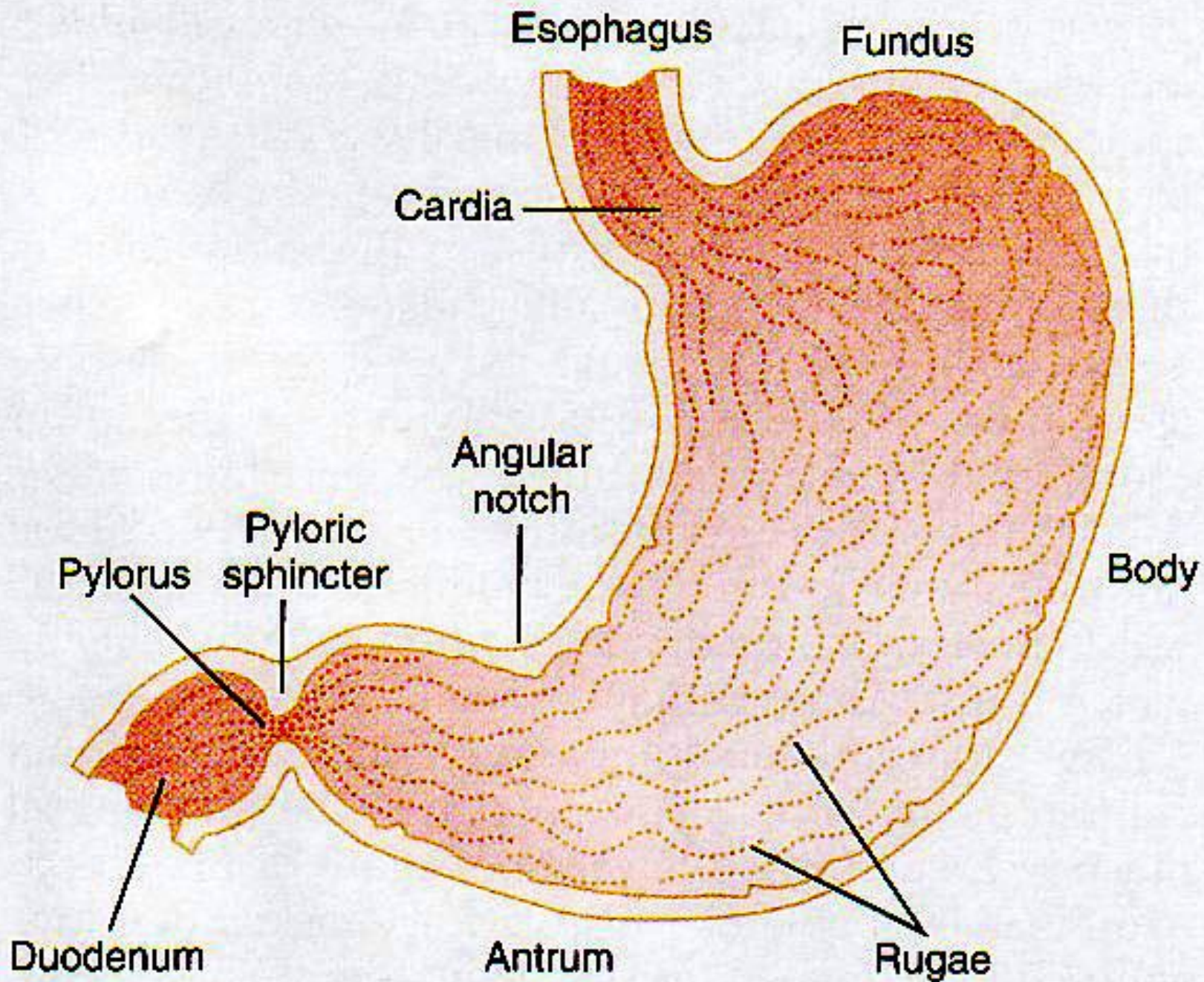




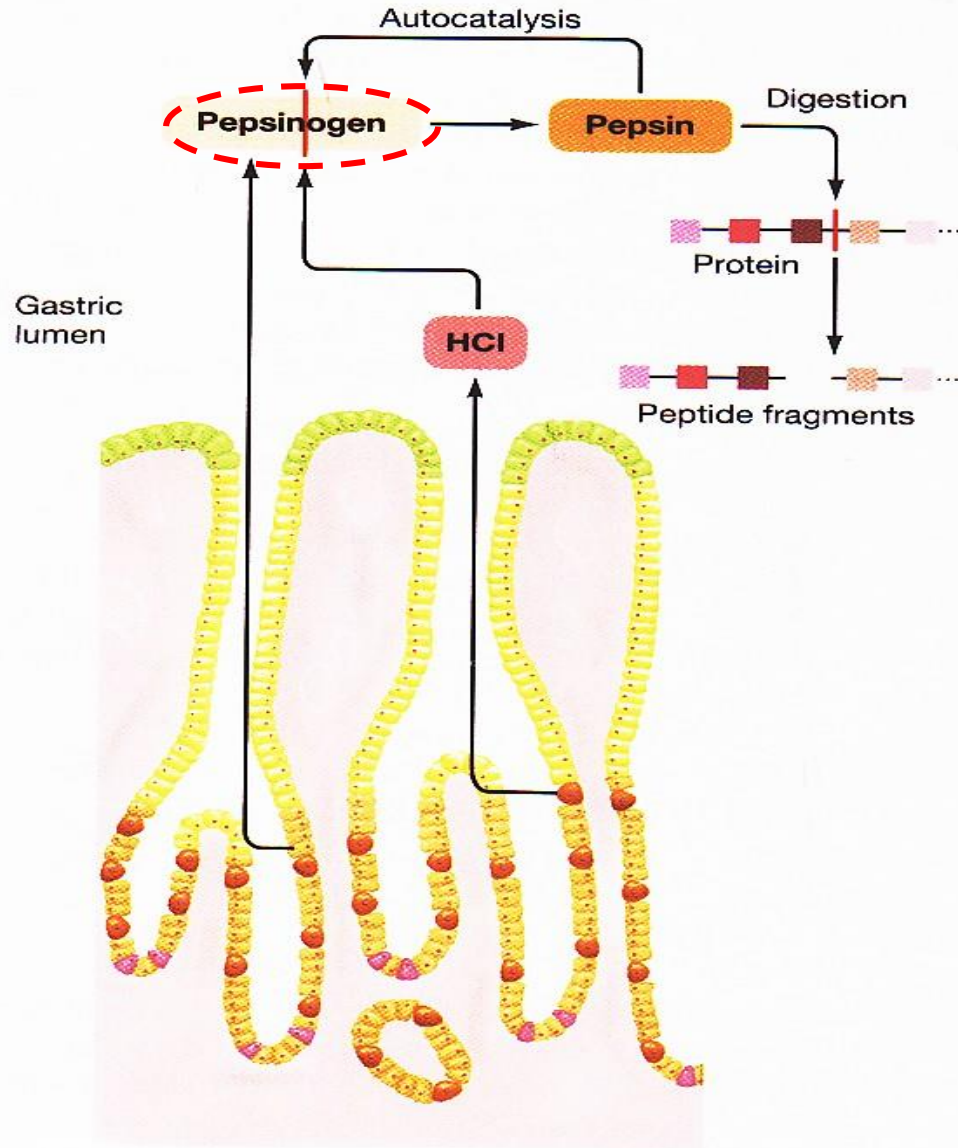
HIGH PROTEIN (FAT?) FOODS?



**Where does
enzymatic
digestion of
protein
begin?**



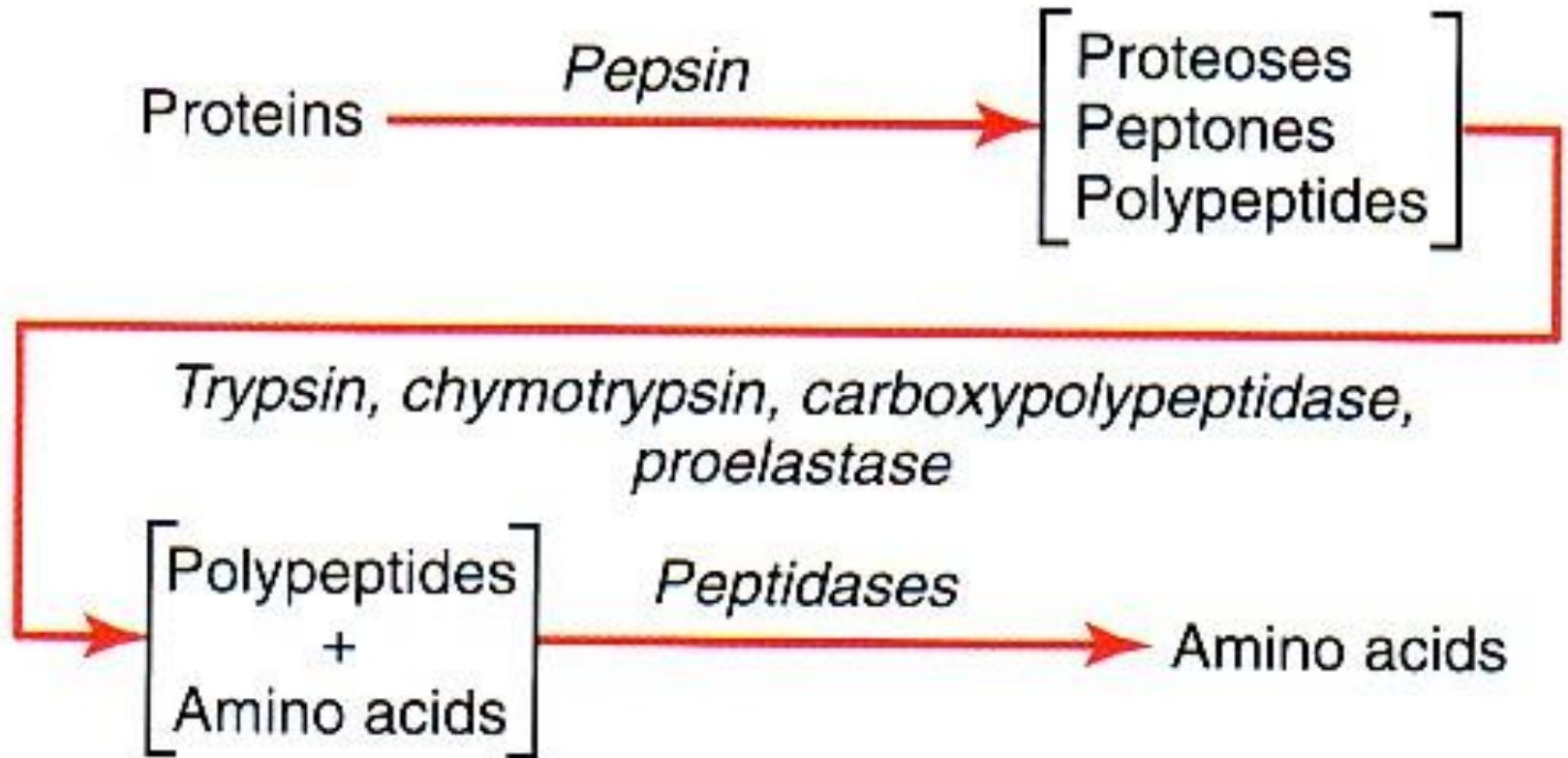
Zymogen
= *inactive precursor*



■ ■ ■ = Various amino acids

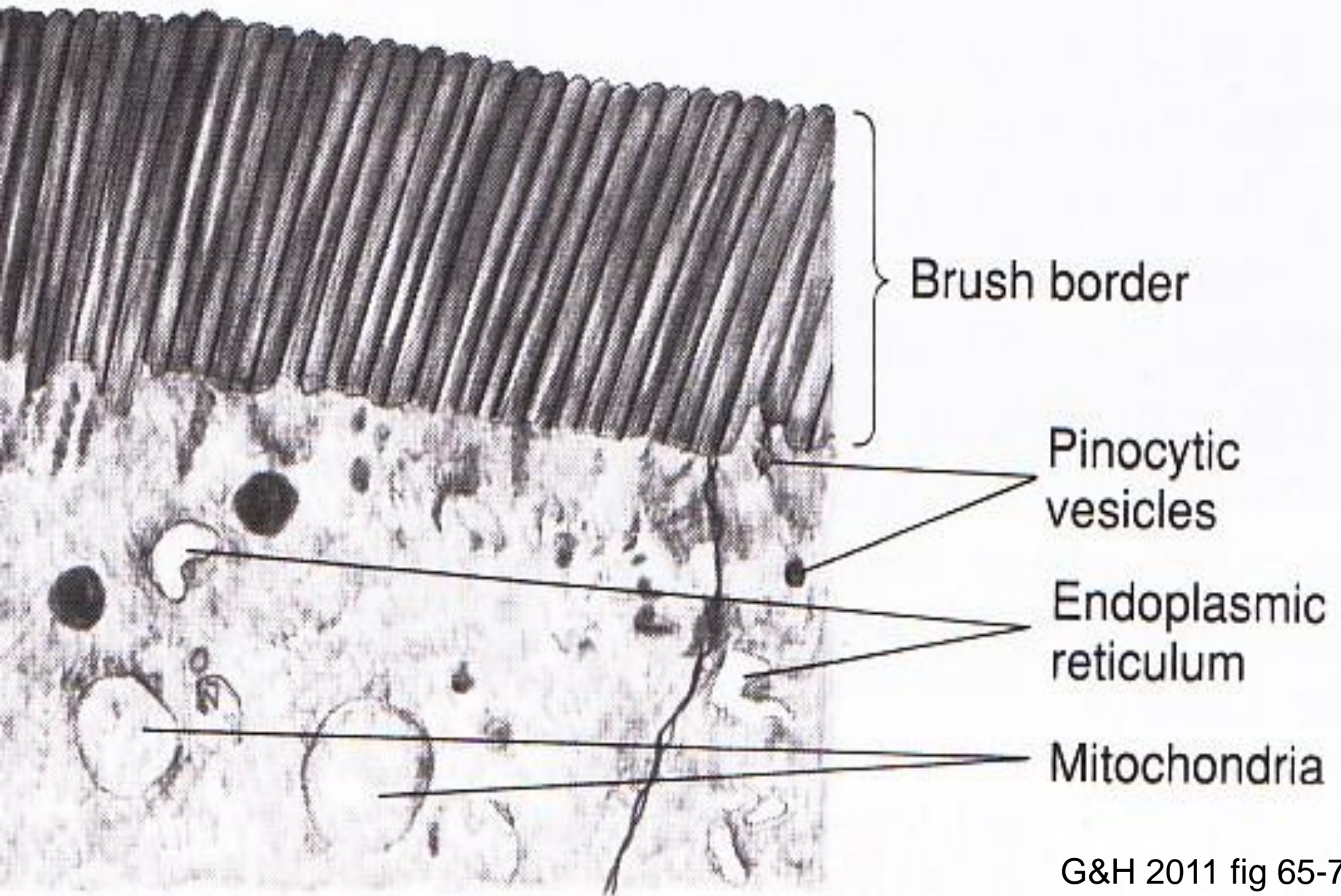
| = Enzymatic splitting of a chemical bond

Protein Digestion = 3⁰ Energy Nutrient

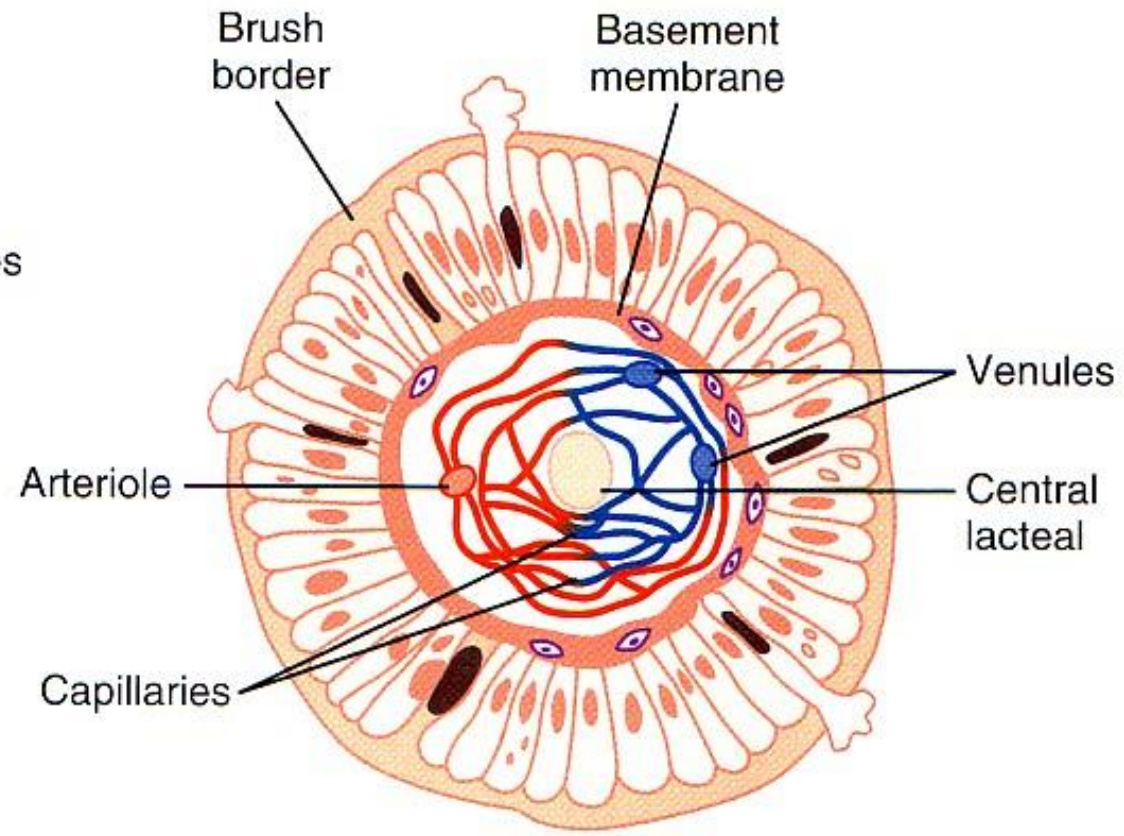
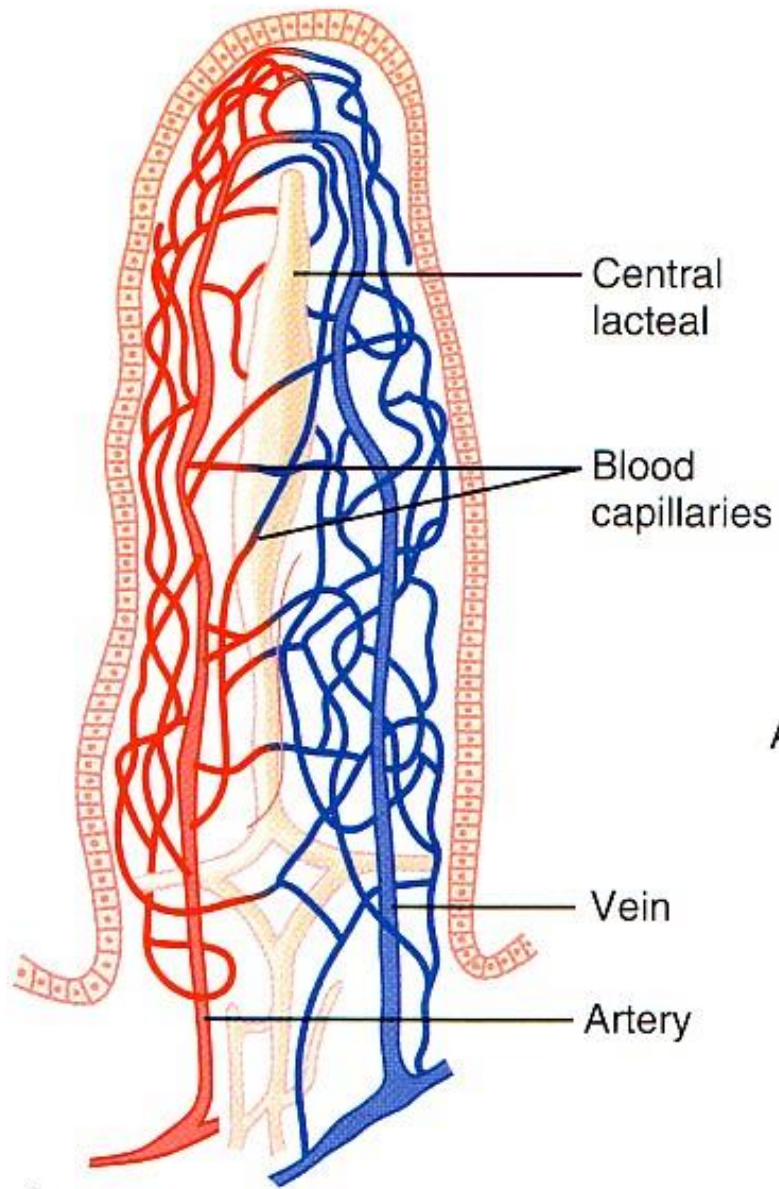


What is the major
function of the
small intestine?

Absorption!!



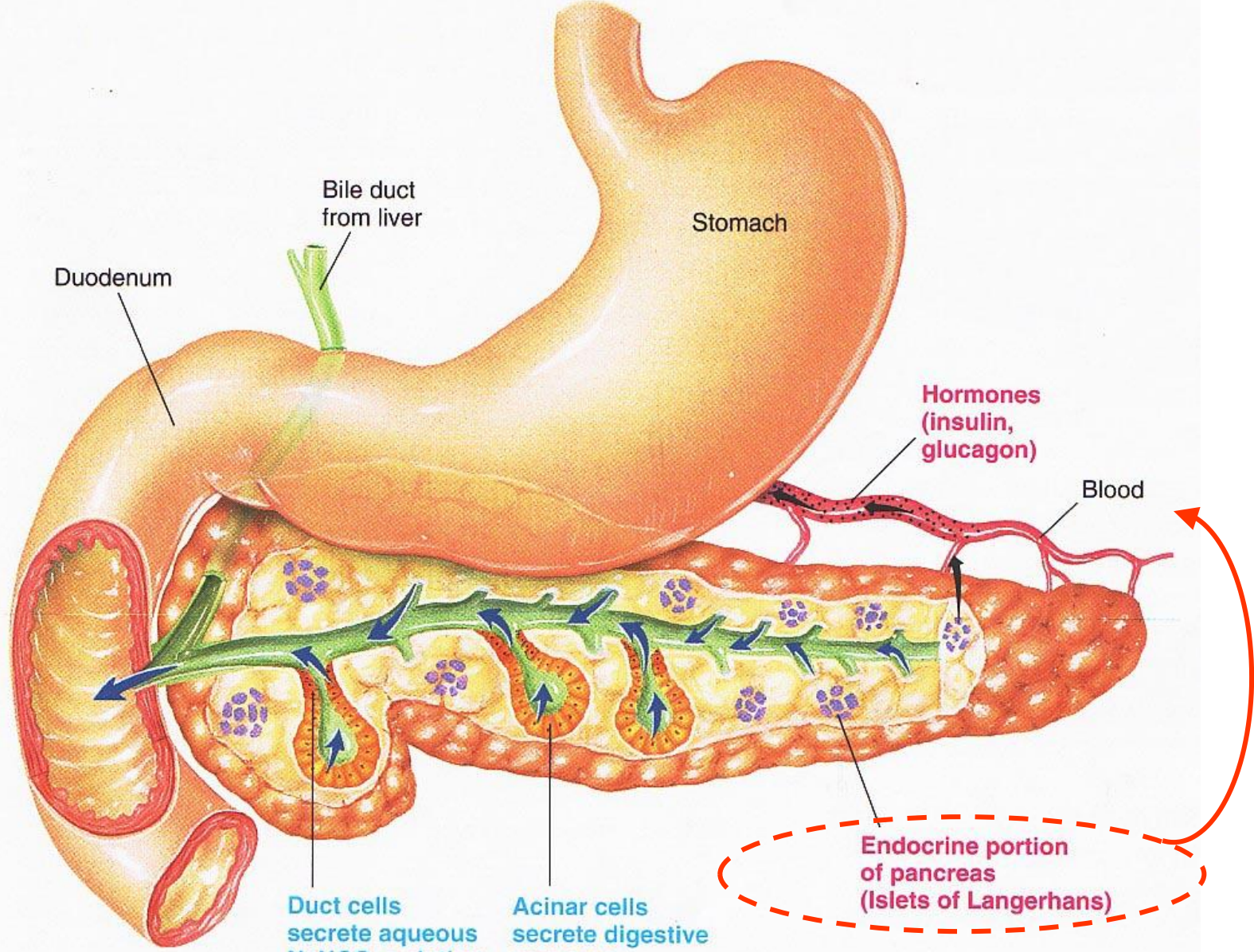
G&H 2011 fig 65-7



A

B

**Why is the
pancreas so
unique?**

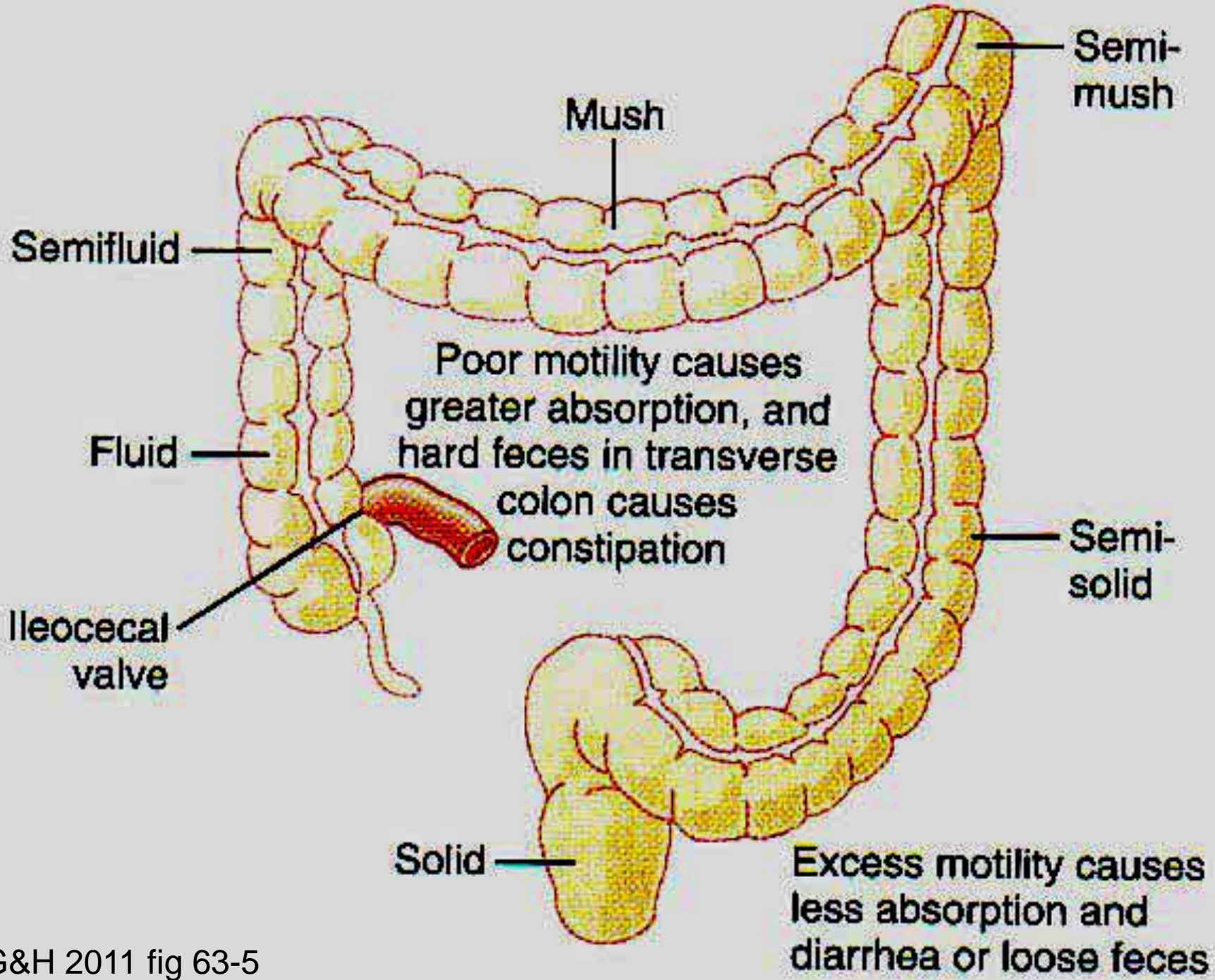


Enzymes specific for all 3 energy nutrients!

Exocrine portion of pancreas (Acinar and duct cells)

Endocrine portion of pancreas (Islets of Langerhans)

The glandular portions of the pancreas are grossly exaggerated.



Questions + Discussion

