



REGULATION OF DIGESTIVE SYSTEM

PHAR-432

LECTURE: 3

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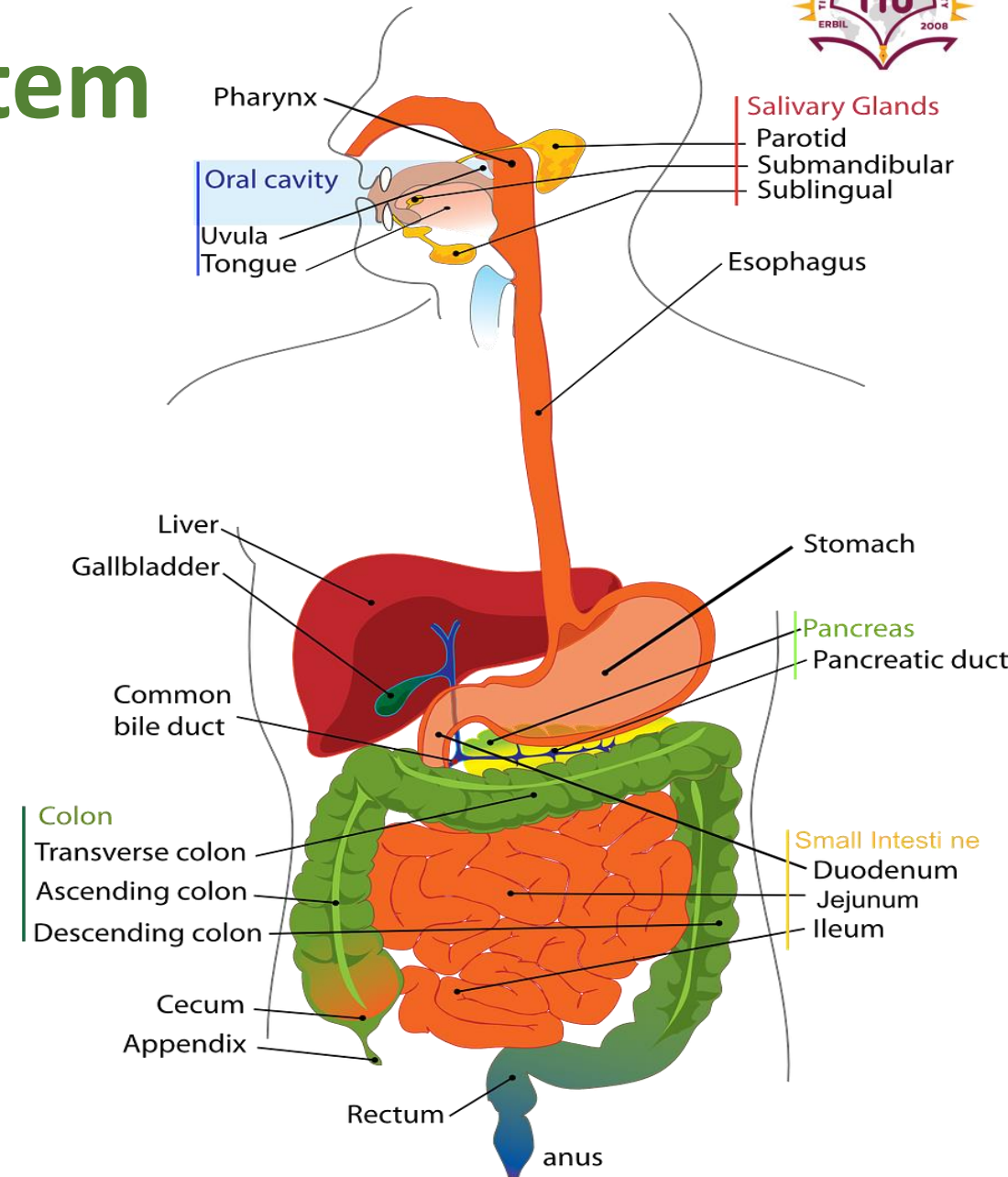
Outlines

- Overview of digestive system
- Notes for healthy GIT
- Digestive process
- Digestion regulation
- Phases of digestion



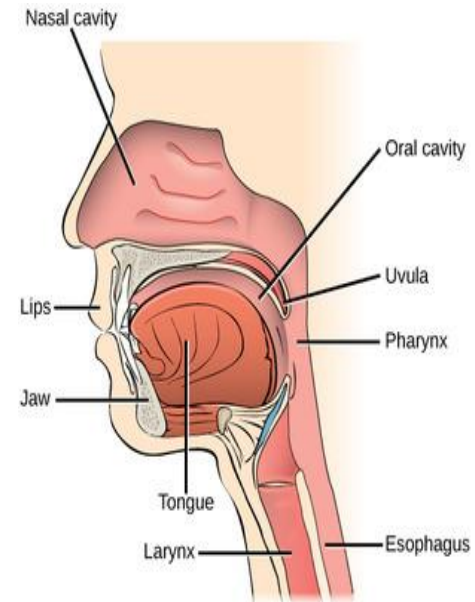
Overview of digestion system

Efficient digestion is essential for overall health because it allows your body to absorb the nutrients it needs to function properly.

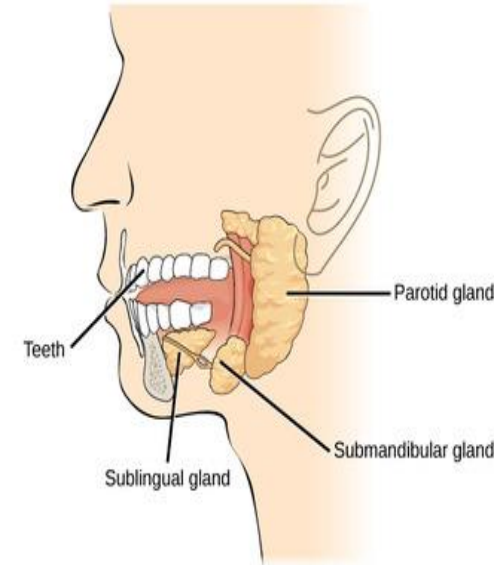


The mouth

- The mouth is the first organ of digestion, where food is broken down mechanically by chewing and chemically by enzymes.
- It secretes : Salivary amylase for breaking down starch and Lingual lipase for saturated fatty acids



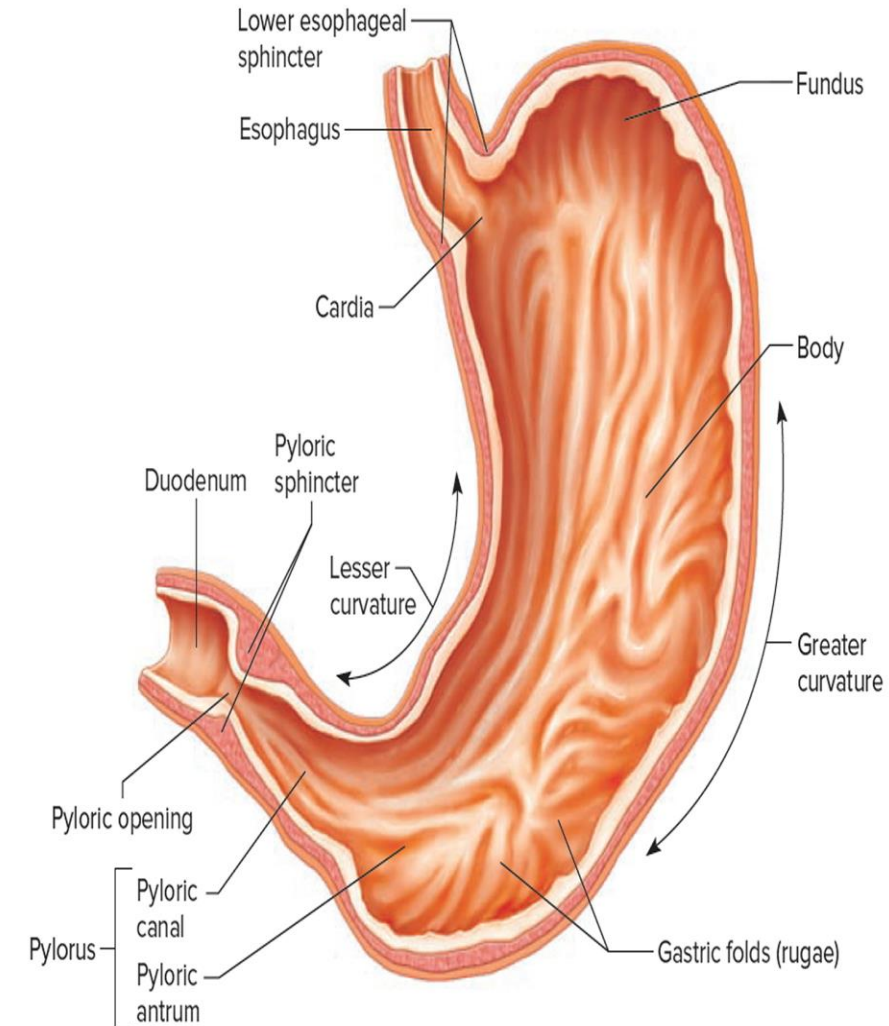
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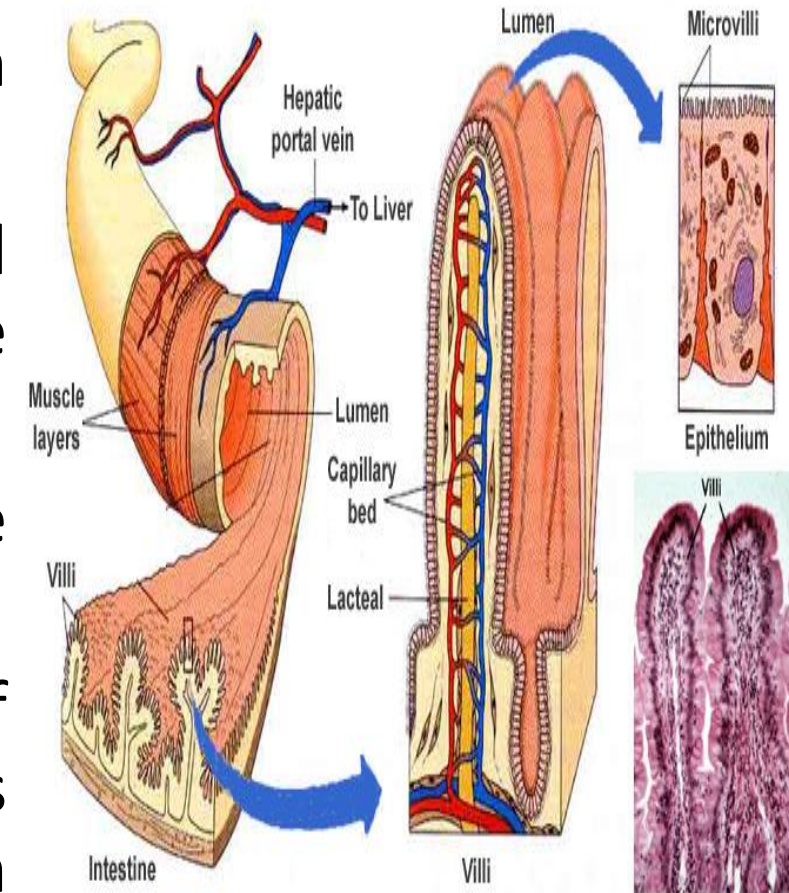
The stomach

- The stomach is the next organ of digestion that release f pepsinogen and hydrochloric acid, and they can unite to release the active pepsin.
- The intrinsic factor is released in the stomach and is necessary for the absorption of vitamin B12.
- Low vitamin B12 levels can be due to low hydrochloric acid or a lack of intrinsic factor.
- And low vitamin B12 is a common cause of anemia.



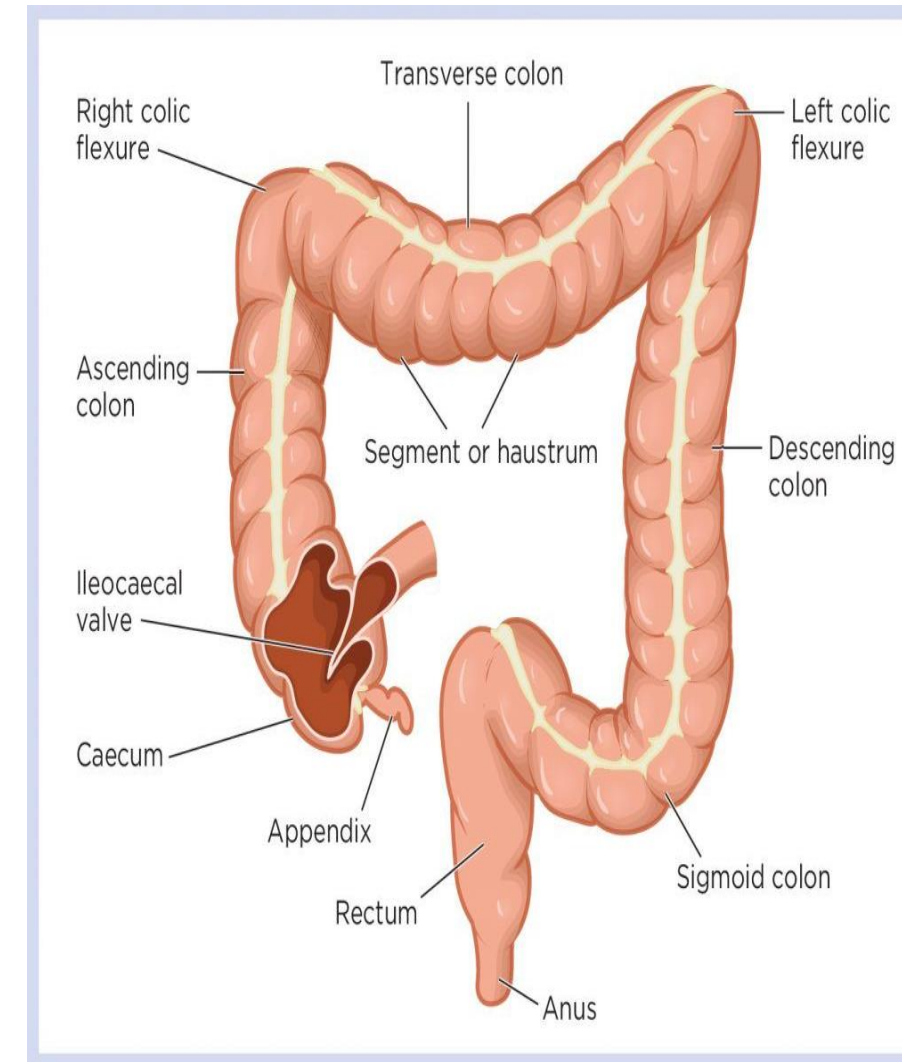
The small intestine

- The small intestine is the next organ of digestion and is where most nutrient absorption occurs.
- The duodenum, receives bile from the liver and gallbladder, and pancreatic enzymes from the pancreas.
- Bile breaks down LCFA, while pancreatic lipase finalizes the breakdown of unsaturated fats.
- Pancreatic amylase finalizes the digestion of starch, while trypsin and chymotrypsin, enzymes released by the pancreas, finalize protein digestion.



The large intestine

- The large intestine is responsible for processing indigestible food material (chyme) after most nutrients are absorbed in the small intestine.
- Functions are: absorbing water and electrolytes, producing and absorbing vitamins, and forming and propelling feces toward the rectum for elimination.
- The appendix is not a mistake and has a nickname "the colon's oil can" because it lubricates the contents that come out of the small intestine.

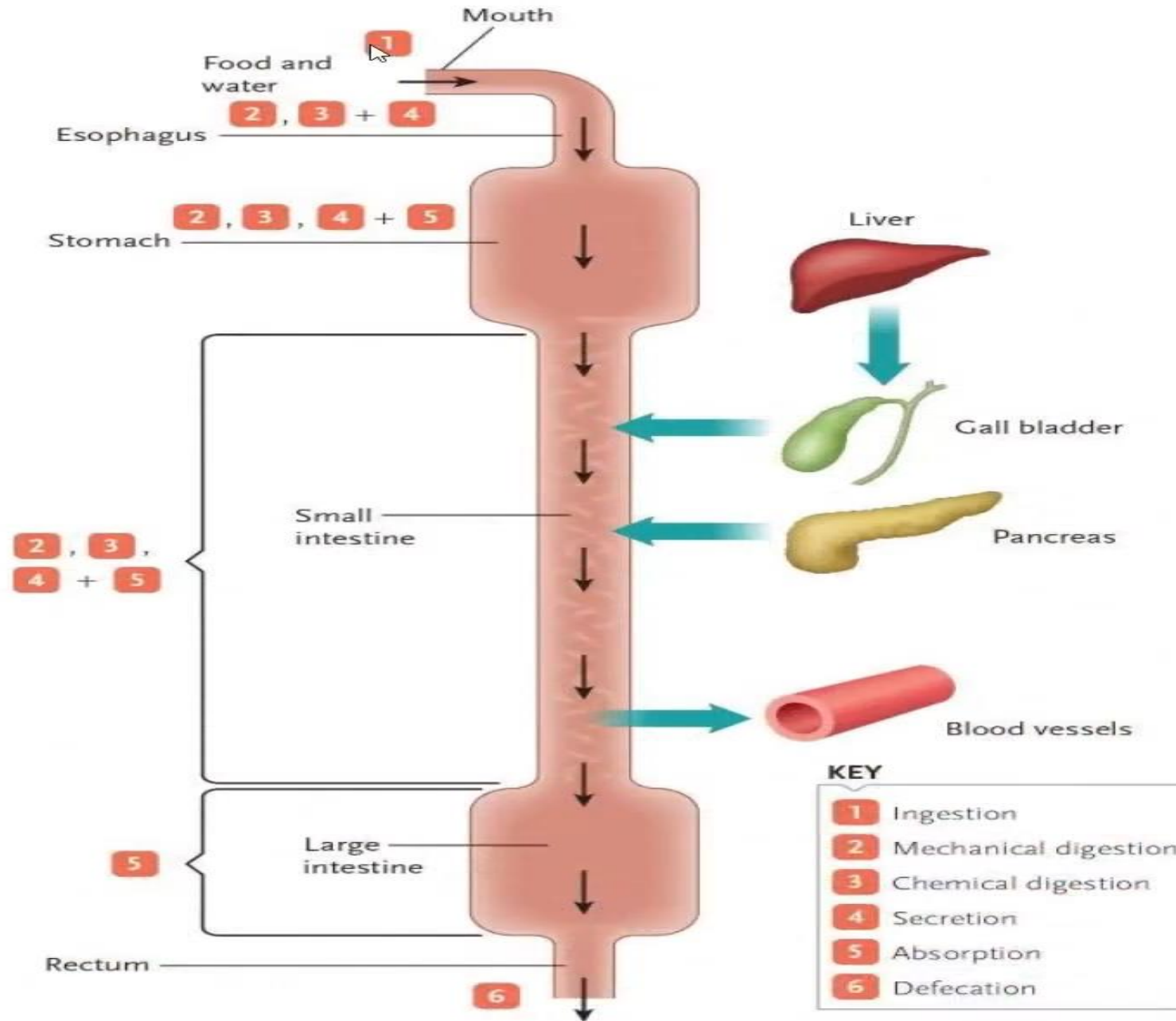


Notes for healthy gut

- The colon needs fiber to function properly and take water out to form stools.
- Hydrotherapy treatments such as sitz baths can help bring relief and speed up healing for hemorrhoids.
- Drinking lemon juice or taking cayenne pepper before meals can help increase hydrochloric acid production and improve digestion.
- Proteolytic enzymes, such as bromelain and papain, can help break down protein and are beneficial for people with pancreatic problems.
- Herbs such as ginger, dandelion, and milk thistle can stimulate the release of digestive enzymes and improve digestion.

The Digestive Process

- The digestive process can be broken down into five main stages:
 1. **Ingestion:** This is the act of putting food into your mouth.
 2. **Propulsion:** This is the movement of food through the digestive system.
 3. **Mechanical and chemical digestion:** This is the breakdown of food into smaller pieces and molecules.
 4. **Absorption:** This is the process of nutrients passing from the digestive system into the bloodstream.
 5. **Defecation:** This is the elimination of waste products from the body.



Absorption in different parts of digestive system

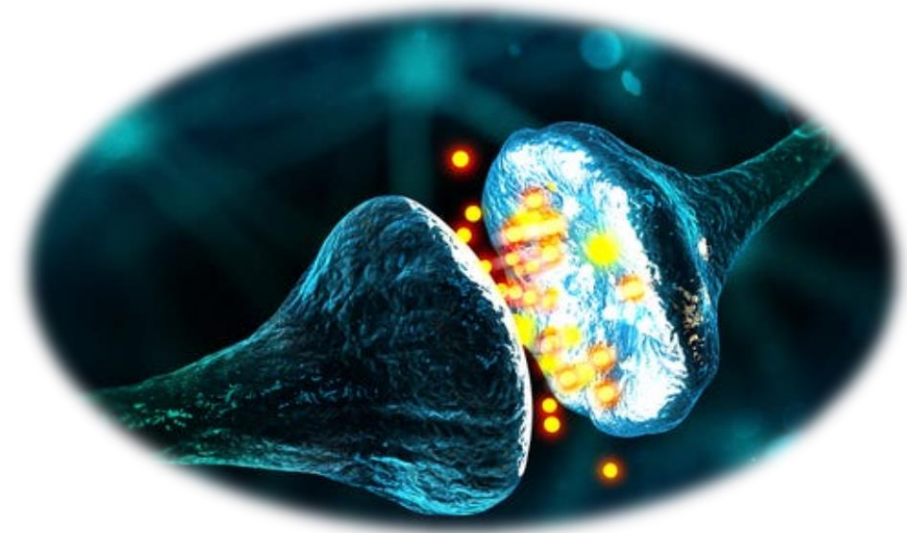
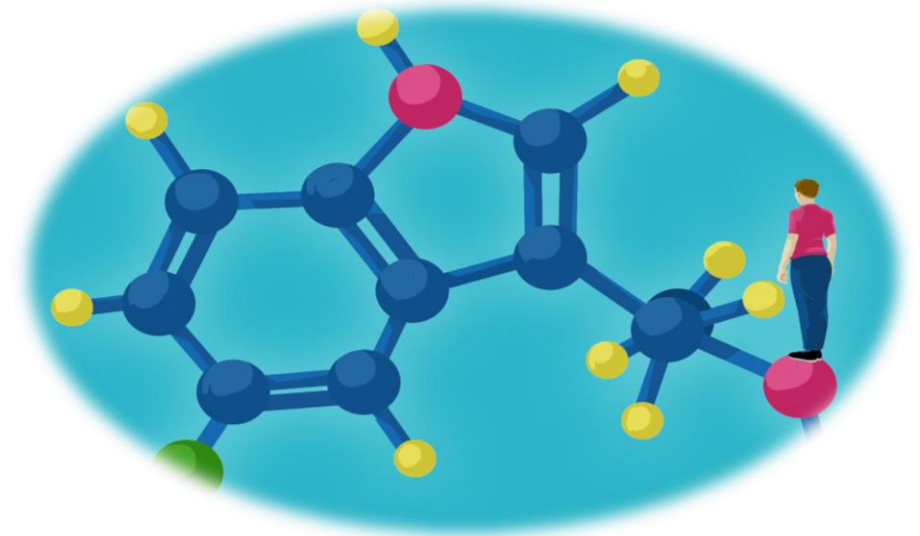
Oral cavity	Stomach	Small Intestine	Large Intestine
Certain drugs coming in contact with the mucosa of the mouth and lower side of the tongue are absorbed into the blood capillaries lining them.	Water, simple sugars, alcohol	Glucose Fructose Fatty acids Glycerol Amino acids	Water , some minerals, drugs

Regulation of digestion

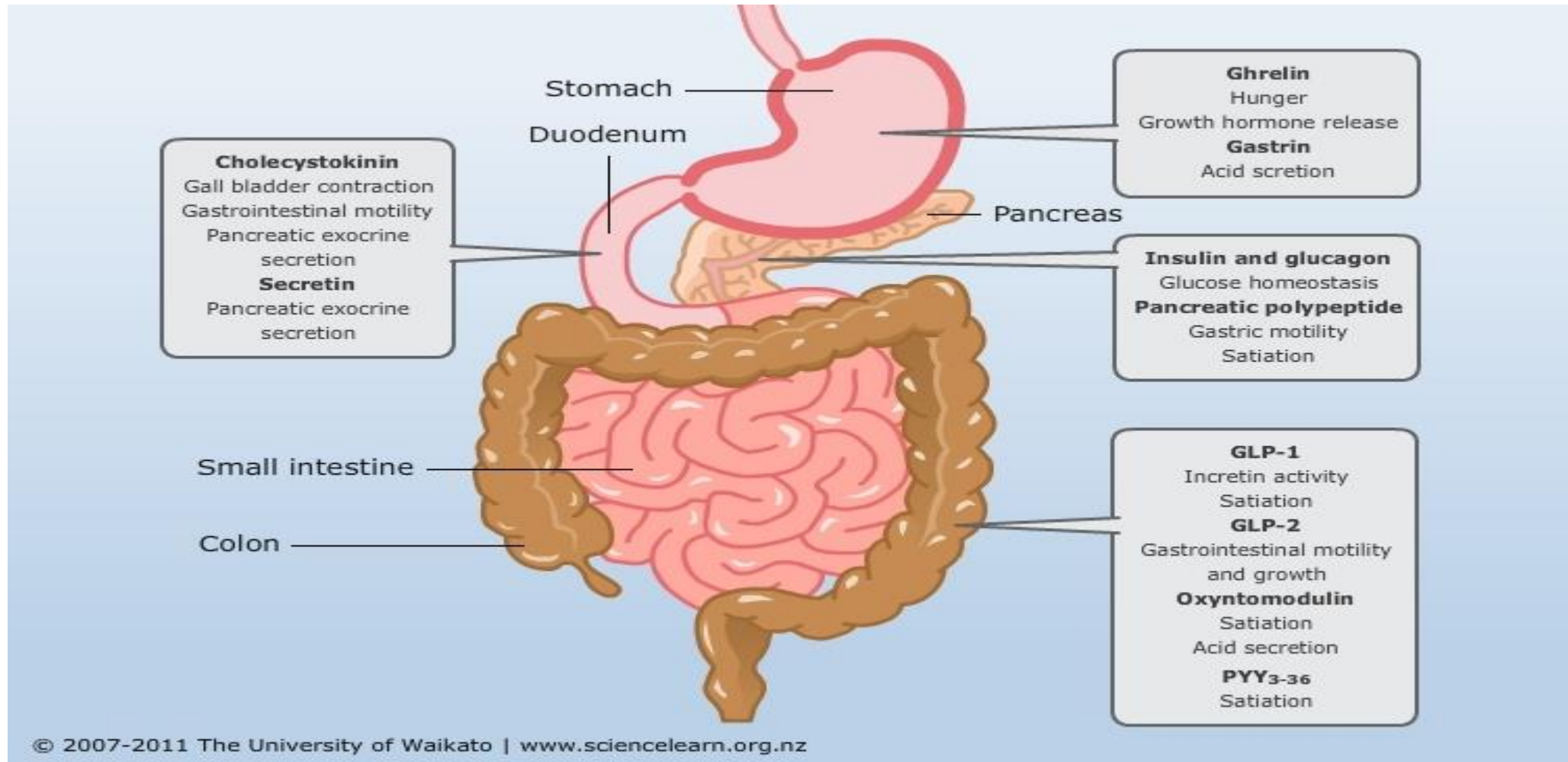
- The activities of the digestive system are regulated by:

1. Hormones

2. Neural reflexes.



Hormones and their effects on target cells

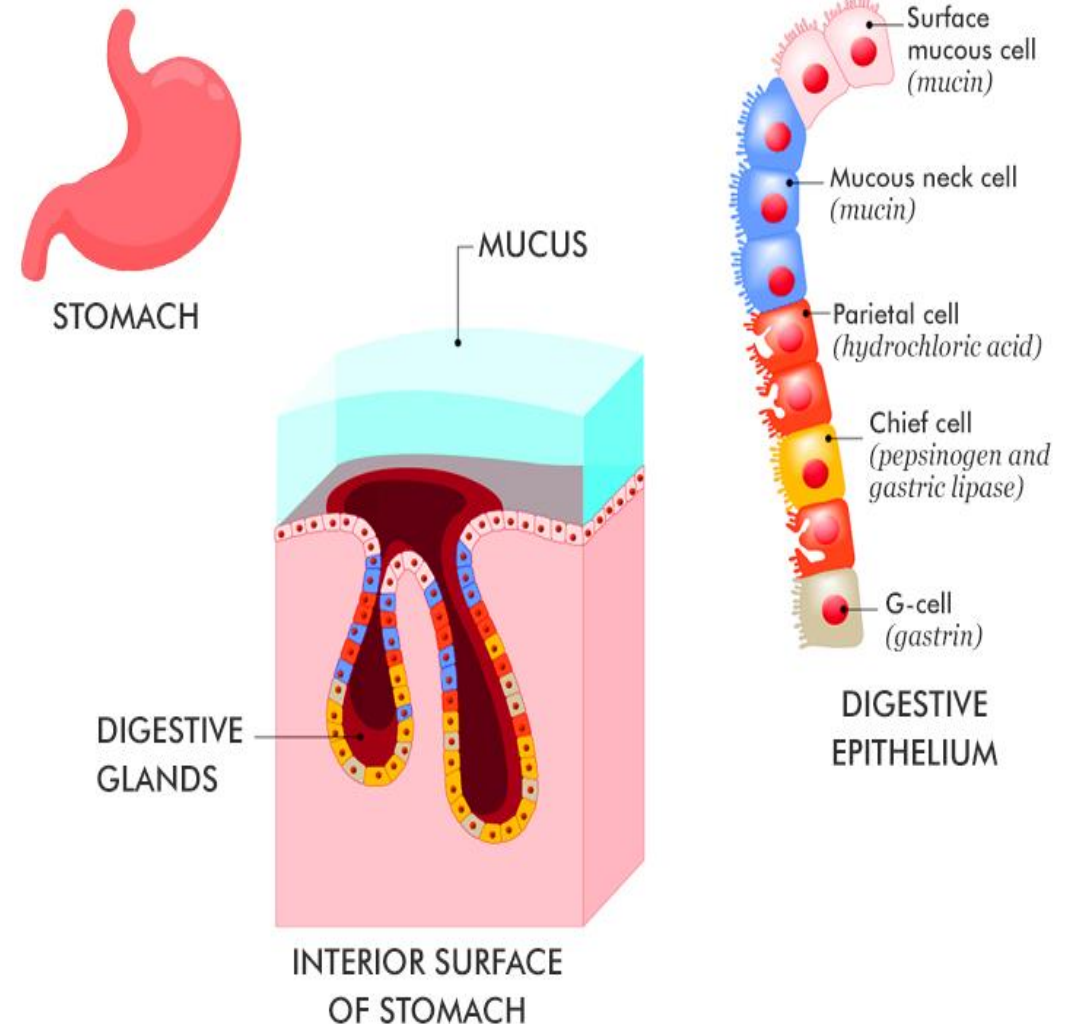


Gastrin

Gastrin is produced by G cells (entero-endocrine cells) of the stomach mucosa.

Effects include:

- Stimulation gastric juice secretion
- Stimulation of smooth muscle contraction in the stomach, small intestine, and large intestine.
- Relaxation of the pyloric sphincter.

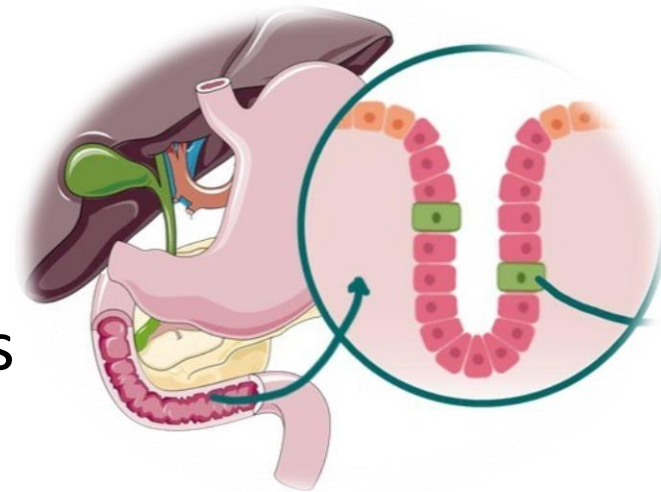


Secretin

Secretin is produced by the enteroendocrine cells of the duodenal mucosa.

Effects include:

- Stimulation of bicarbonate secretion by the pancreas, which stabilizes the pH of the chyme when released into the duodenum.
- Stimulation of bile production by the liver
- Inhibition of gastric juice secretions and gastric motility, which in turn slows digestion in the stomach and retards gastric emptying.

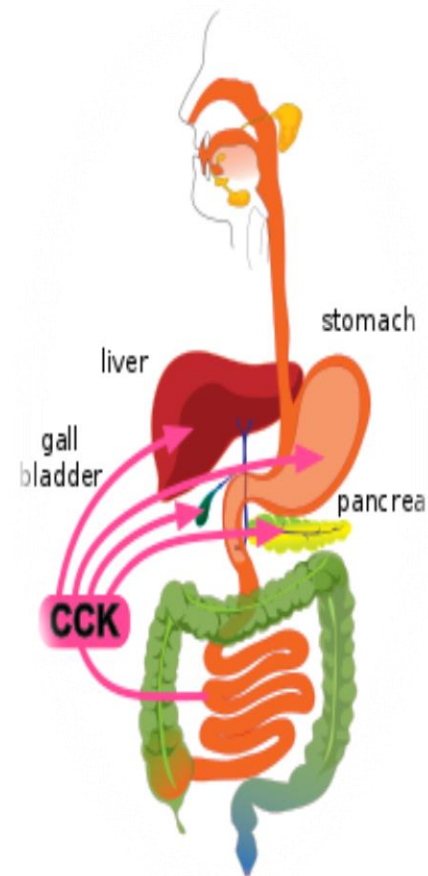


Cholecystokinin (CCK)

Cholecystokinin (CCK) is produced by the enteroendocrine cells of the duodenal mucosa.

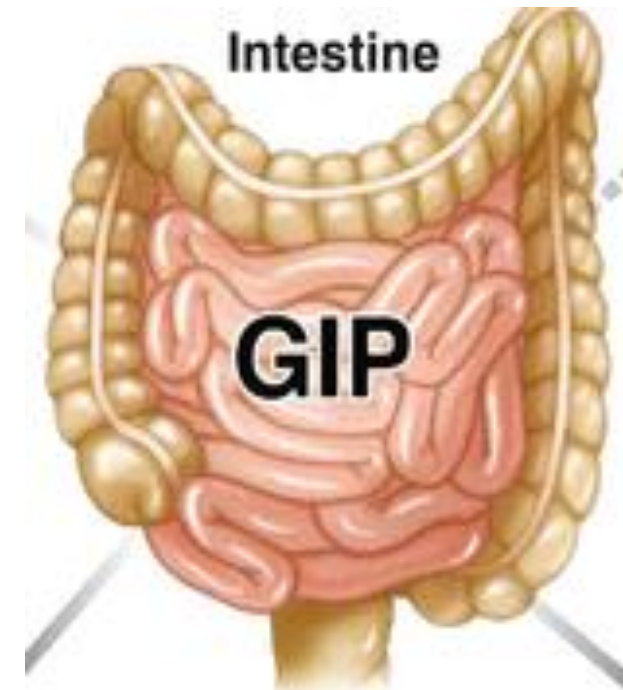
Effects include:

- Stimulation of bile release by the gallbladder.
- Stimulation of pancreatic juice secretion
- Relaxation of the hepatopancreatic ampulla and opening of the hepatopancreatic sphincter.



Glucose insulinotropic peptide (GIP)

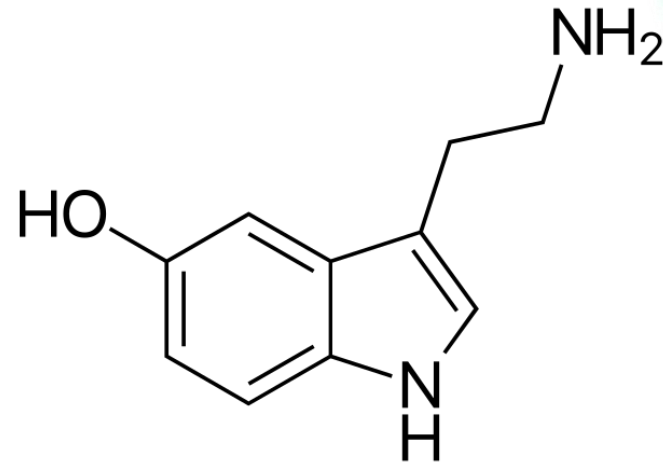
- Glucose insulinotropic peptide (GIP) is produced and released by the enteroendocrine cells of the duodenal mucosa in response to the presence of the glucose in the small intestine.
- This hormone stimulates the pancreas to begin releasing insulin.



Serotonin

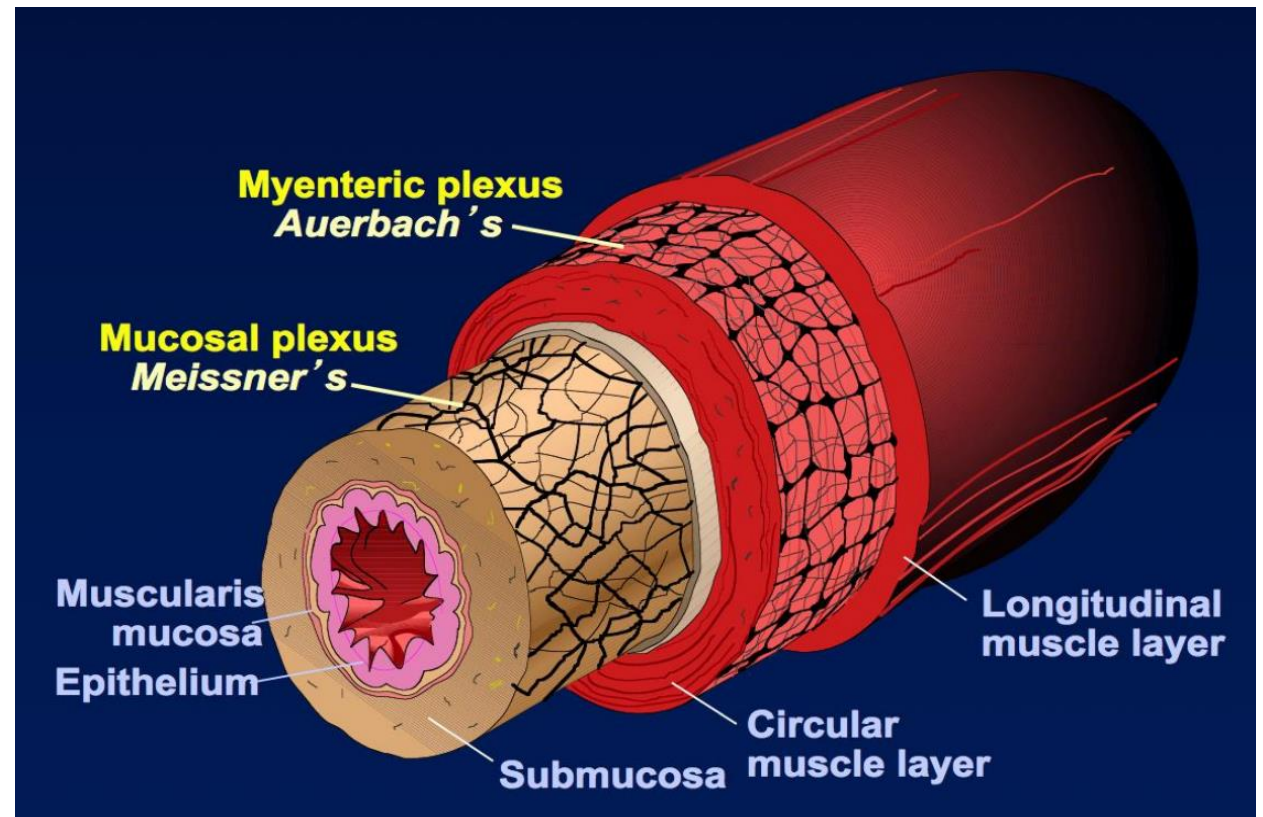
Serotonin is secreted by the pineal gland

- Increases mood
- Inhibit gastric secretions
- Increase peristalsis
- Dilate blood vessels



GIT neurons

- The Gastrointestinal Tract Has Its Own Nervous System Called the: Enteric Nervous System

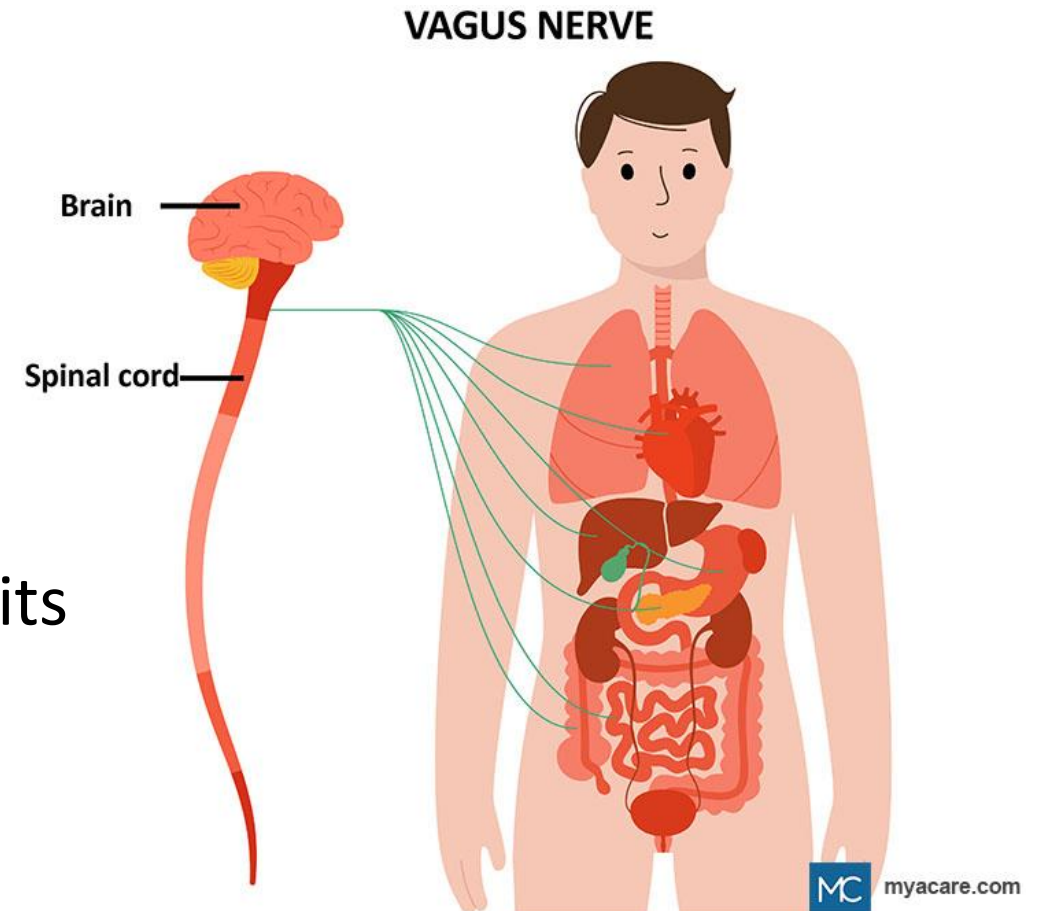


Neuronal control of digestive system

Autonomic Control of the Gastrointestinal Tract:

1-The Parasympathetic Nerves: activate Activity in the Gastrointestinal Tract

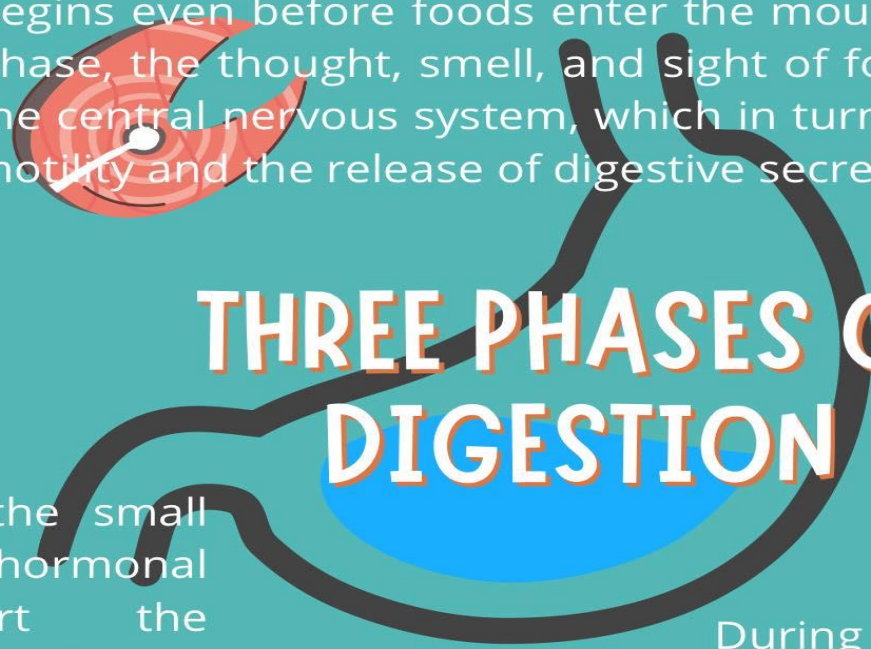
2- The Sympathetic Nervous System : Inhibits Activity in the Gastrointestinal Tract



Cephalic Phase

1

Begins even before foods enter the mouth. During this phase, the thought, smell, and sight of food stimulates the central nervous system, which in turn stimulates GI motility and the release of digestive secretions.



THREE PHASES OF DIGESTION

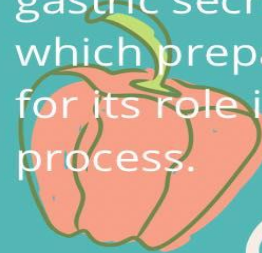


As food enters the small intestine, hormonal responses alert the accessory organs of the digestive tasks that lie ahead, signifying that the intestinal phase of digestion is under way.

Intestinal Phase

3

During this phase, muscular contractions become more forceful and the release of gastric secretions increases, which prepare the stomach for its role in the digestive process.



Gastric Phase

2



Cephalic phase

- The cephalic phase of digestion, triggered by the sight, smell, or thought of food, initiates the digestive process with the salivary and gastric secretory responses mediated via the autonomic nervous system.

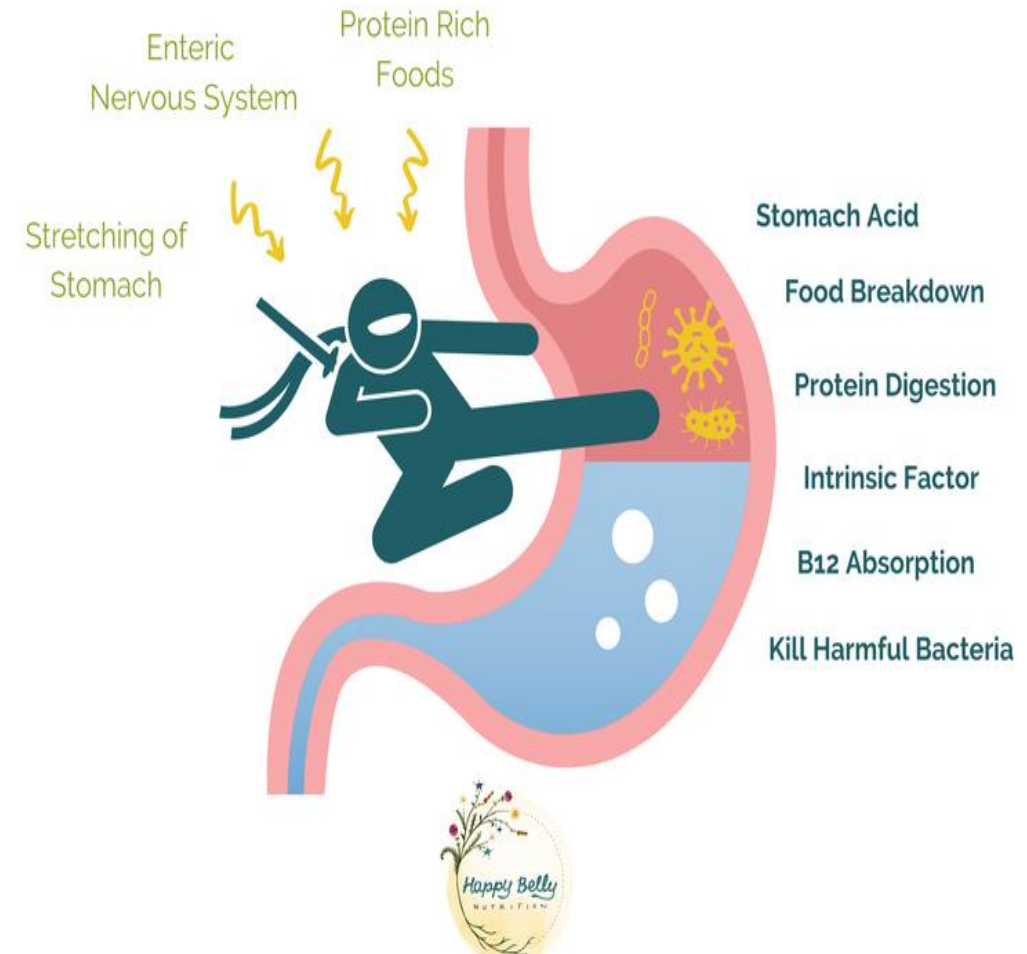


Gastric phase

The gastric phase describes those stimuli that originate from the stomach.

These stimuli include:

- Distention (enlargement) of the stomach
- Low acidity
- The presence of peptides



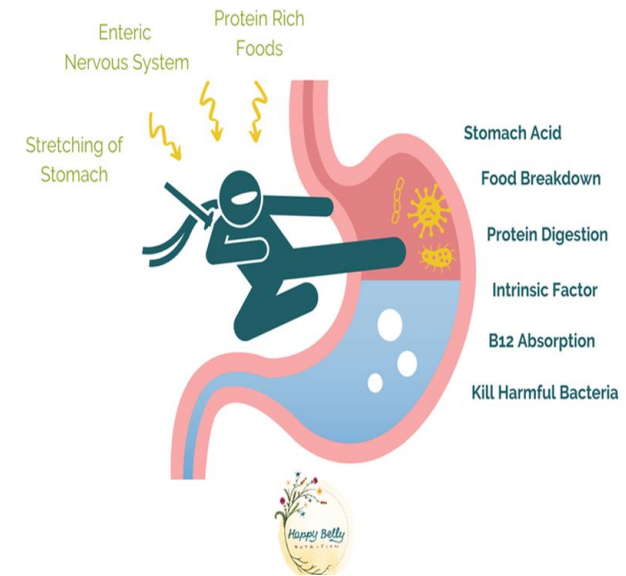
Gastric phase

In response, the following reflexes are initiated:

Neural response: Gastric juice secretion and smooth muscle contraction are promoted.

Hormonal response: Gastrin production is promoted.

General effects: The stomach and small intestine prepare for the digestion of chyme, and gastric emptying is promoted.



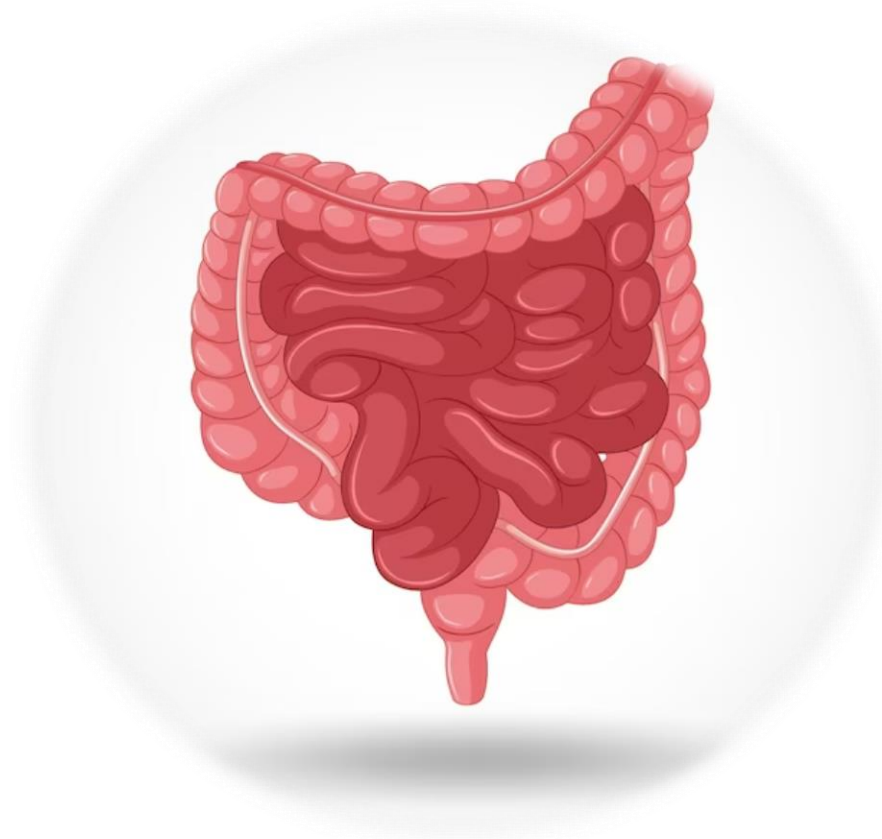
Intestinal phase

These include: distention of the duodenum, high acidity, and the presence of chyme.

In response, the following reflexes are initiated:

Neural response: Gastric secretion and gastric motility are inhibited (enterogastric reflex).

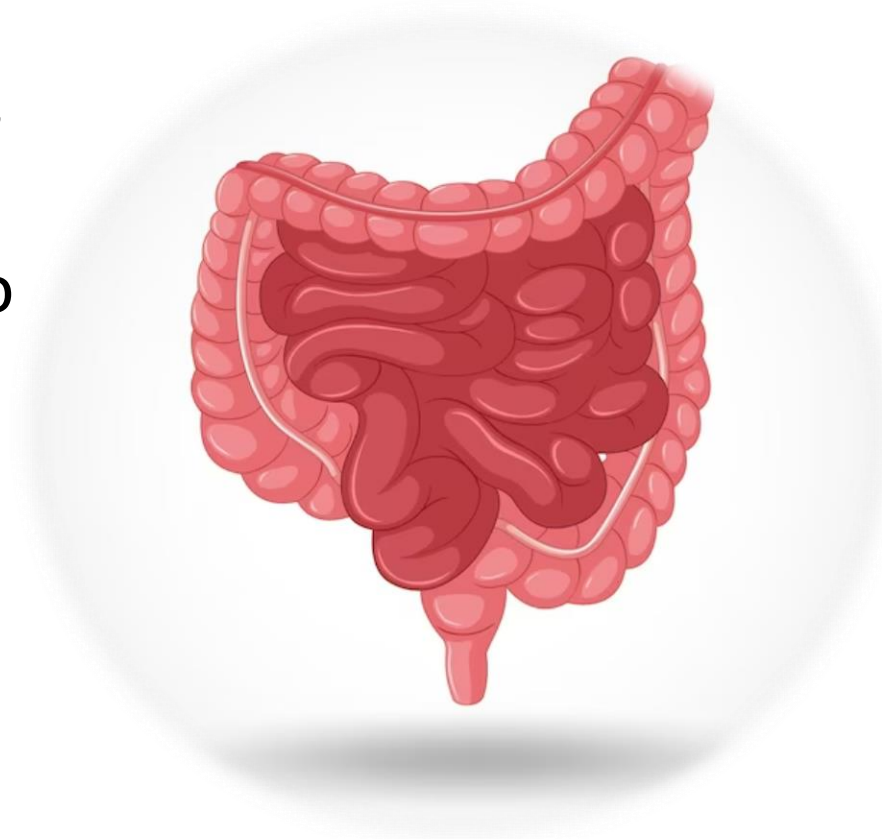
Intestinal secretions, smooth muscle contraction, and bile and pancreatic juice production are promoted.



Intestinal phase

Hormonal response: Production of secretin, CCK, and GIP is promoted.

General effects: Stomach emptying is retarded to allow adequate time for digestion (especially fats) in the small intestine. Intestinal digestion and motility are promoted.



References

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