

HUMAN SYSTEMS

25 & 26 APRIL 2026

NIGEL HOWARD





WE ACKNOWLEDGE
THE **LAND** OF THE COAST SALISH
PEOPLES

—

Sḵwx̱w̱ú7mesh (Squamish),
Stó:lō and Səl̓ílwətaʔ/Selilwitulh (Tsleil-
Waututh) and xwməθkwəy̓əm (Musqueam)

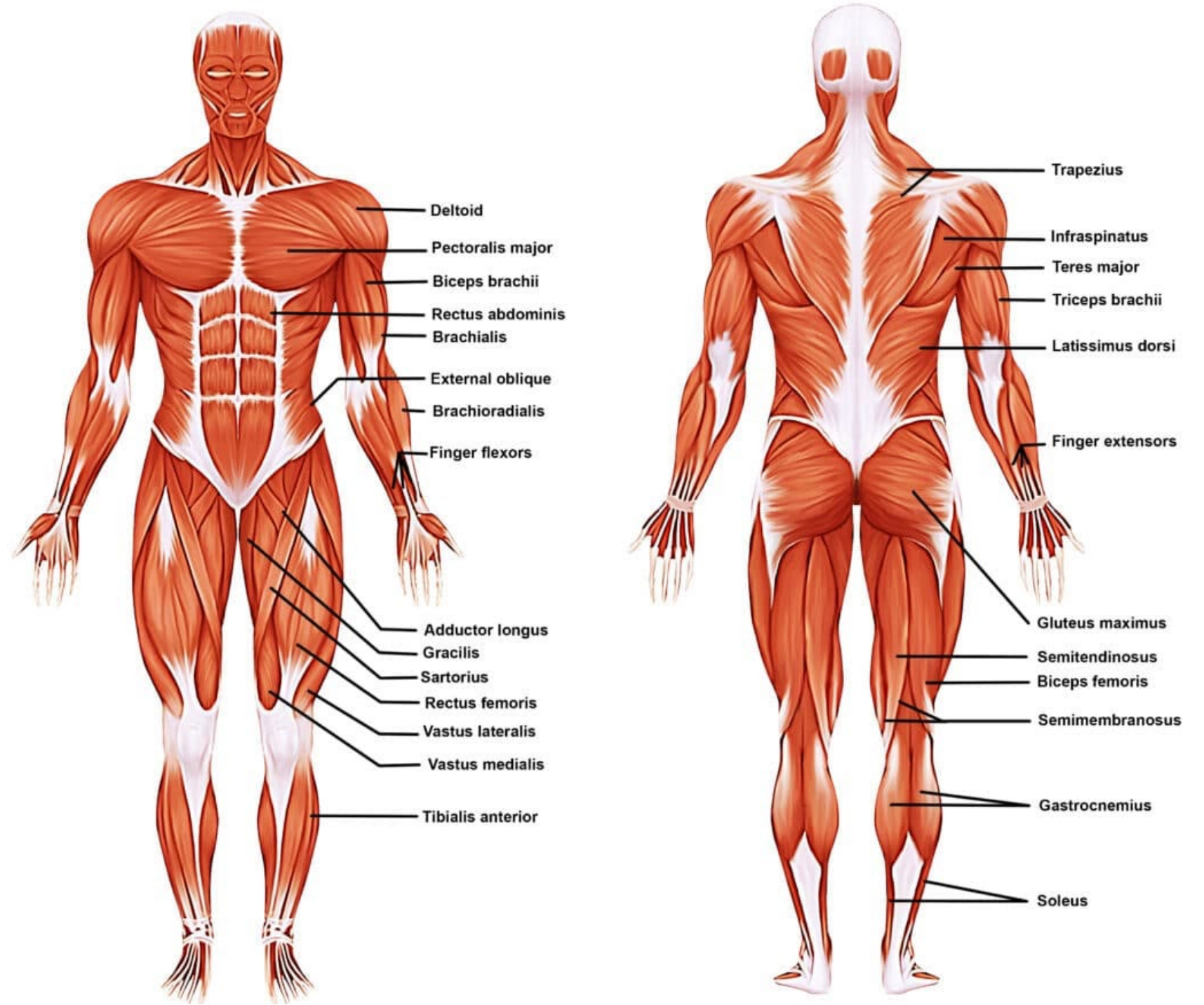
11 ORGAN SYSTEMS

- **IMMUNE/LYMPHATIC** - Defends the body against infection and maintains fluid balance.
- **CARDIOVASCULAR** - Pumps blood via the heart to transport oxygen, nutrients, and waste throughout the body.
- **MUSCULAR & SKELETAL** - Provide structure, support, protection, and enable movement.
- **NERVOUS** - Coordinates activities, processes information, and controls body responses using the brain, spinal cord, and nerves.

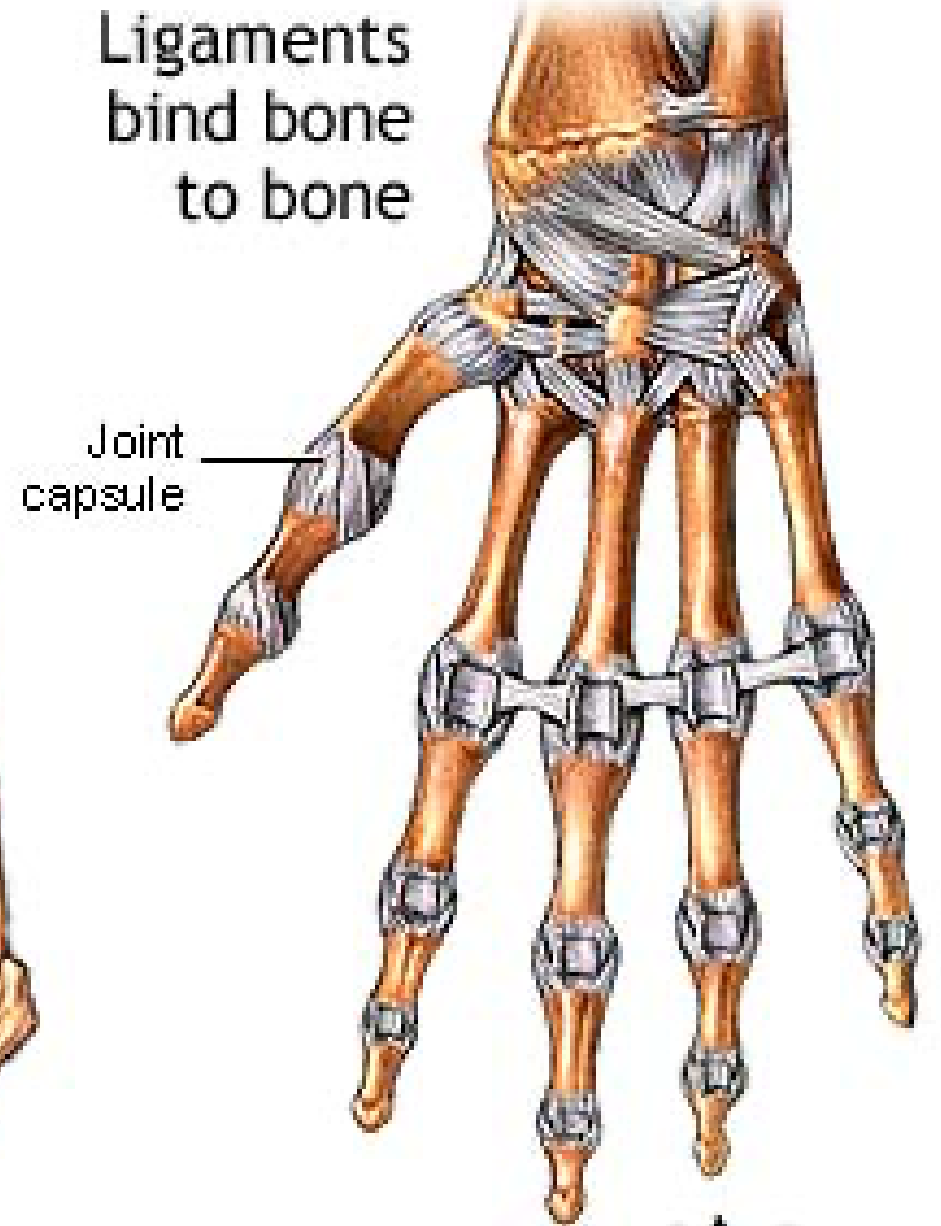
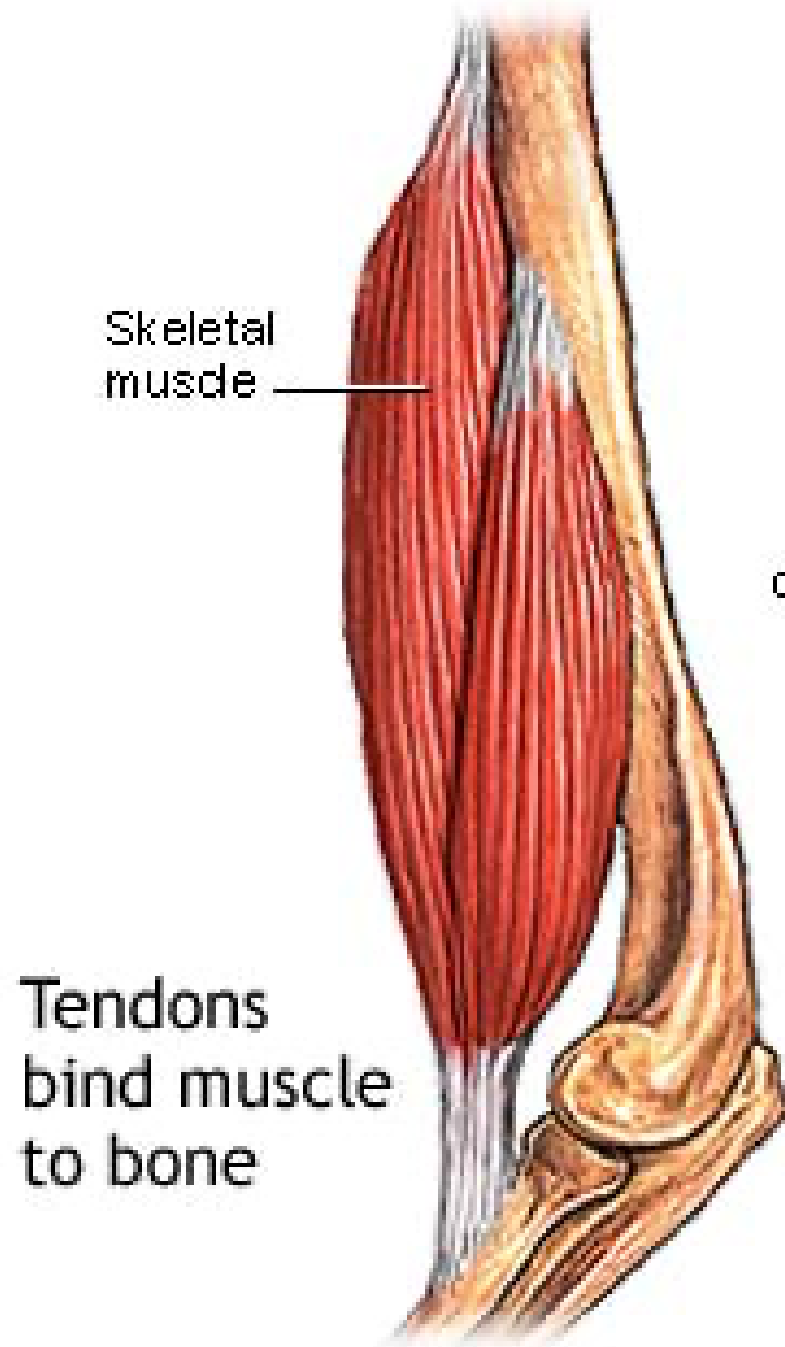
- **RESPIRATORY** - Facilitates gas exchange, specifically bringing in oxygen and releasing carbon dioxide.
- **DIGESTIVE** - Breaks down food into nutrients for absorption and eliminates solid waste.
- **URINARY** - Filters blood to eliminate waste products and regulates fluid balance.
- **REPRODUCTIVE** - Produces offspring and sex hormones

- **INTEGUMENTARY** – protects the body, regulates temperature, and detects sensations via skin, hair, and nails.
- **ENDOCRINE** - Regulates bodily processes like growth and metabolism through hormone secretion.

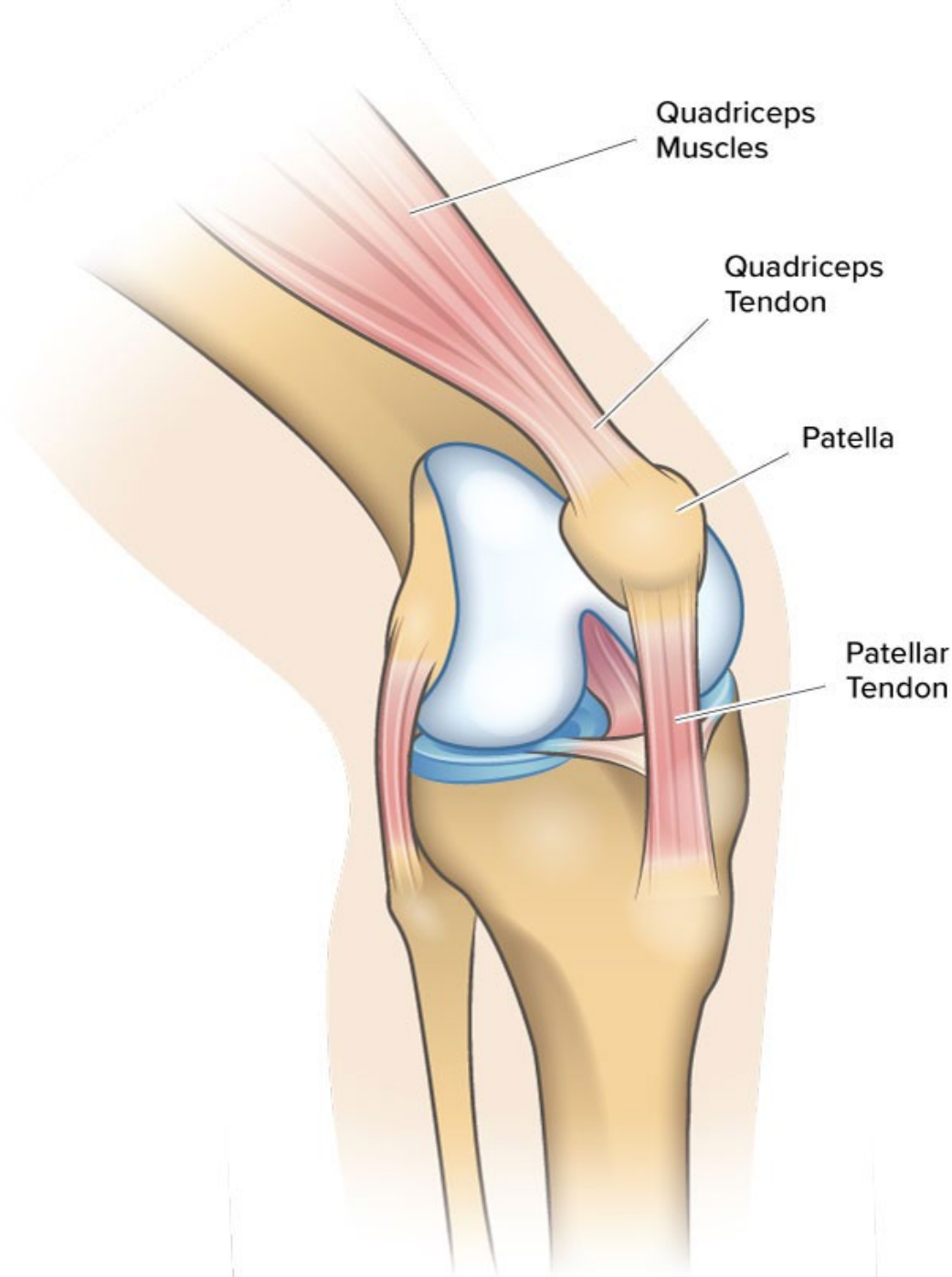
MUSCULAR SYSTEM



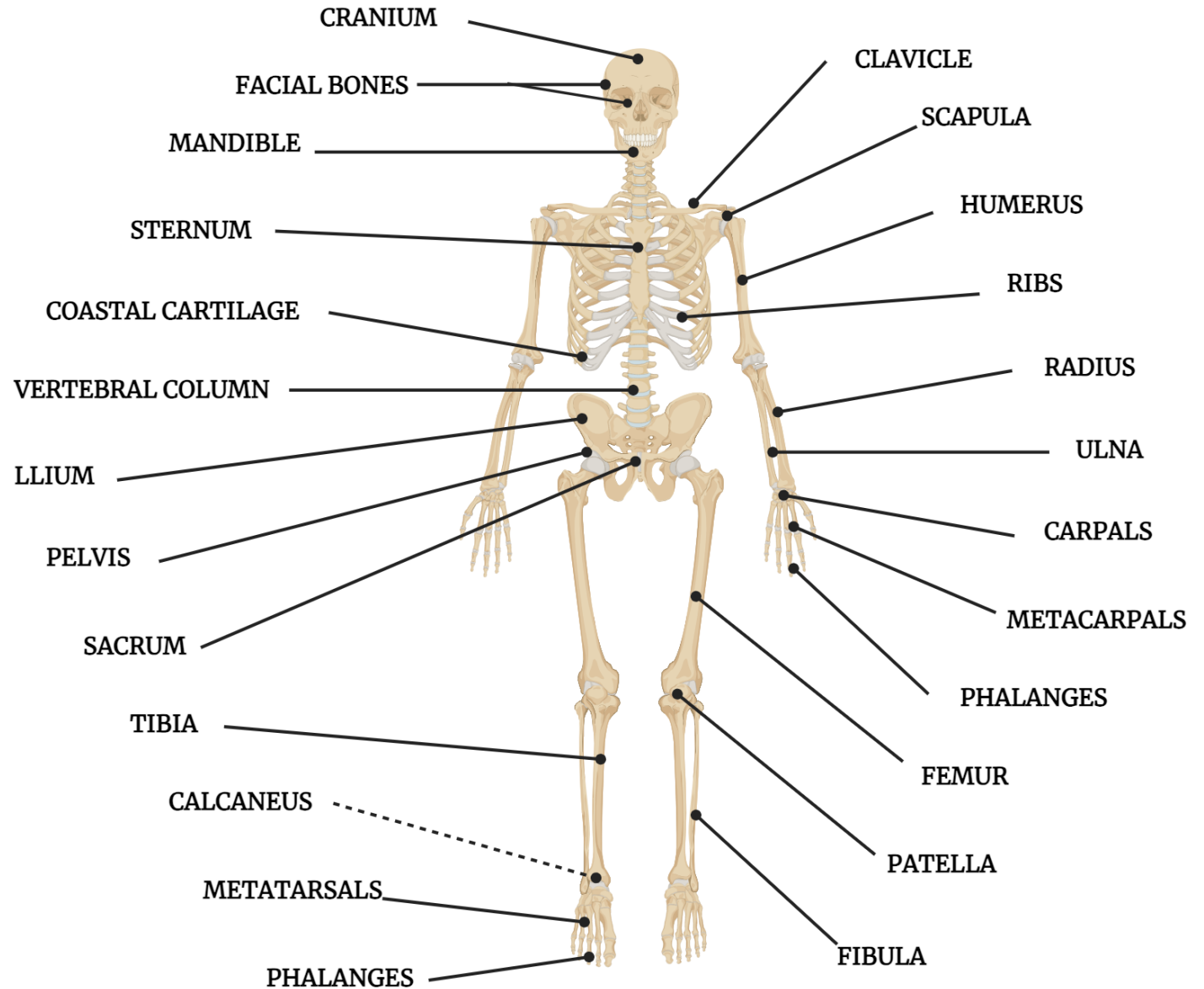
TENDONS & LIGAMENTS



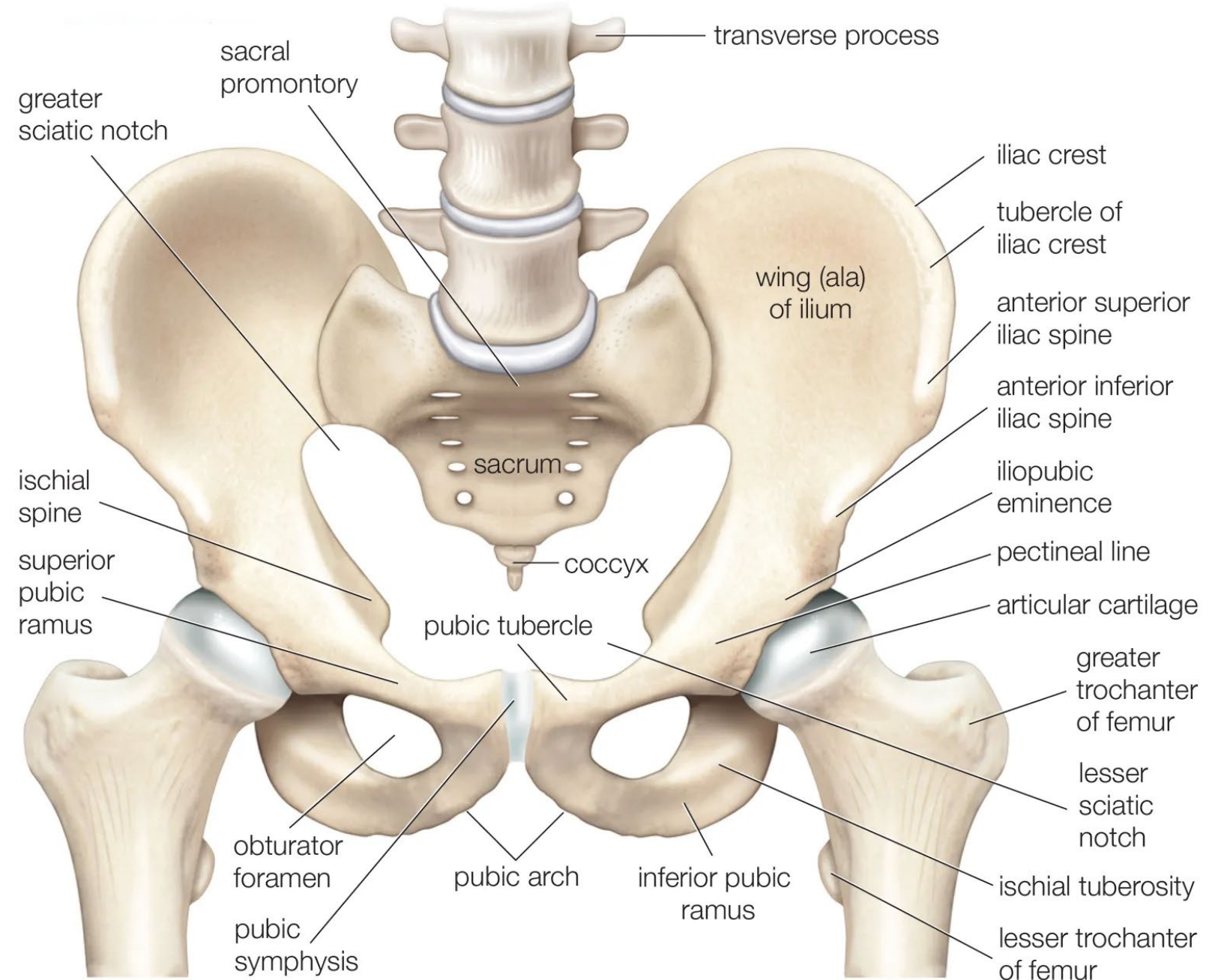
KNEE



SKELETAL SYSTEM



Bones of the pelvic girdle

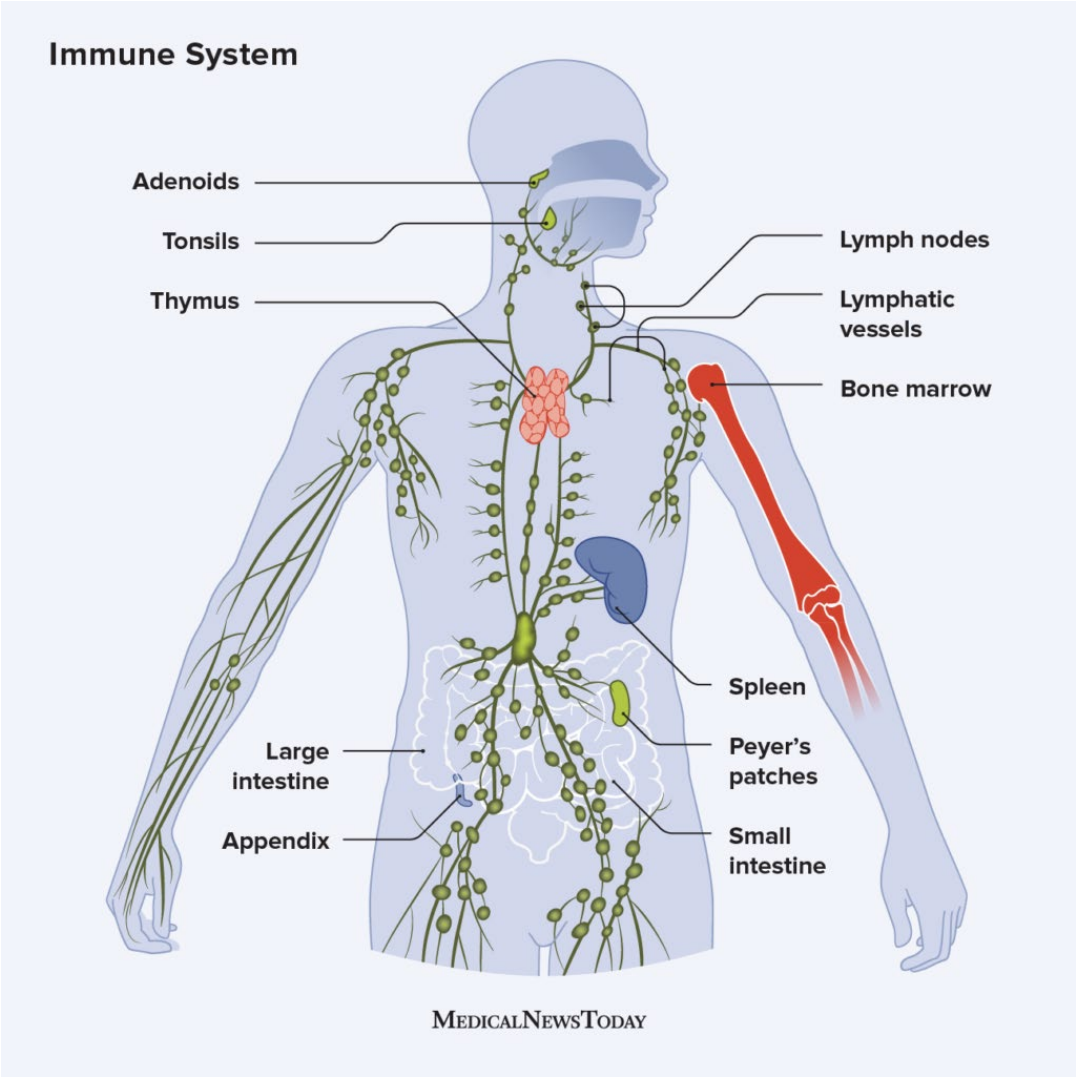


CERVICAL INSTABILITY



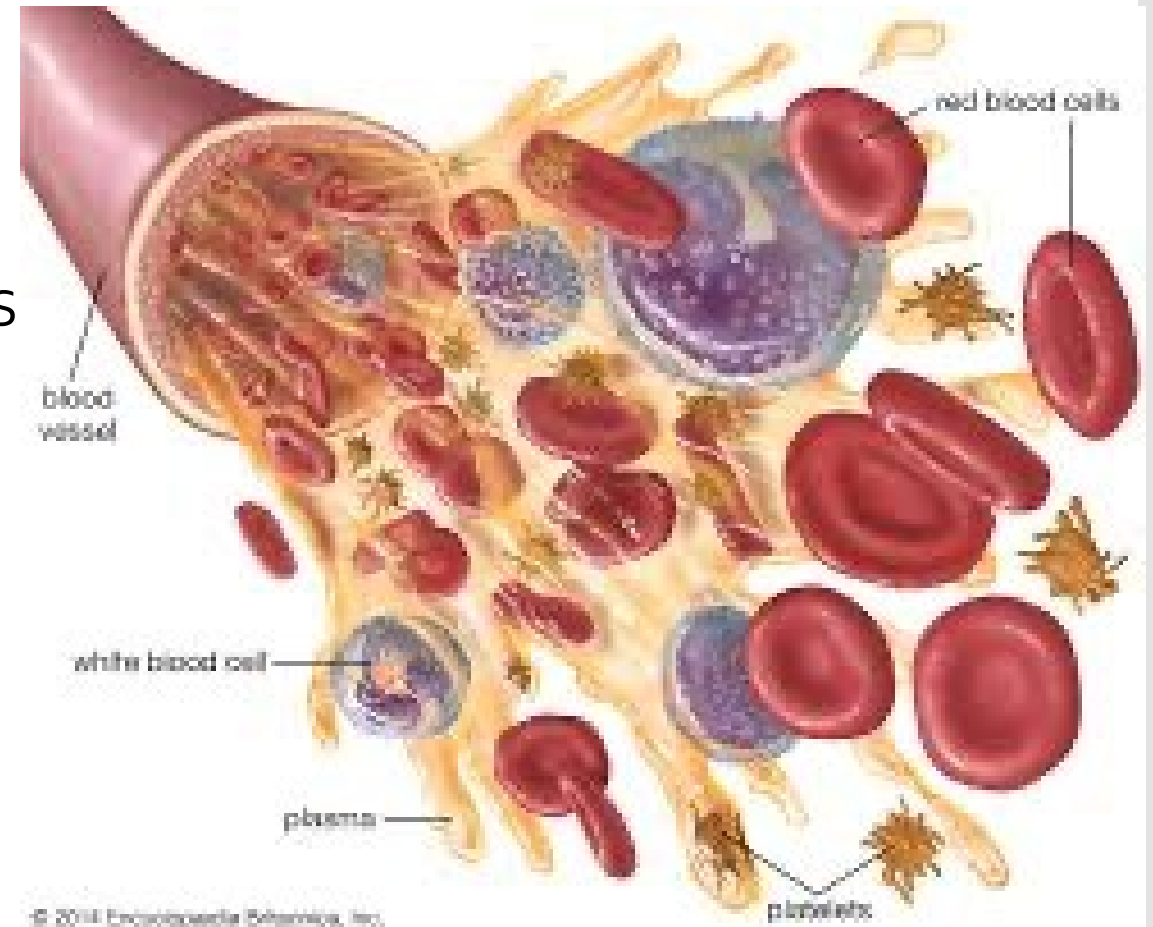
- Defined as the inability of the spine under physiological loads to maintain its normal pattern of displacement so that there is no neurological damage or irritation, no development of deformity, and no incapacitating pain.

IMMUNE SYSTEM



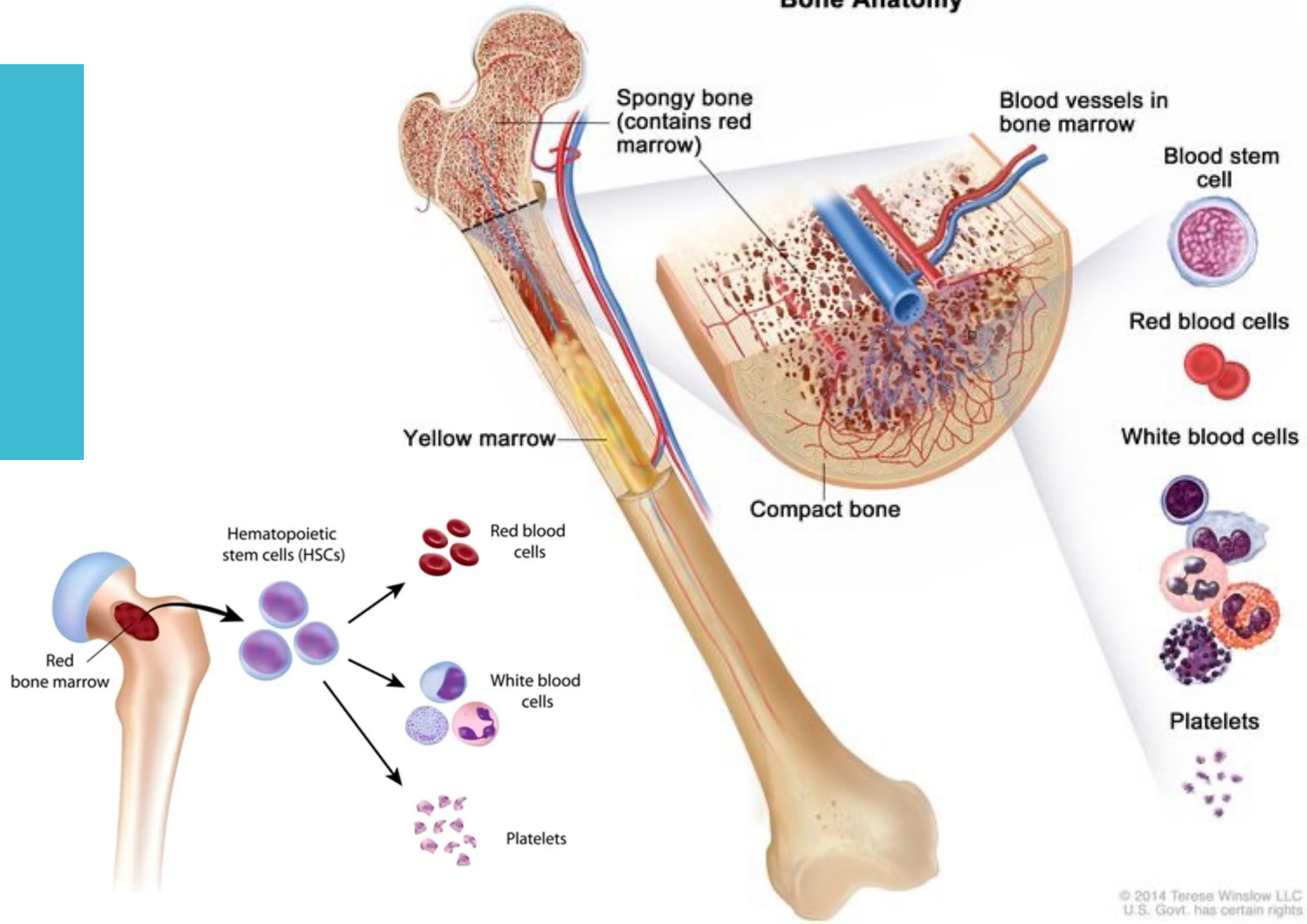
IMMUNE SYSTEM

- WHITE BLOOD CELLS
- RED BLOOD CELLS
- PROTEINS
- CHEMICALS



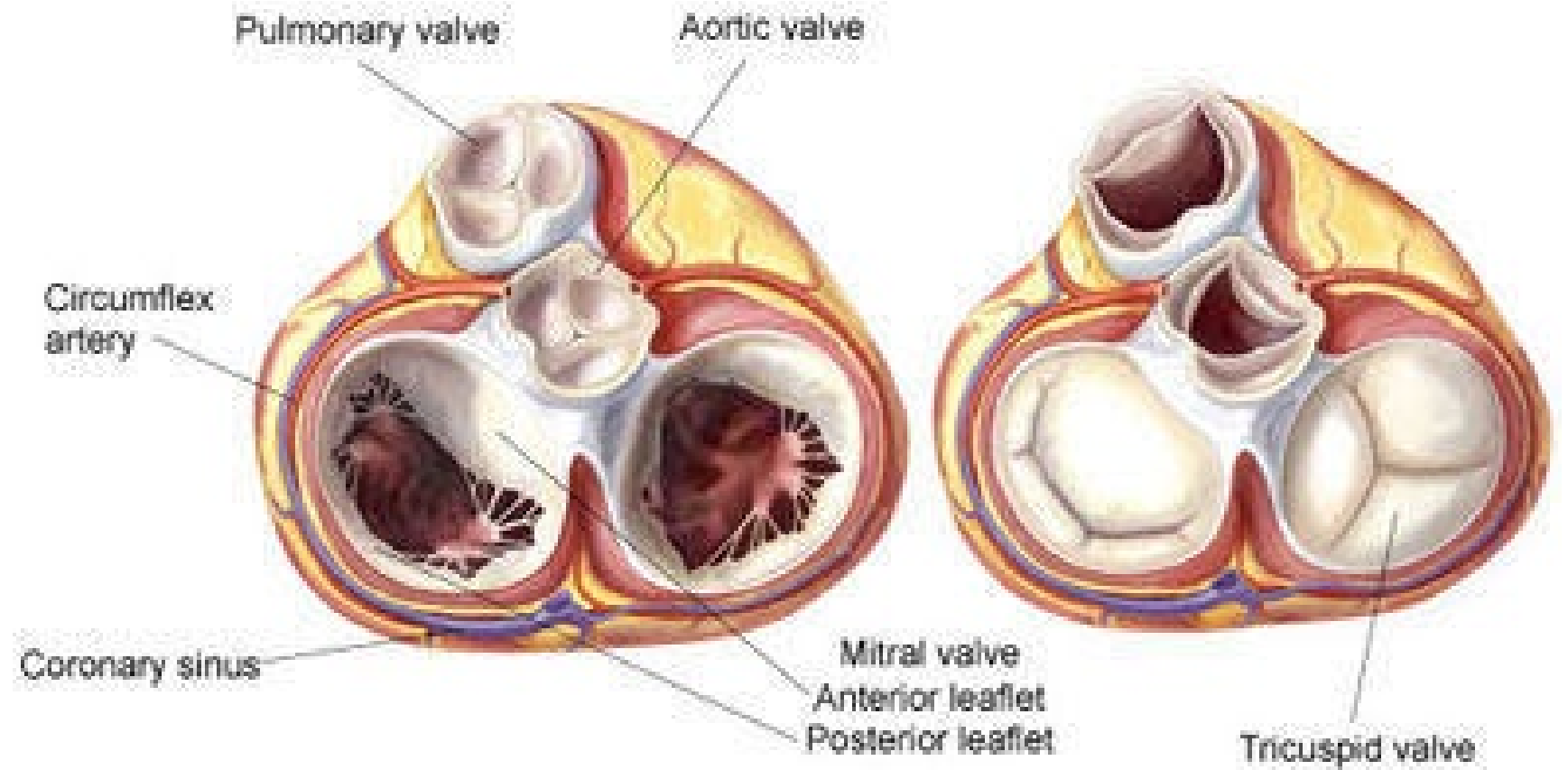
BONE MARROW

Bone Anatomy

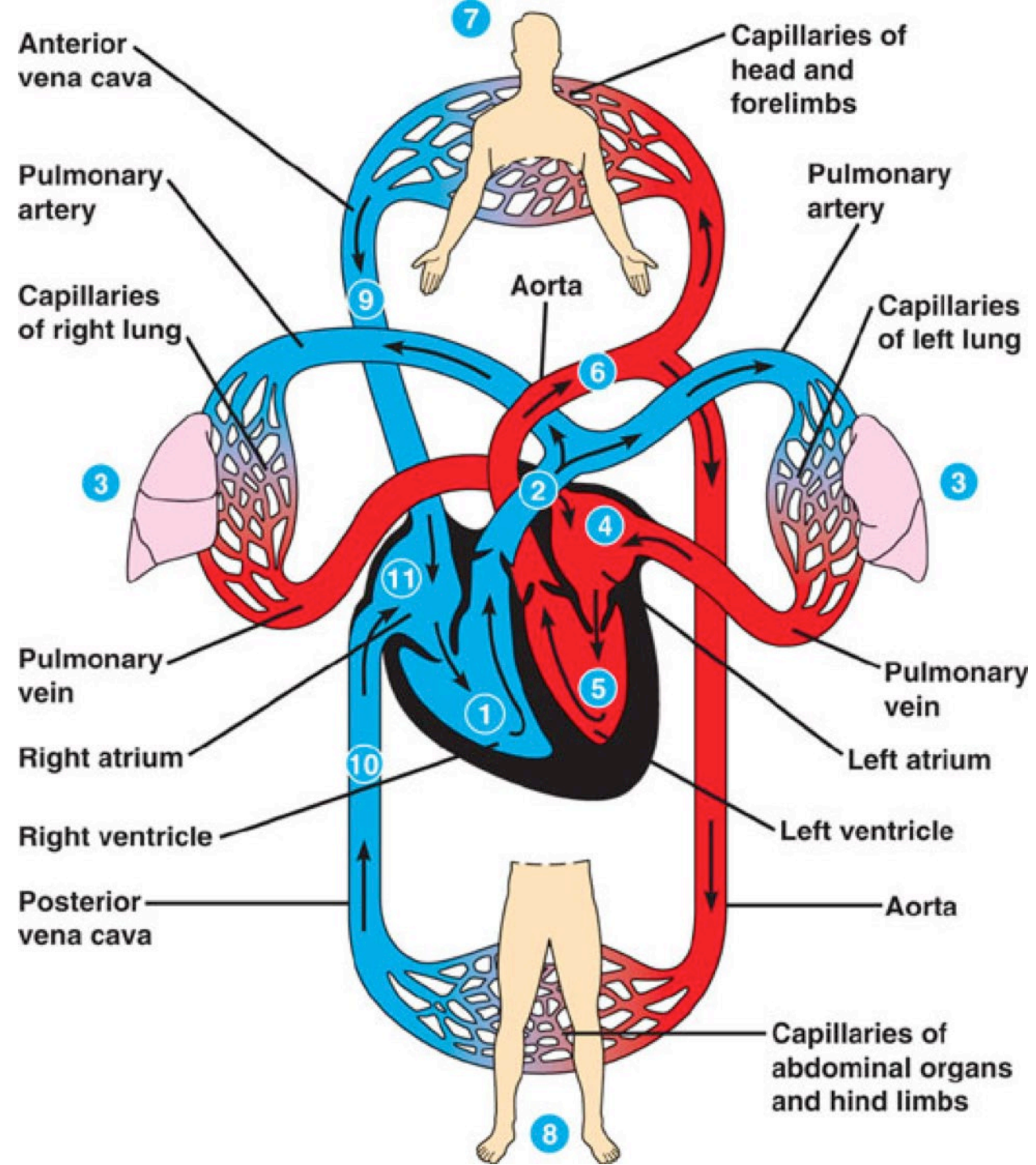


MITRAL
&
TRICUSPID
VALVES

PULMONARY
&
AORTIC
VALVES



CARDIOVASCULAR SYSTEM

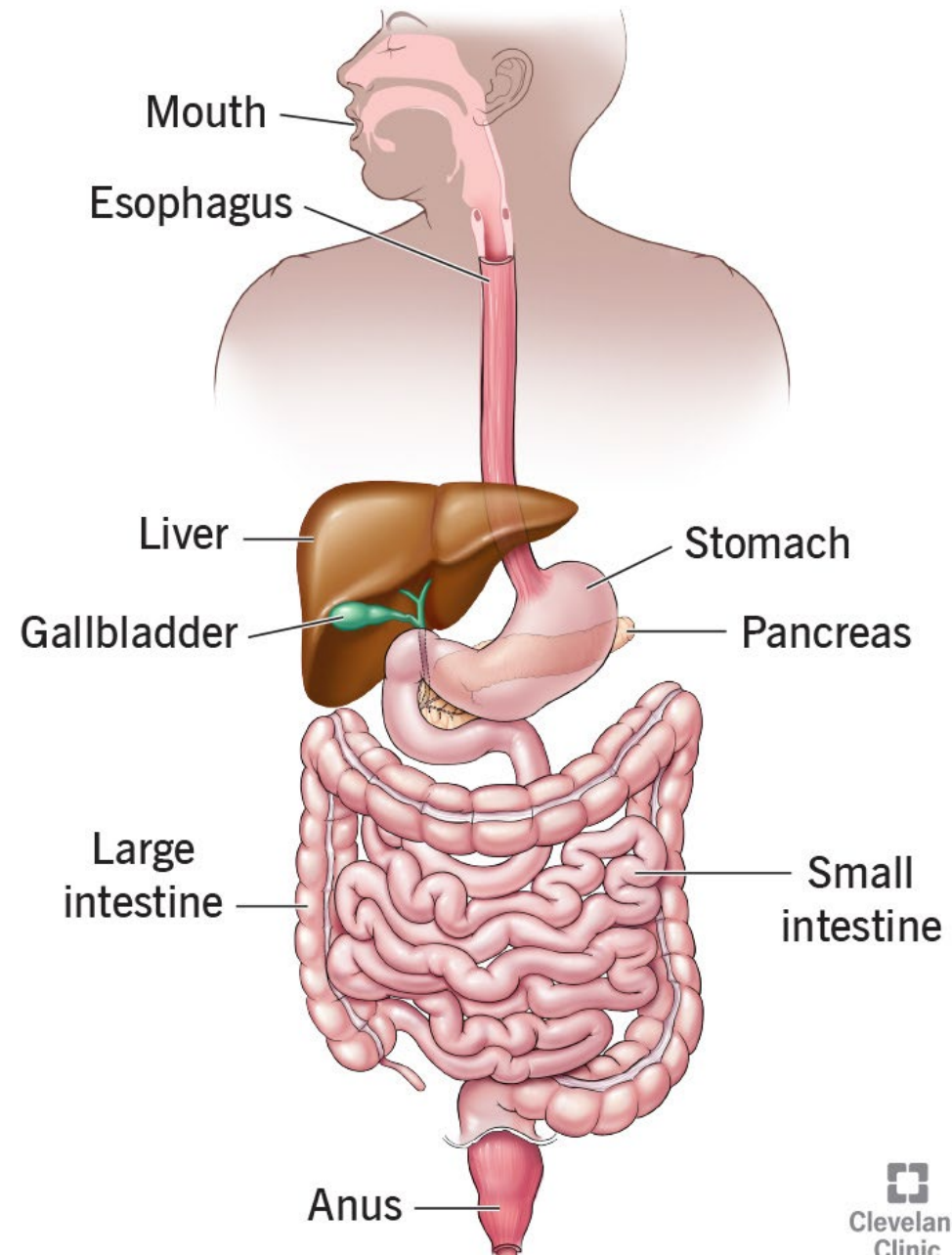


DIGESTIVE SYSTEM

- CONVERTS FOOD WE CONSUME INTO SIMPLIST FORMS
 - GLUCOSE (SUGARS)
 - AMINO ACIDS (PROTEIN)
 - FATTY ACIDS (FATS)
- ABSORBED INTO THE BLOODSTREAM FROM SMALL INTESTINE
 - NUTRIENTS – CARRIED INTO EVERY CELL IN THE BODY

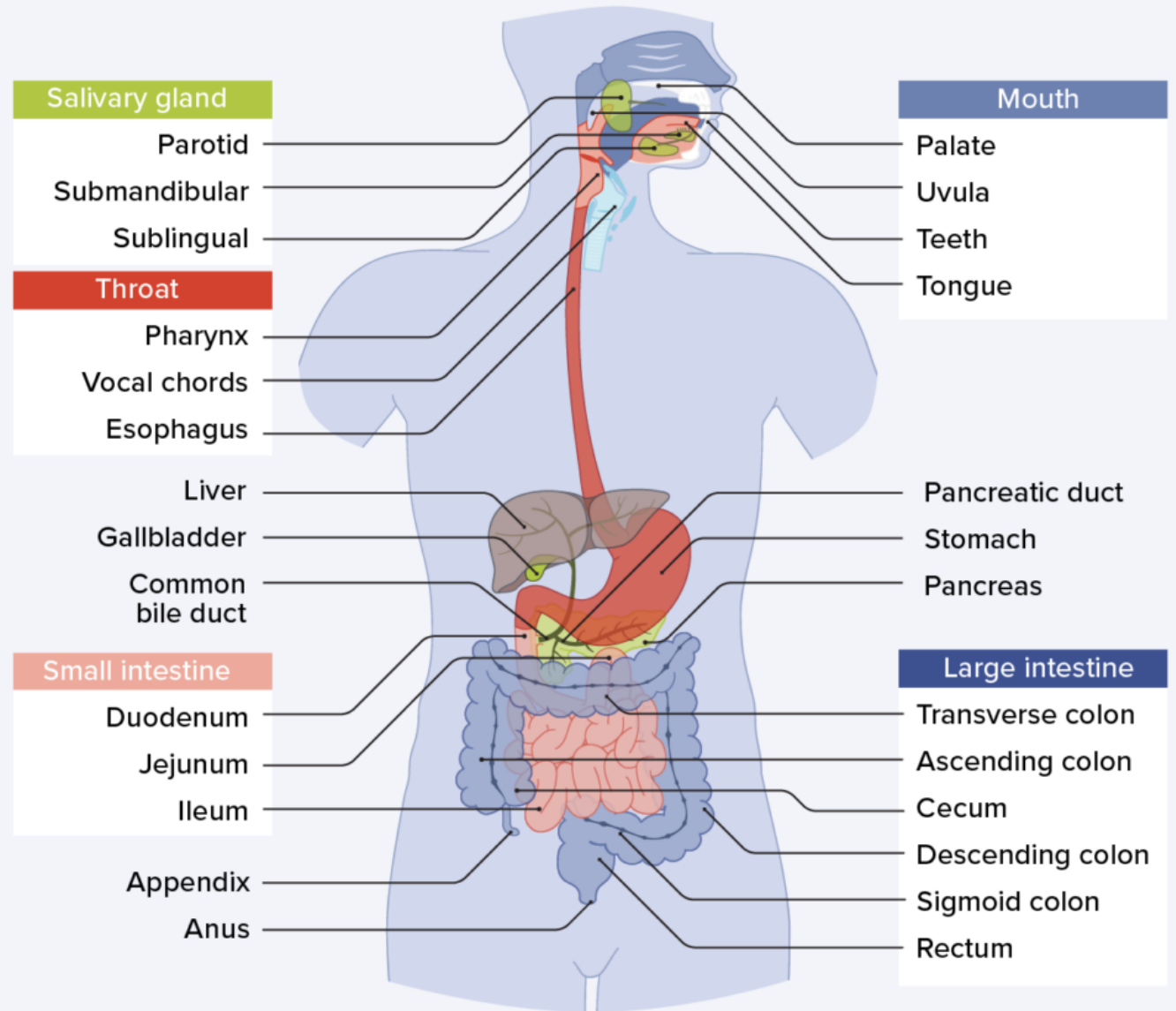
DIGESTIVE SYSTEM

Digestive system



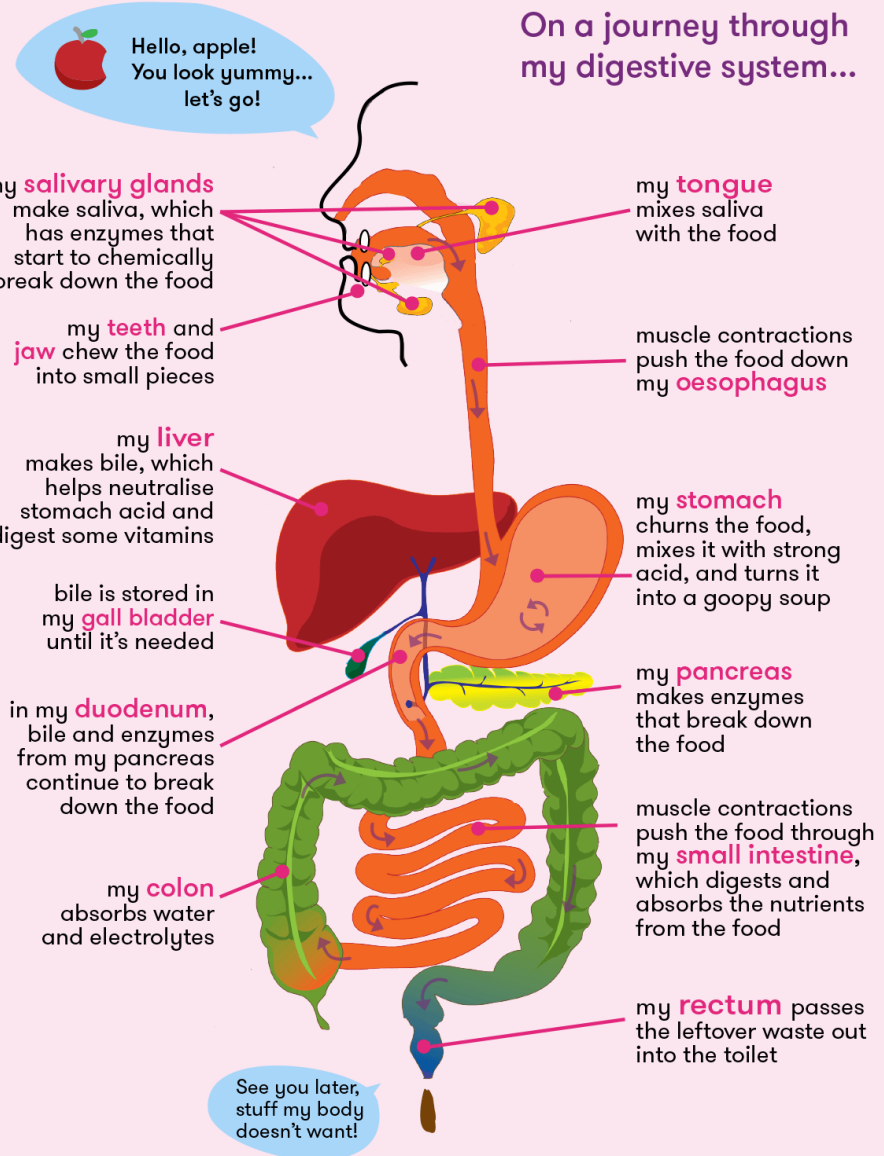
DIGESTIVE SYSTEM

Digestion



DIGESTIVE PROCESS

WHERE DOES MY FOOD GO AFTER I EAT IT?



DIGESTIVE PROCESS

1. Mouth: Chews food and mixes it with saliva

2. Salivary glands: Produce saliva, which contains a starch-digesting enzyme called salivary amylase

3. Pharynx: Swallows the chewed food mixed with saliva called bolus

4. Esophagus: Moves the bolus to the stomach

5. Stomach: Mixes and churns food with gastric juice that contain acid and a protein-digesting enzyme called pepsin creating chyme

6. Liver: Makes bile which aids in the digestion and absorption of fat

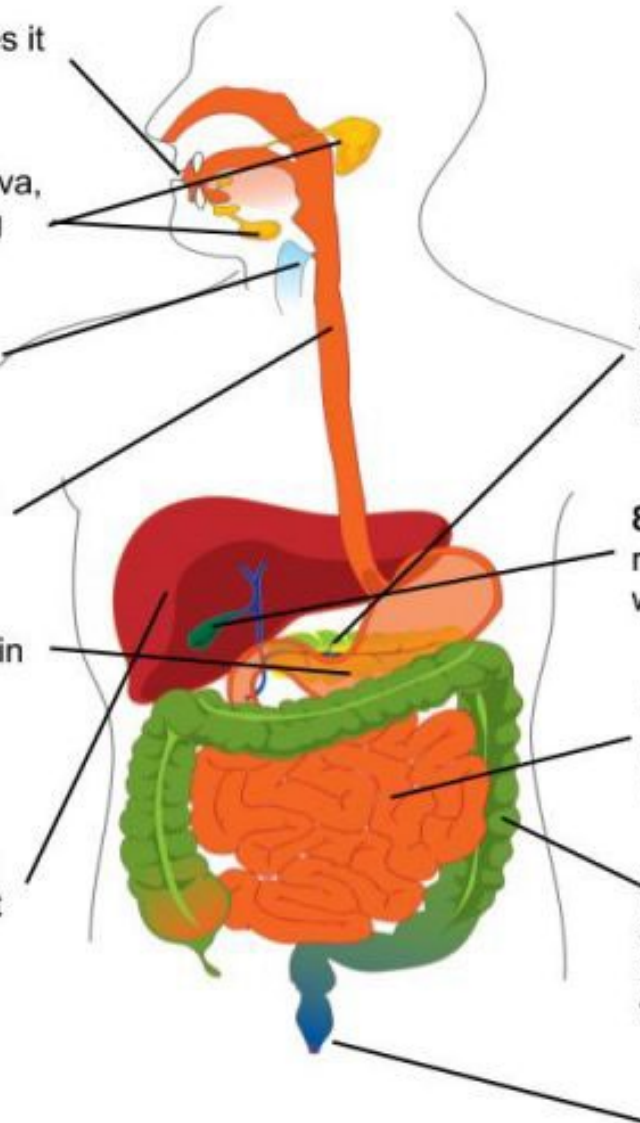
7. Pancreas: Releases bicarbonate to neutralize intestinal contents; produces enzymes that digest carbohydrates, protein, and fat

8. Gallbladder: Stores bile and releases it into the small intestine when needed


9. Small Intestine: Digests food and absorbs nutrients into blood or lymph

10. Large Intestine: Absorbs water and some vitamins and minerals; home to intestinal bacteria; passes waste material

11. Anus: Opens to allow waste to leave the body




DIGESTIVE PROCESS

Propulsion 

- Swallowing (oropharynx)
- Peristalsis (esophagus, stomach, small intestine, large intestine)

Chemical digestion 

Mechanical digestion 

- Chewing (mouth)
- Churning (stomach)
- Segmentation (small intestine)

Ingestion of food

Pharynx

Esophagus

Stomach

Small intestine

Large intestine

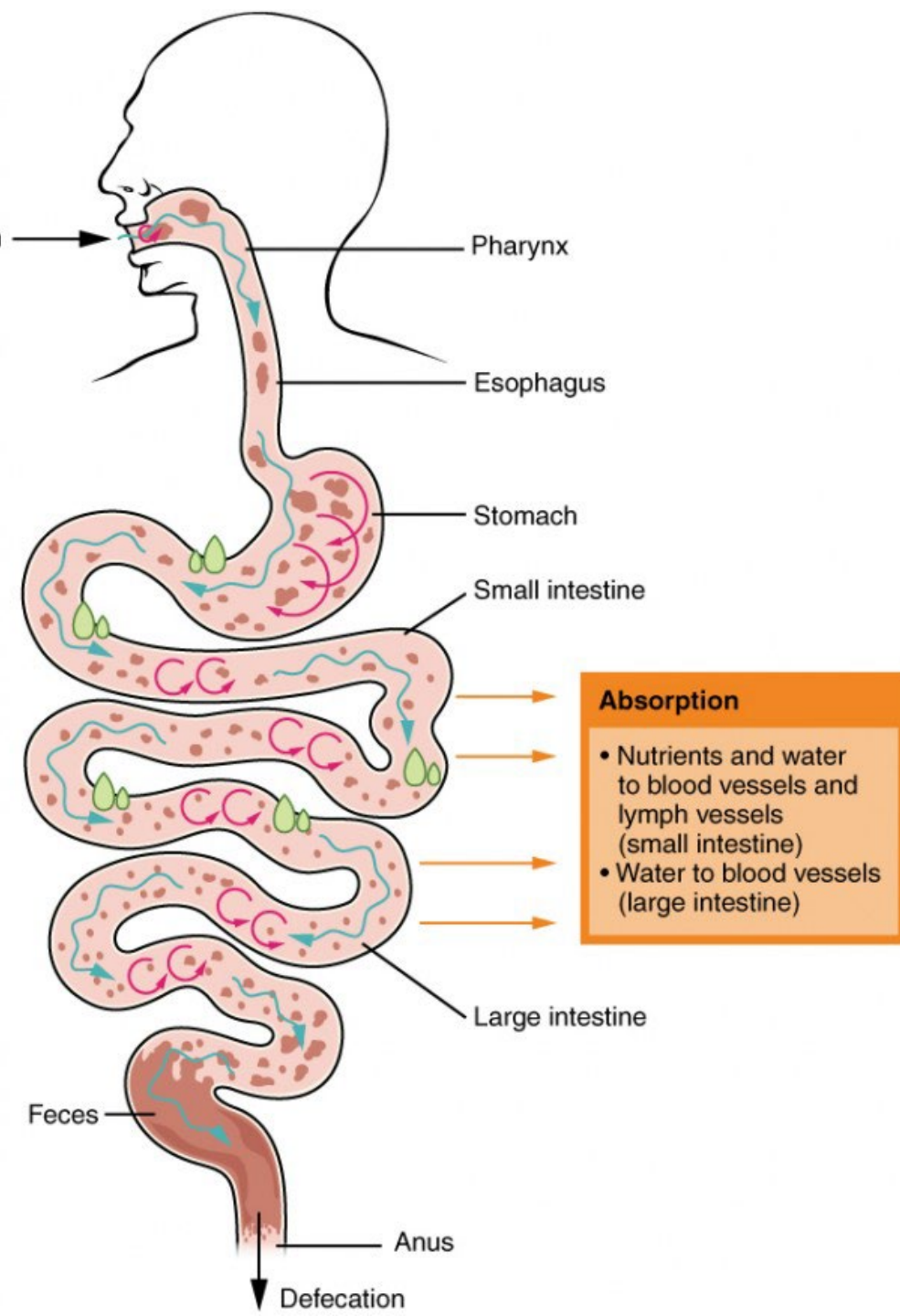
Feces

Anus

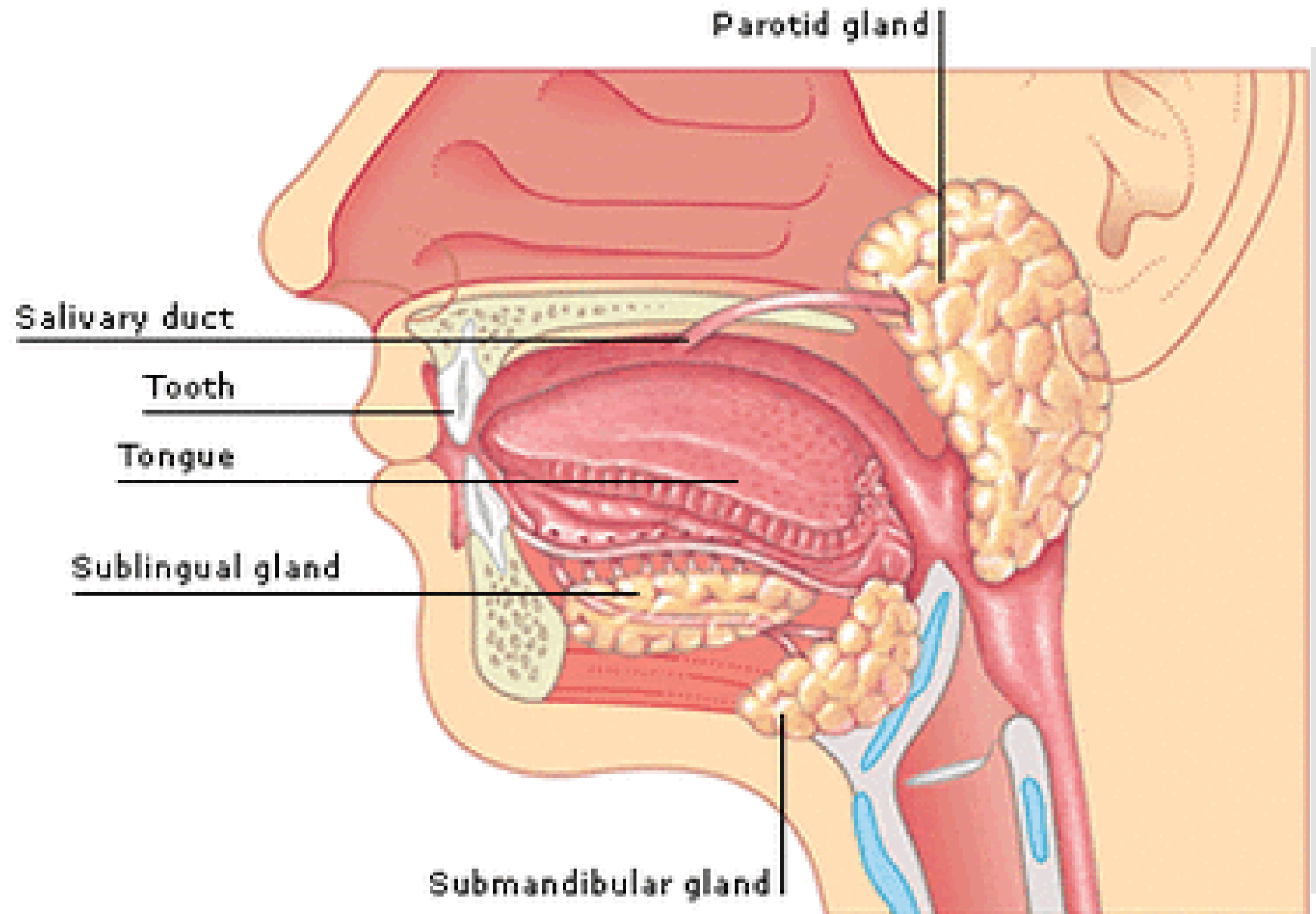
Defecation

Absorption

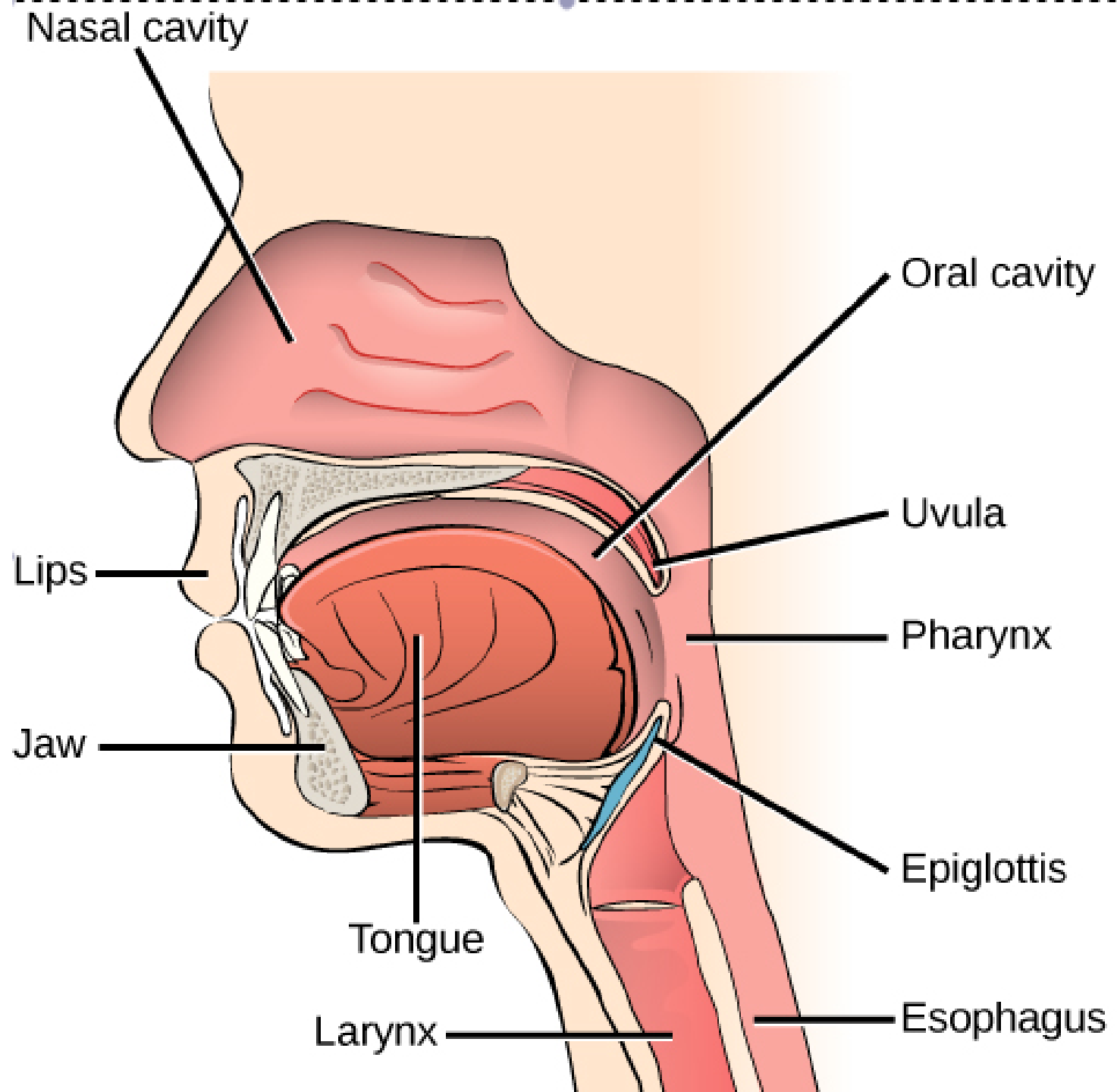
- Nutrients and water to blood vessels and lymph vessels (small intestine)
- Water to blood vessels (large intestine)



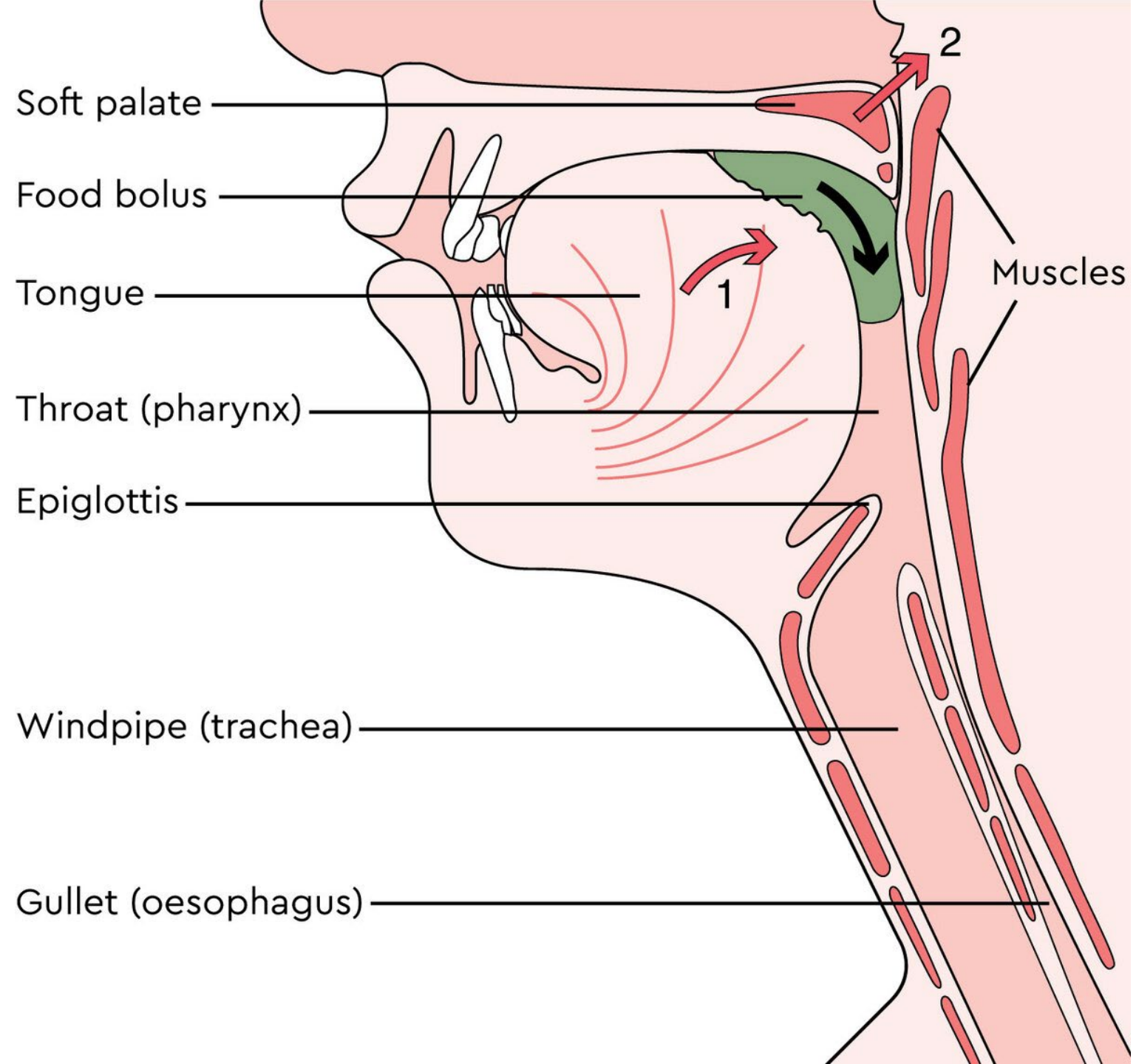
CHEWING
&
GLANDS



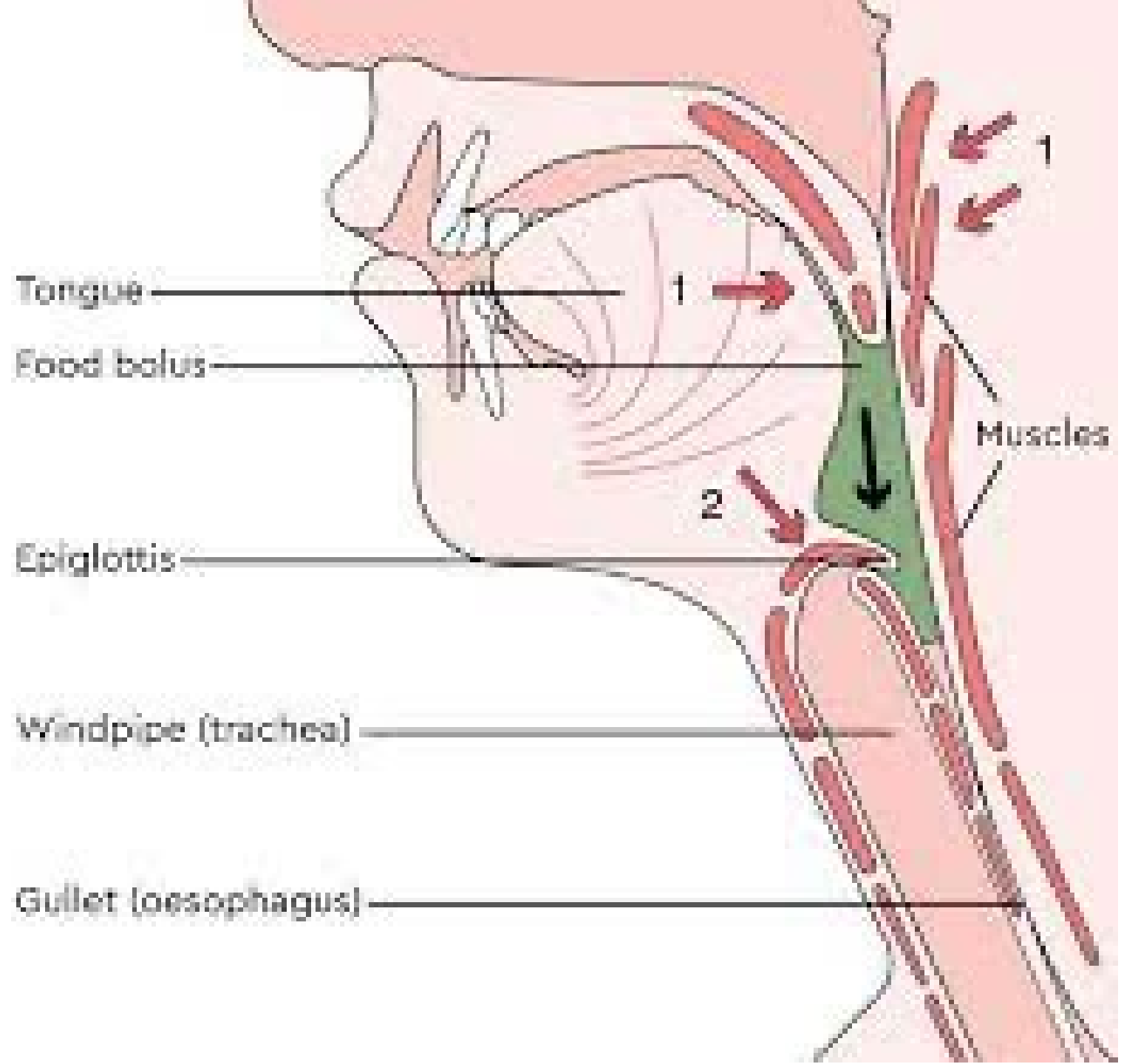
EPIGIOTIS -
SWALLOWING

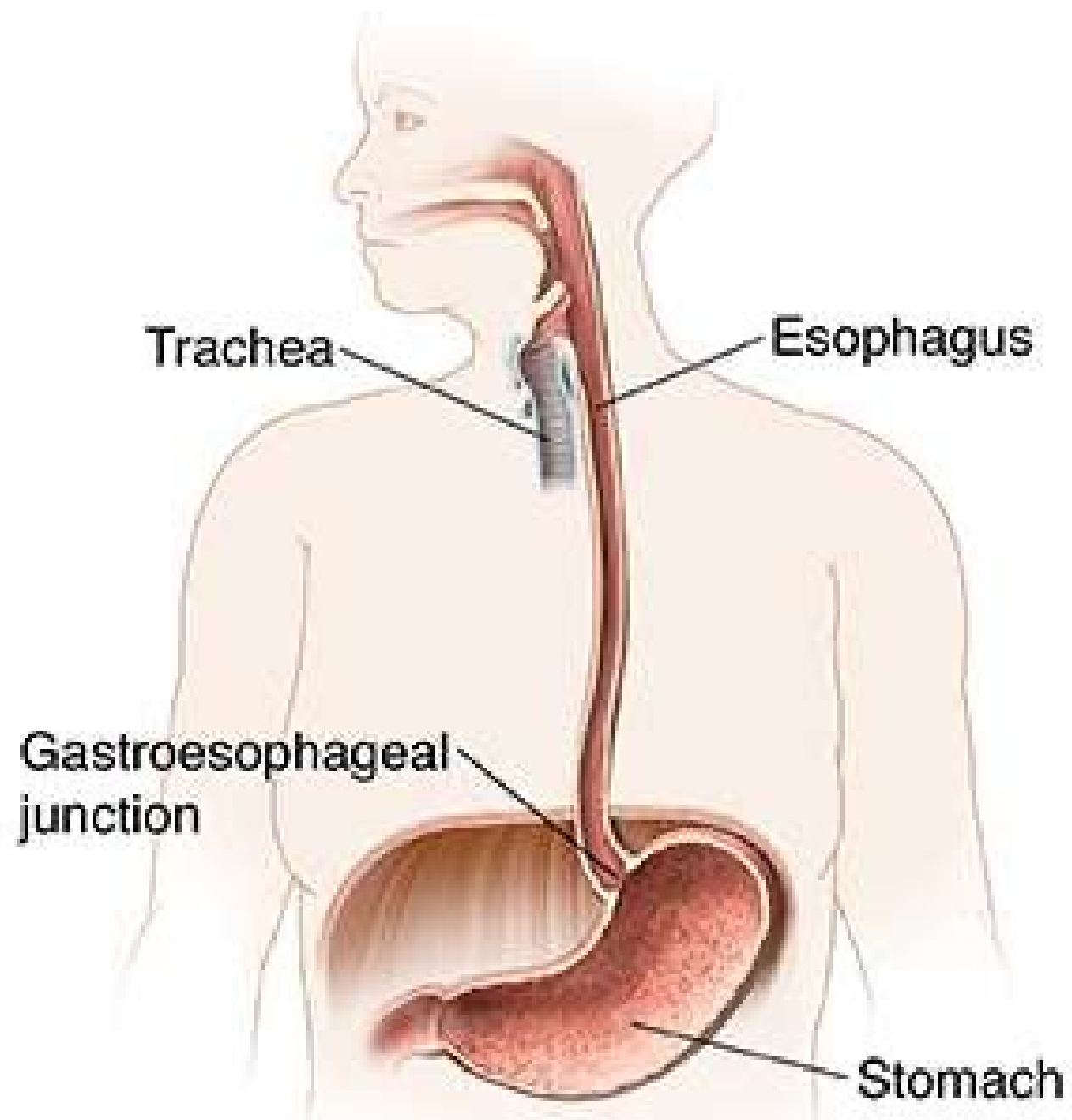


SWALLOWING PROCESS

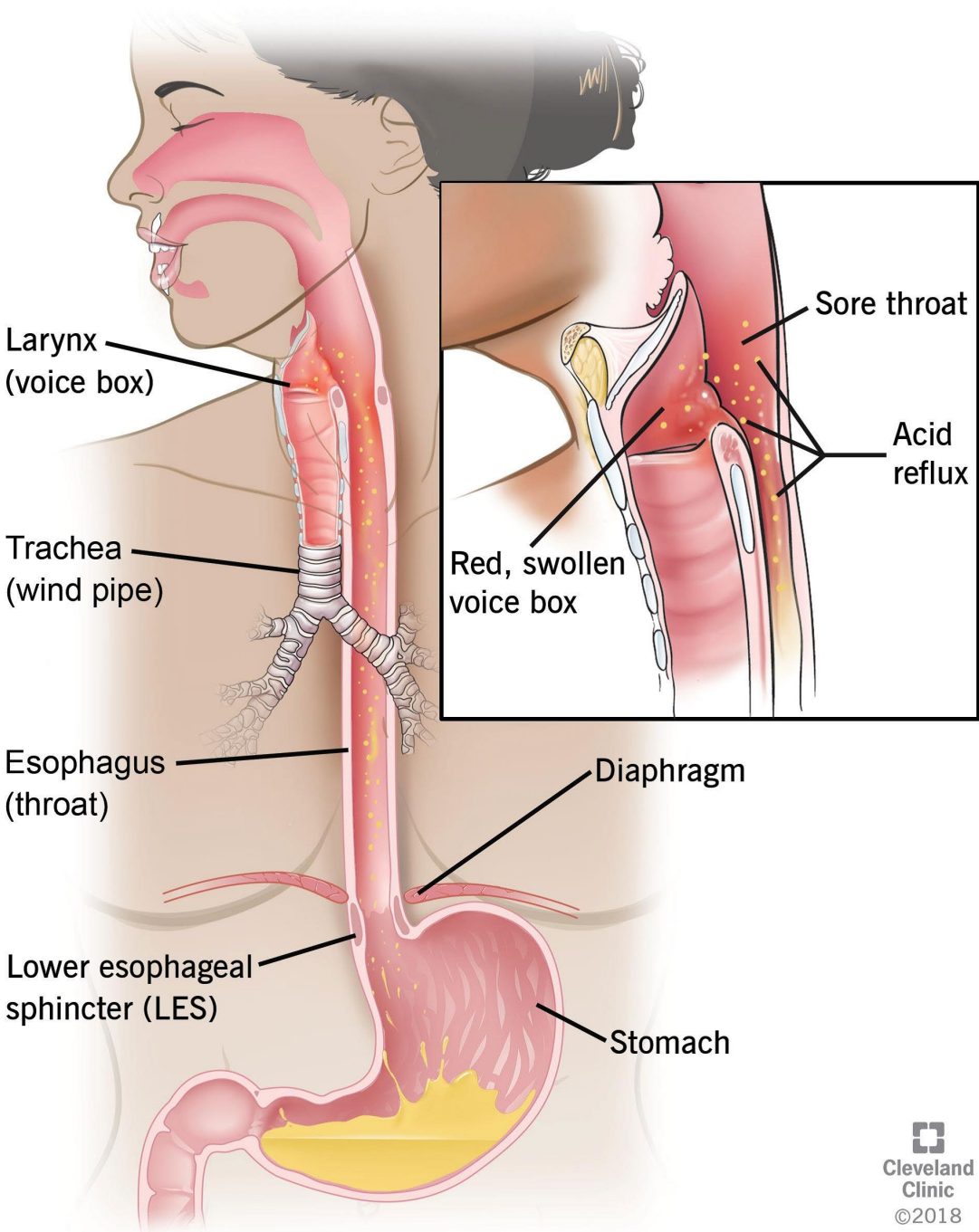


SWALLOWING PROCESS





ESOPHAGUS



STOMACH

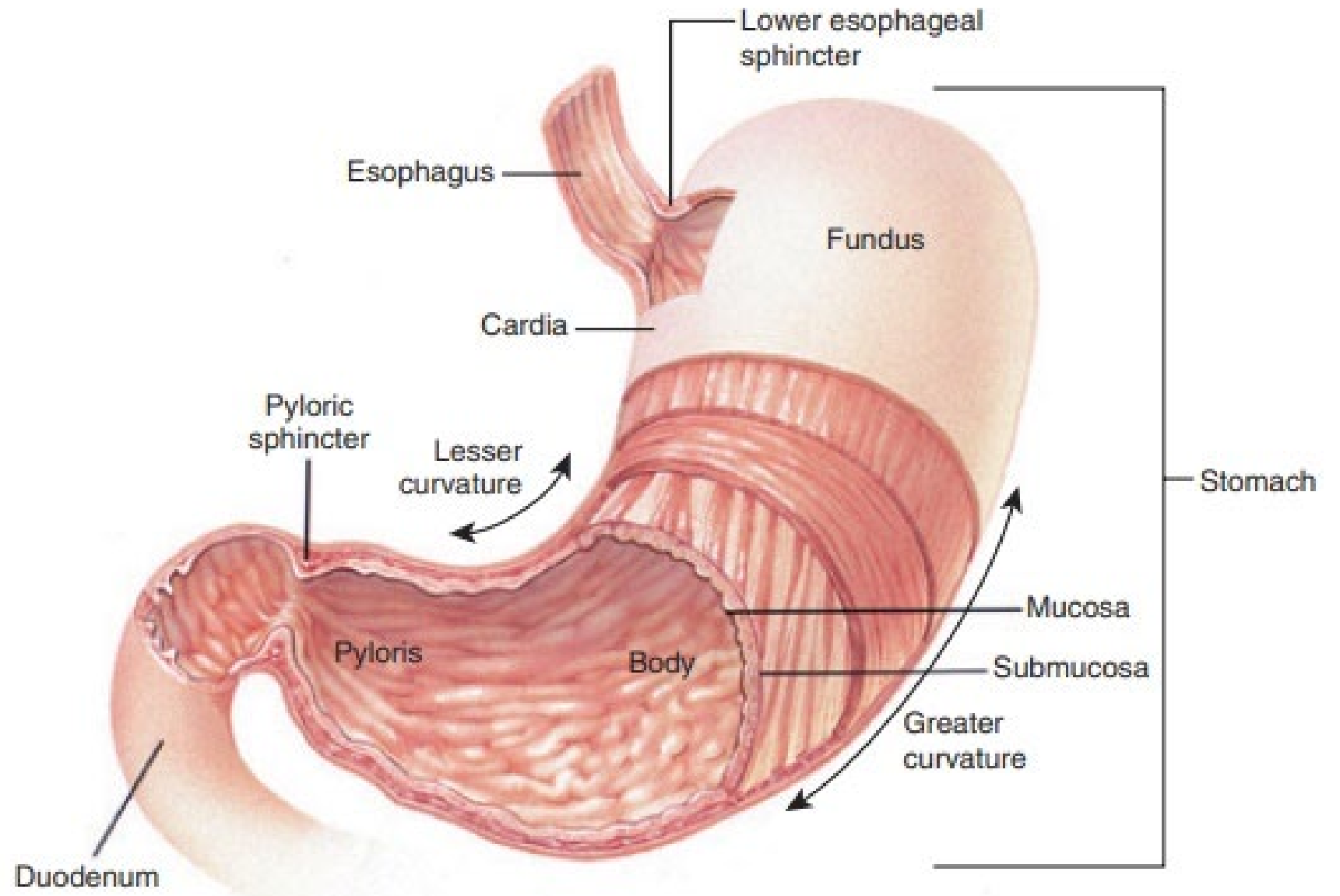


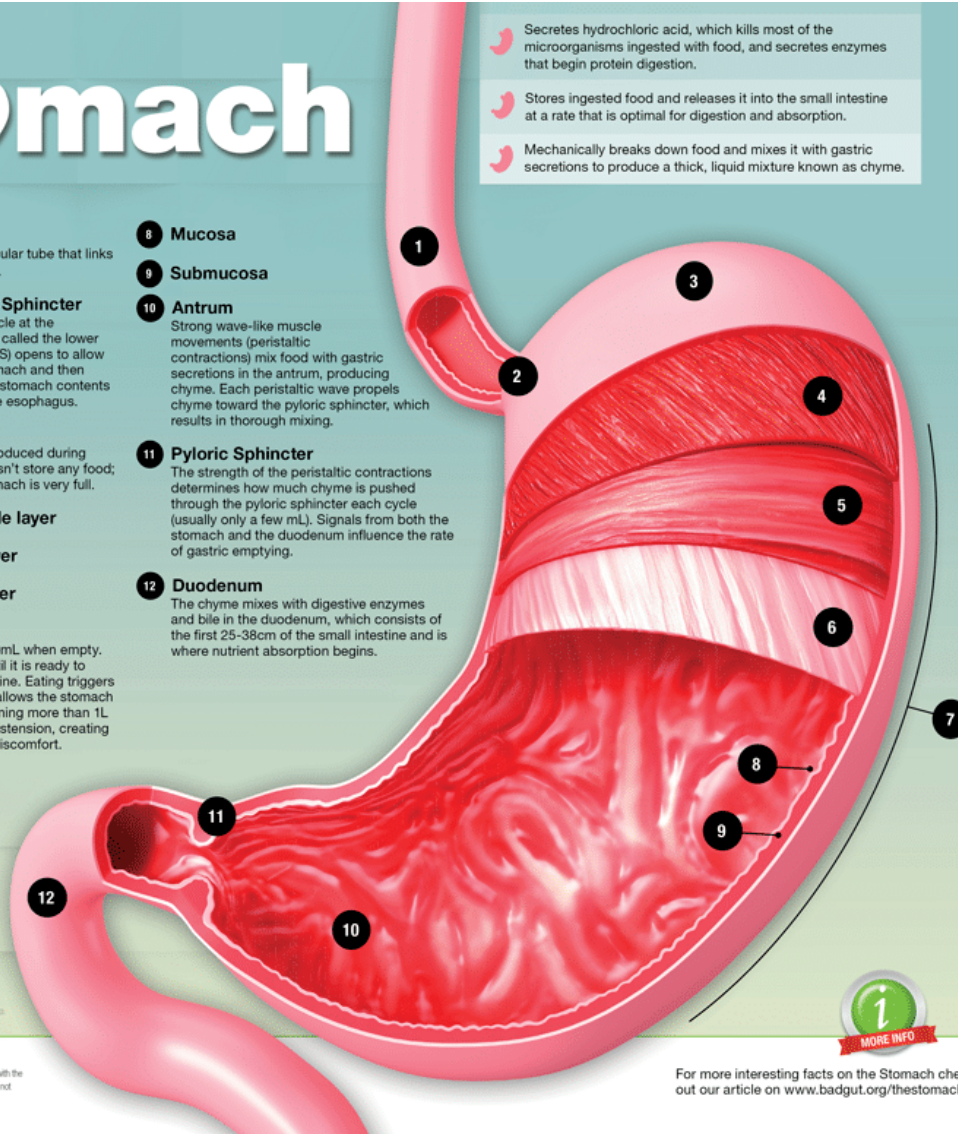
FIGURE 24-8 The stomach.

THE Stomach

- 1 Esophagus**
The esophagus is a muscular tube that links the throat to the stomach.
- 2 Lower Esophageal Sphincter**
A specialized ring of muscle at the bottom of the esophagus called the lower esophageal sphincter (LES) opens to allow food to pass into the stomach and then quickly closes to prevent stomach contents from flowing back into the esophagus.
- 3 Fundus**
The fundus stores gas produced during digestion. It typically doesn't store any food; however, it can if the stomach is very full.
- 4 Longitudinal muscle layer**
- 5 Circular muscle layer**
- 6 Oblique muscle layer**
- 7 Body**
The body's volume is ~50mL when empty. Food is stored in here until it is ready to move into the small intestine. Eating triggers receptive relaxation that allows the stomach to expand to ~1L. Consuming more than 1L of food can cause over-distension, creating a feeling of fullness and discomfort.

- 8 Mucosa**
- 9 Submucosa**
- 10 Antrum**
Strong wave-like muscle movements (peristaltic contractions) mix food with gastric secretions in the antrum, producing chyme. Each peristaltic wave propels chyme toward the pyloric sphincter, which results in thorough mixing.
- 11 Pyloric Sphincter**
The strength of the peristaltic contractions determines how much chyme is pushed through the pyloric sphincter each cycle (usually only a few mL). Signals from both the stomach and the duodenum influence the rate of gastric emptying.
- 12 Duodenum**
The chyme mixes with digestive enzymes and bile in the duodenum, which consists of the first 25-38cm of the small intestine and is where nutrient absorption begins.

- Secretes hydrochloric acid, which kills most of the microorganisms ingested with food, and secretes enzymes that begin protein digestion.
- Stores ingested food and releases it into the small intestine at a rate that is optimal for digestion and absorption.
- Mechanically breaks down food and mixes it with gastric secretions to produce a thick, liquid mixture known as chyme.



Stomach diagram: © geologic / 123RF Stock Photo, background image: © Ron Dale / 123RF Stock Photo, food image: © Valha Shaukawi / 123RF Stock Photo, seed image: © Alaysha Paternio / 123RF Stock Photo.

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Interesting Facts About the Stomach



Did you know? Just thinking about tasting, smelling, chewing, and swallowing food increases gastric secretions before you even eat anything!

Stomach acid is very acidic and contains enzymes that break down proteins, so at least every three days a new protective layer of mucus covering the stomach lining forms. Without it, the gastric juices would begin to macerate your stomach! Amazingly, the stomach secretes 2L of gastric juice every day.



A **peptic ulcer** is a sore in the lining of the stomach (gastric ulcer) or duodenum (duodenal ulcer). Most ulcers result from infection with bacteria called *Helicobacter pylori*, but another common cause is non-steroidal anti-inflammatory drugs such as ibuprofen and aspirin. Stress and spicy food do NOT cause ulcers.

Emotions can influence gastric motility. Depending on the person, sadness and fear tend to decrease motility whereas anger and aggression tend to increase it. Intense pain in any part of the body inhibits motility throughout the digestive tract.



Did you know? The stomach only absorbs certain medications (like aspirin) and small amounts of alcohol.

Vomiting is not a result of reverse peristalsis as you might expect. The force comes from the contraction of the respiratory muscles, (mainly the diaphragm) and the abdominal muscles. The brain signals to the stomach, esophagus, and associated sphincters to relax, allowing the gastric contents to travel upward and out.



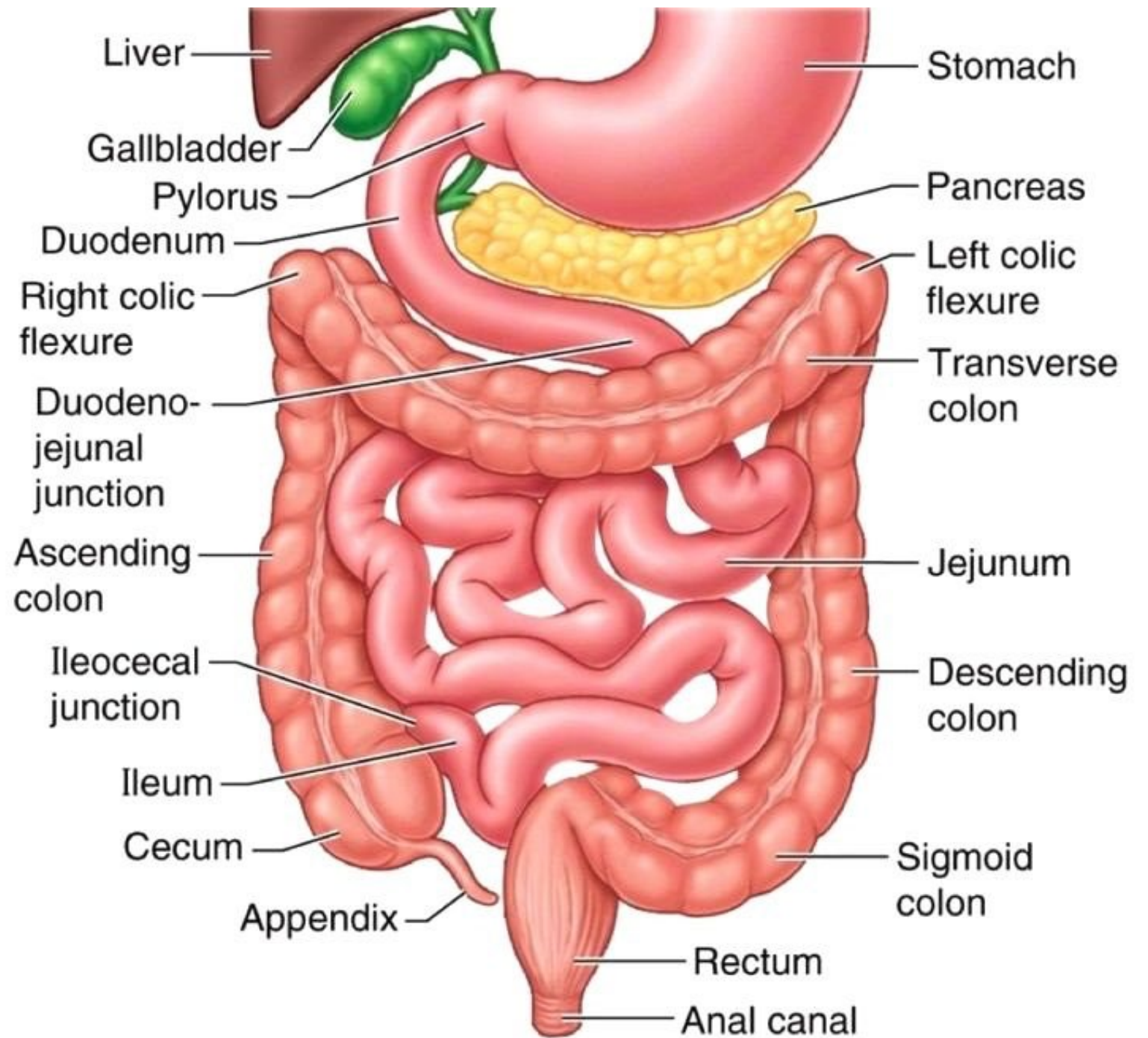
In 1868, Adolf Kussmaul, of Germany, performed what historians believe to be the first esophago-gastroscopy on a professional sword-swallower. This insightful choice of patient allowed him to complete the procedure with an inflexible device on someone who was used to having uncomfortable objects in his upper GI tract!



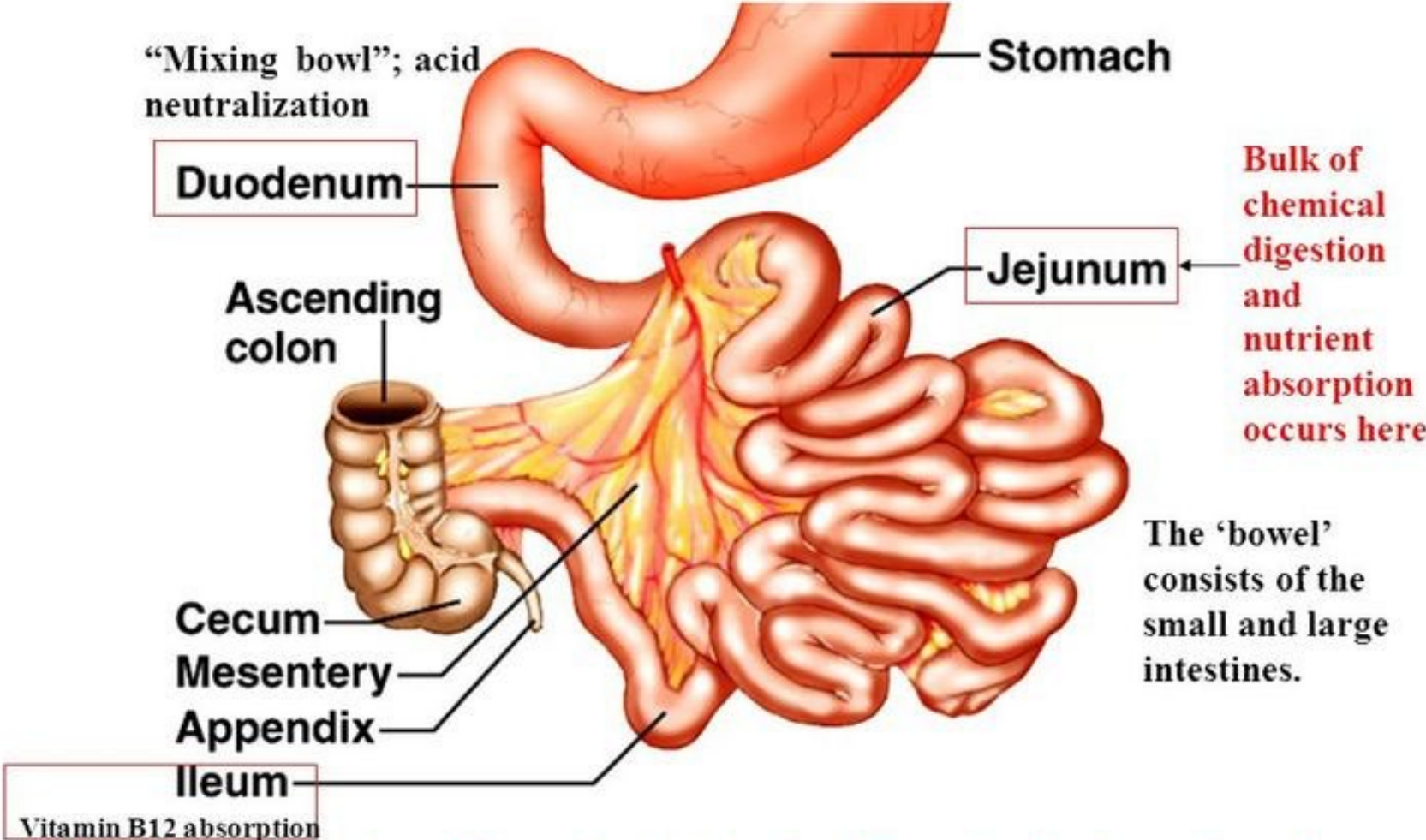
For more interesting facts on the Stomach check out our article on www.badgut.org/thestomach



SMALL
INTESTINE

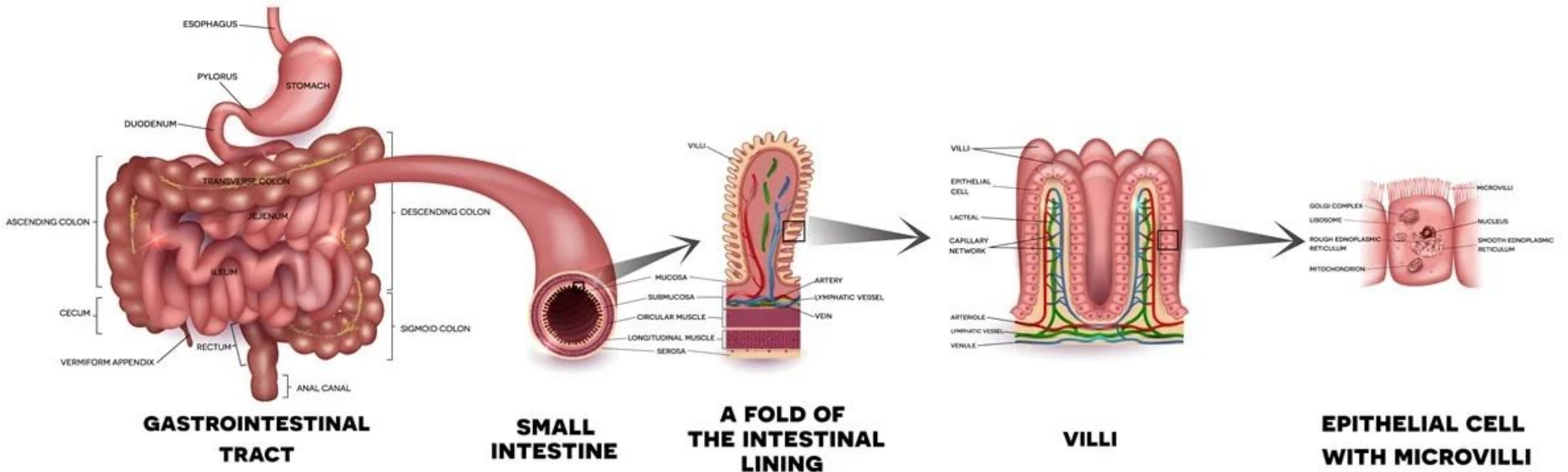


Three Parts of Small Intestine



Main functions of small intestine: 1) chemical digestion 2) absorption of nutrients (90%) from chyme

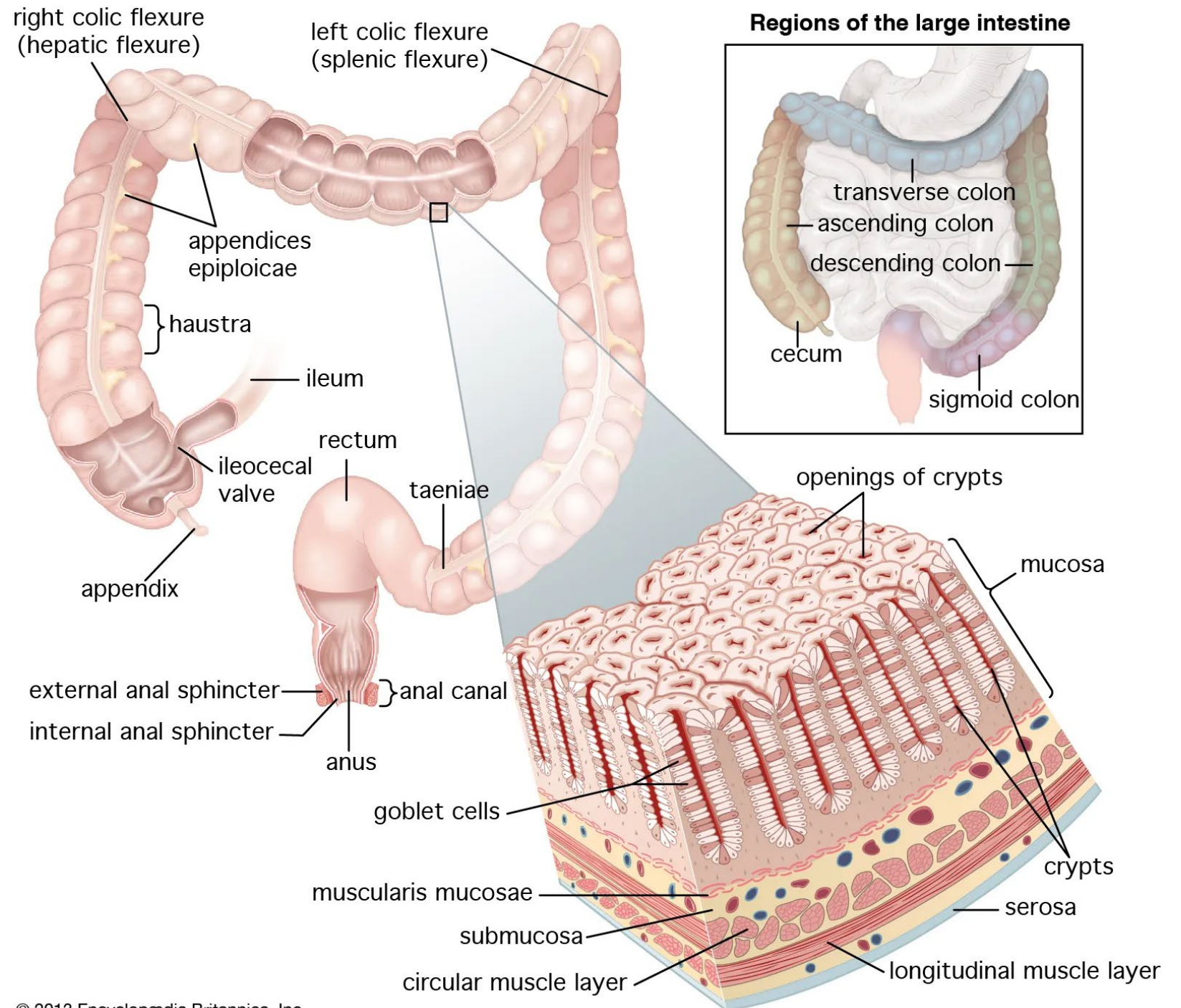
FUNCTIONS OF SMALL INTESTINE

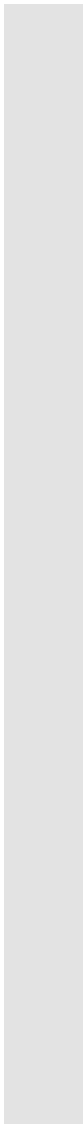


ABSORBING
WATER
ELECTROLYTES
VITAMINS

PRODUCING
VITAMINS

FORMING/PROPELLING
FAECES





THANK YOU!

