



**SNS COLLEGE OF ALLIED HEALTH SCIENCES**  
SNS Kalvi Nagar, Coimbatore - 35  
Affiliated to Dr MGR Medical University, Chennai



**DEPARTMENT OF CARDIO PULMONARY PERFUSION CARE**  
**TECHNOLOGY**

**COURSE NAME : GASTROENTEROLOGY**

**3<sup>RD</sup> YEAR**

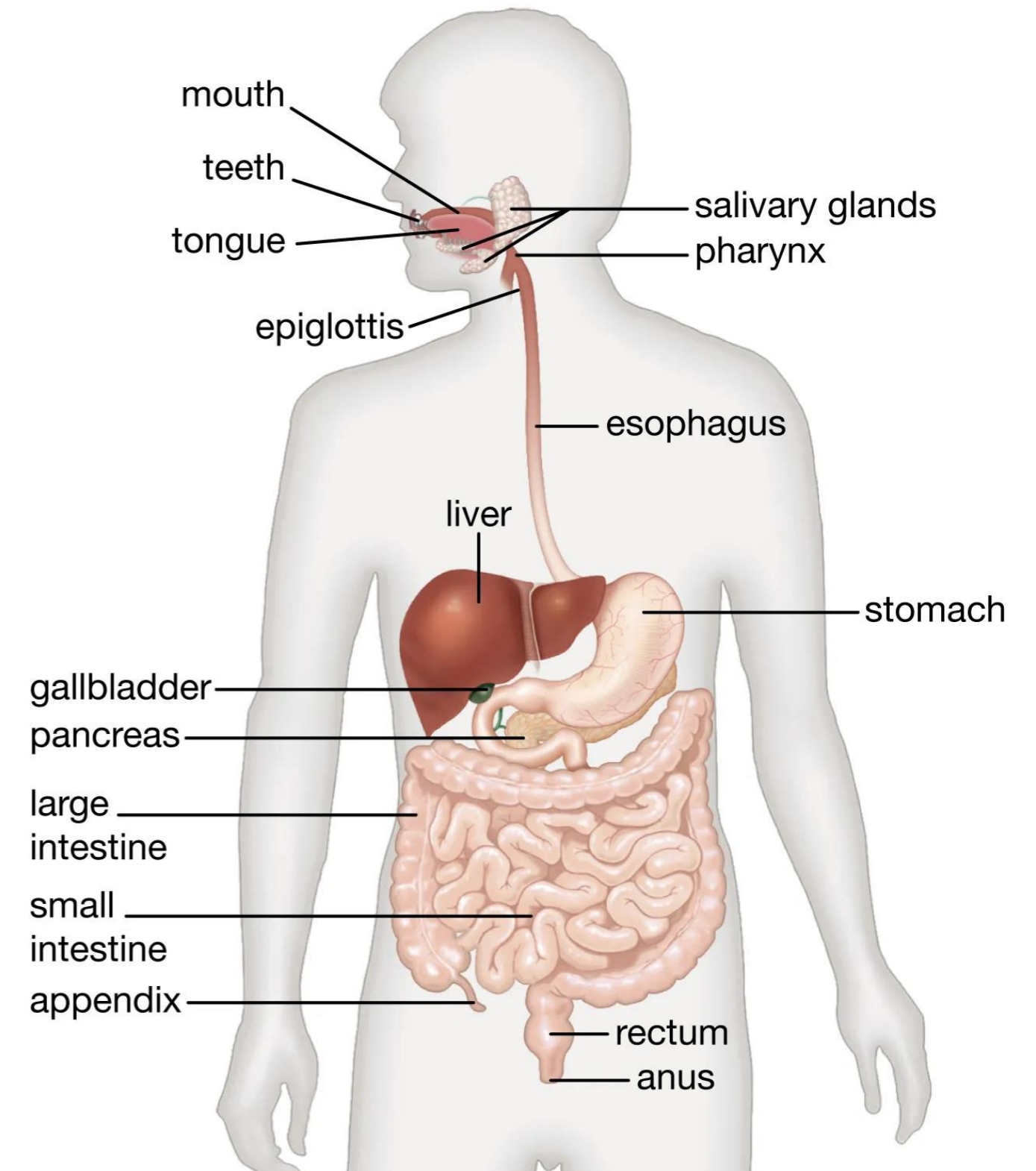
**TOPIC : ANATOMY OF DIGESTIVE SYSTEM**



# INTRODUCTION



- The gastrointestinal tract is an organ system within humans and other animals which **takes in food, digests it and absorb energy and nutrients, and expels the remaining waste as feces.**
- The digestive system is formed by the alimentary canal & its associated glands.
- The digestive system begins at mouth & ends at anus.

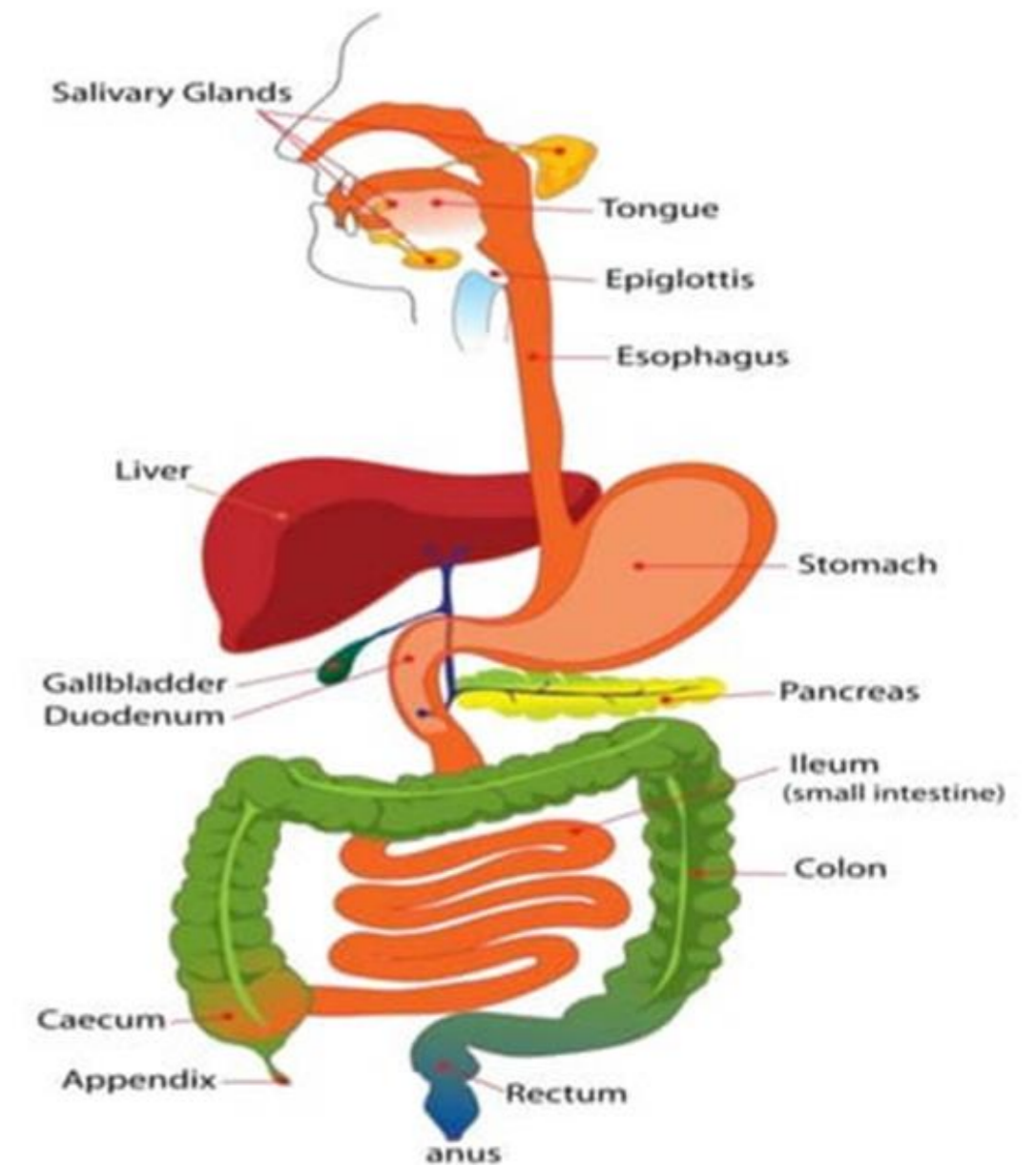




# FUNCTIONS OF DIGESTIVE SYSTEM

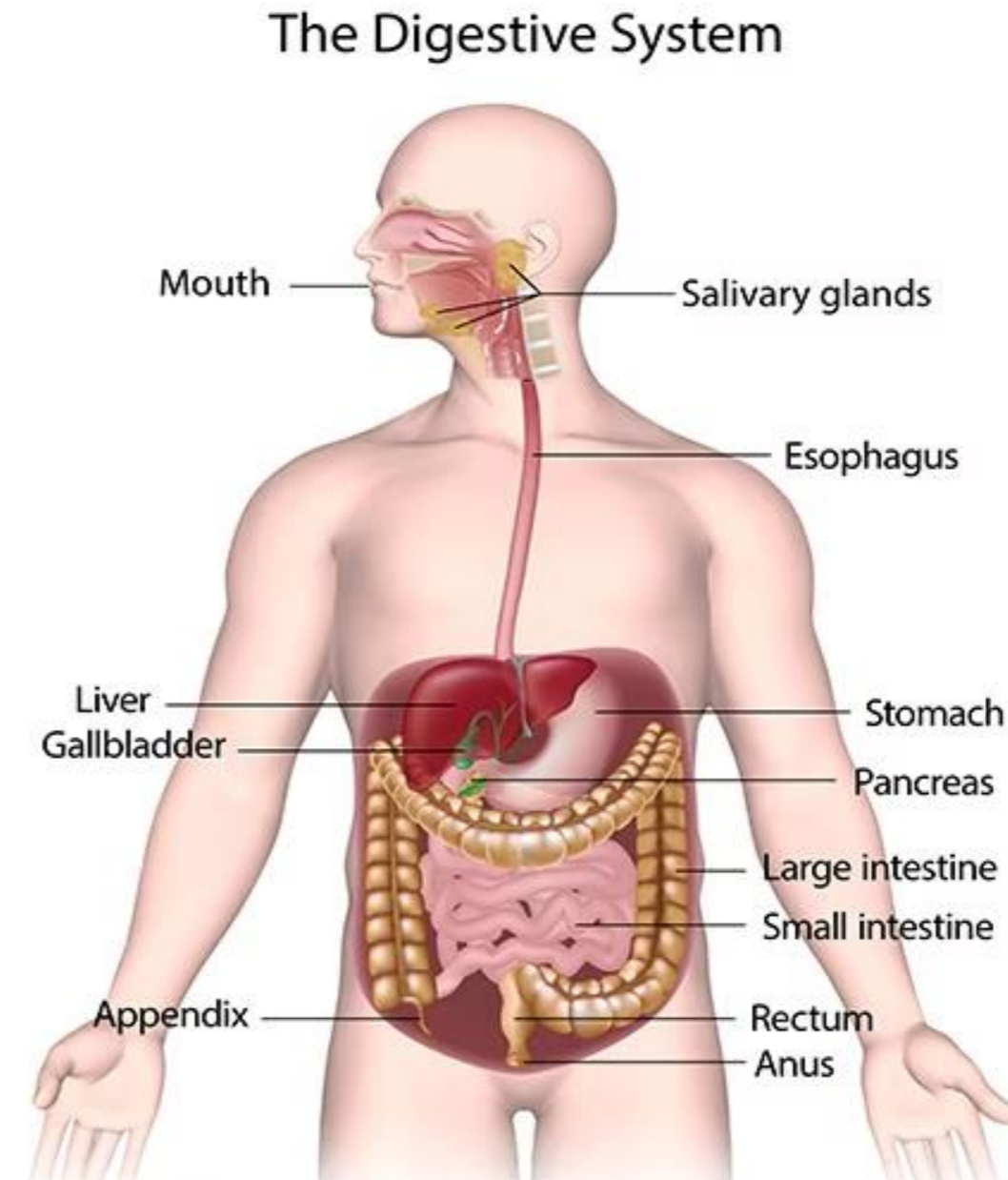


- **Ingestion** : taking of food into the alimentary tract.
- **Propulsion** : mixes & moves the contents along the alimentary tract.
- **Digestion** : consist of:
  - Mechanical breakdown of food e.g. mastication (chewing)
  - Chemical digestion of food into small molecules by enzymes.
- **Absorption** : digested food substances pass through the walls of some organs of the walls of some organs of the alimentary canal into the blood for circulation.
- **Elimination** : food substances that have been eaten but cannot be digested & absorbed are excreted from the alimentary canal as faeces by the process of defaecation.



# Parts of Digestive System

1. Mouth
2. Tongue
3. Oesophagus
4. Stomach
5. Small intestine
6. Large intestine
7. Rectum
8. Anal canal





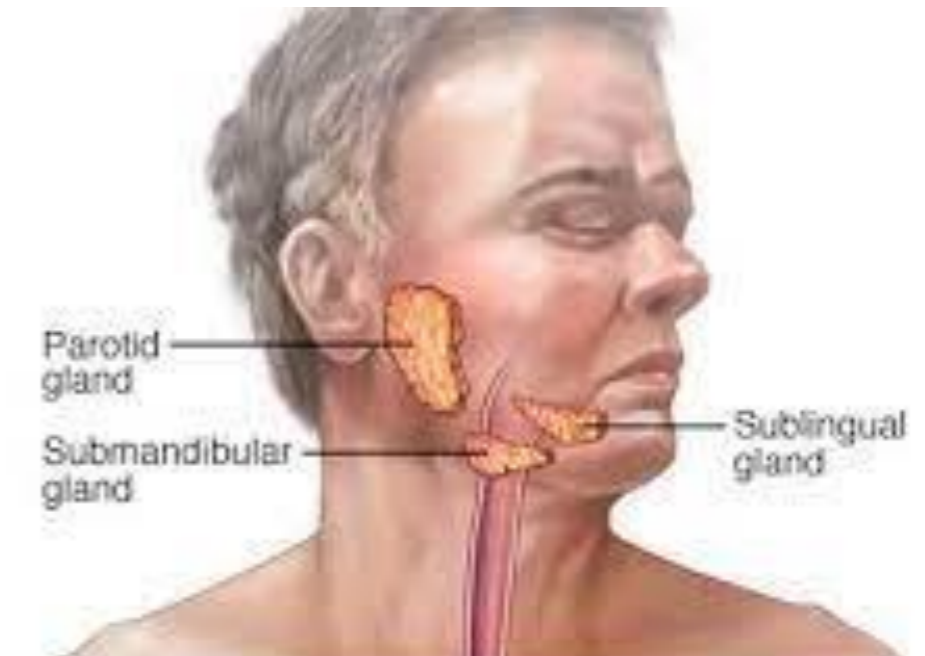
# Glands



An organ that makes one or more substances, such as hormones, digestive juices, sweat, tears, saliva, or milk.

Glands contributing digestive juices include the

- Salivary glands
- Liver
- Pancreas



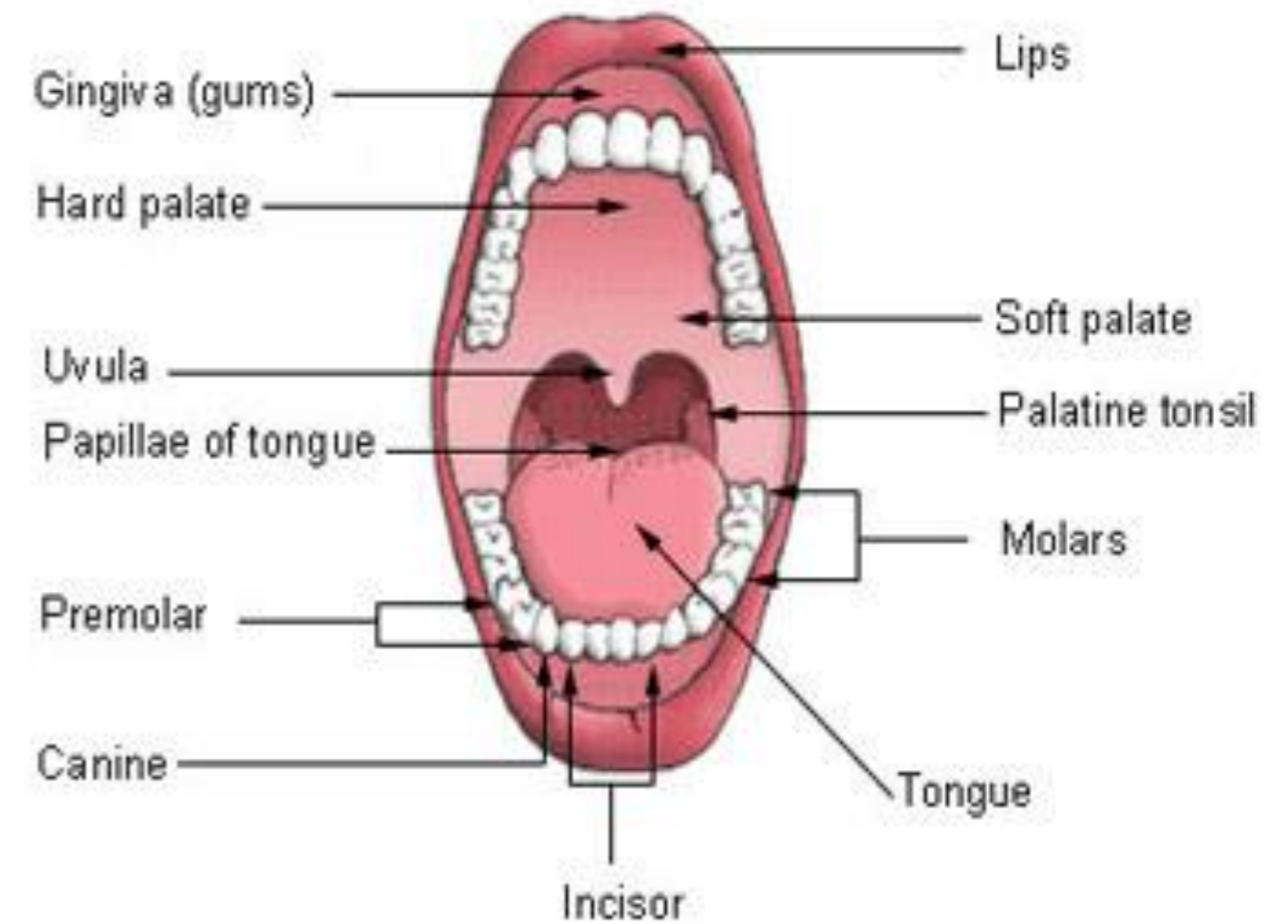
# MOUTH

- The mouth is the first portion of the alimentary canal that **receives food and produces saliva.**
- The oral mucosa is the **mucous membrane epithelium** lining the inside of the mouth.

## BOUNDARIES

- ✓ Anteriorly – Lips
- ✓ Posteriorly – Pharynx
- ✓ Superiorly – Palate
- ✓ Inferiorly – Tongue & floor of the mouth
- ✓ Laterally – Cheeks
- The **uvula** is a **curved fold of muscle covered with mucous membrane**, hanging down from the middle.

**Mouth (Oral Cavity)**

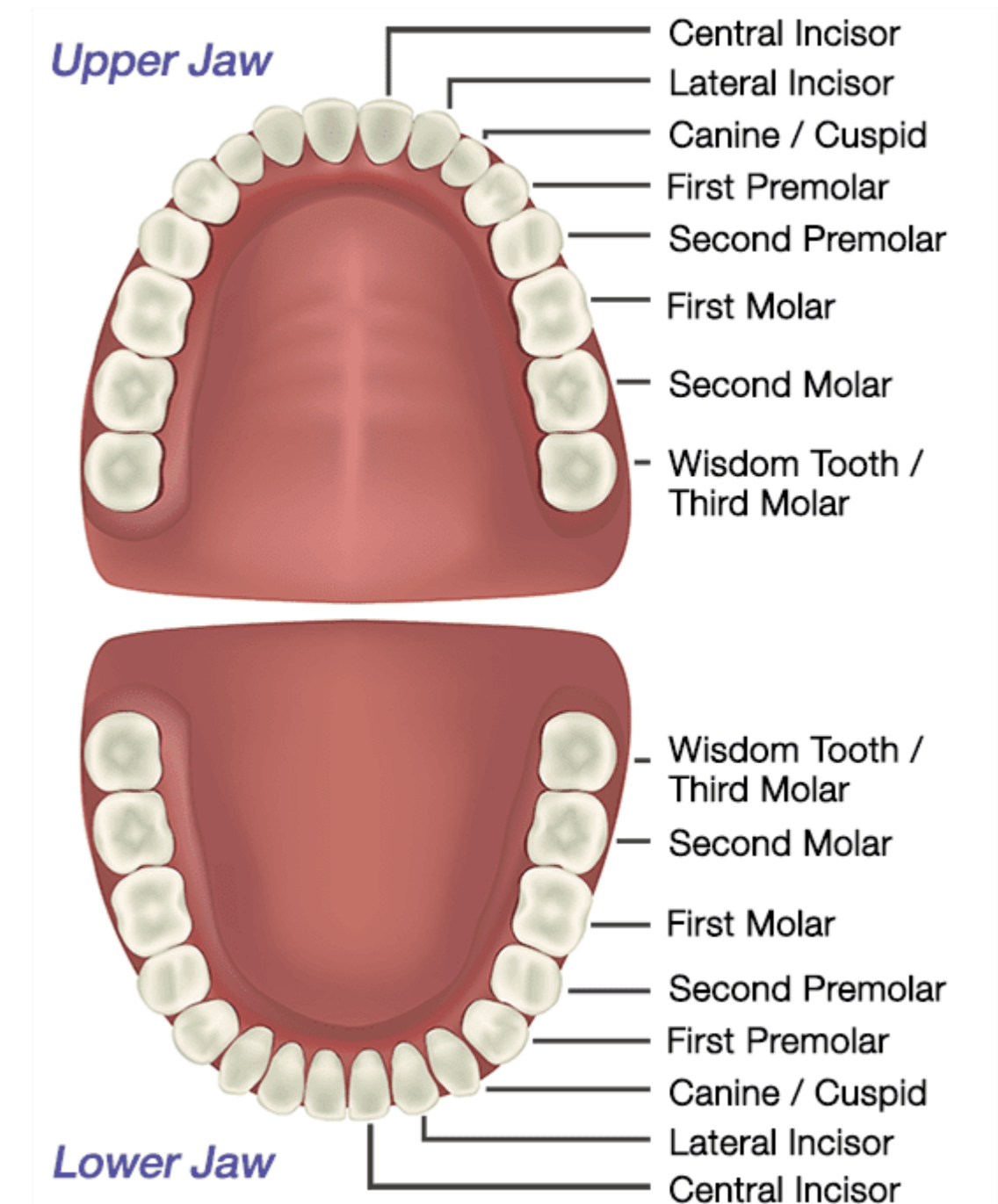




# TEETH



- The human teeth function to mechanically break down items of food by cutting and crushing them in preparation for swallowing and digesting.
- Each jaw has
  - 4 incisor (biting the food)
  - 2 canine (tearing the fleshy food)
  - 4 premolar (grinding the food)
  - 6 molar (chewing the food)

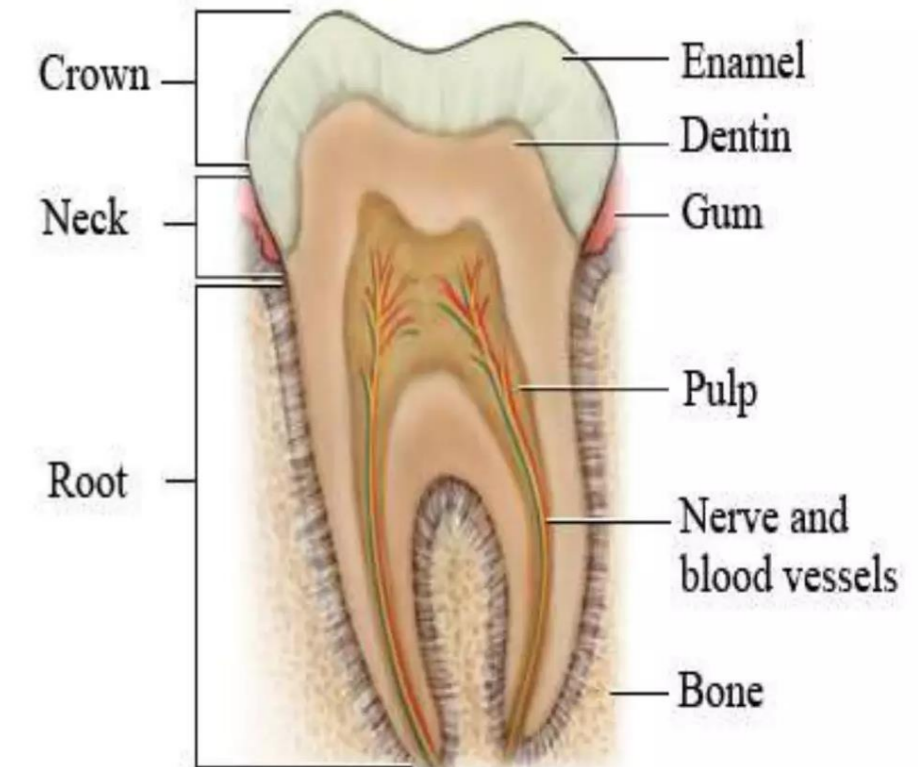




# Parts of teeth



1. **Enamel** - Enamel is the hardest and most highly mineralized substance of the body.
2. **Dentine** - Dentin is the substance between enamel or cementum and the pulp chamber.
3. **Cementum** - Cementum is a specialized bone like substance covering the root of a tooth. Its coloration is yellowish and it is softer than dentin and enamel
4. **Dental pulp** - The dental pulp is the central part of the tooth filled with soft connective tissue.



BLOOD SUPPLY - Maxillary arteries

VENOUS DRAINAGE - Internal jugular veins

NERVE SUPPLY - Maxillary nerves, Mandibular nerves





# TONGUE



- The tongue is a muscular organ in the mouth, that manipulates food for mastication, and is used in the act of swallowing
- Tongue has **extrinsic and intrinsic** muscles

Blood supply – Lingual artery a branch of external carotid artery  
- Lingual vein drains into internal jugular vein

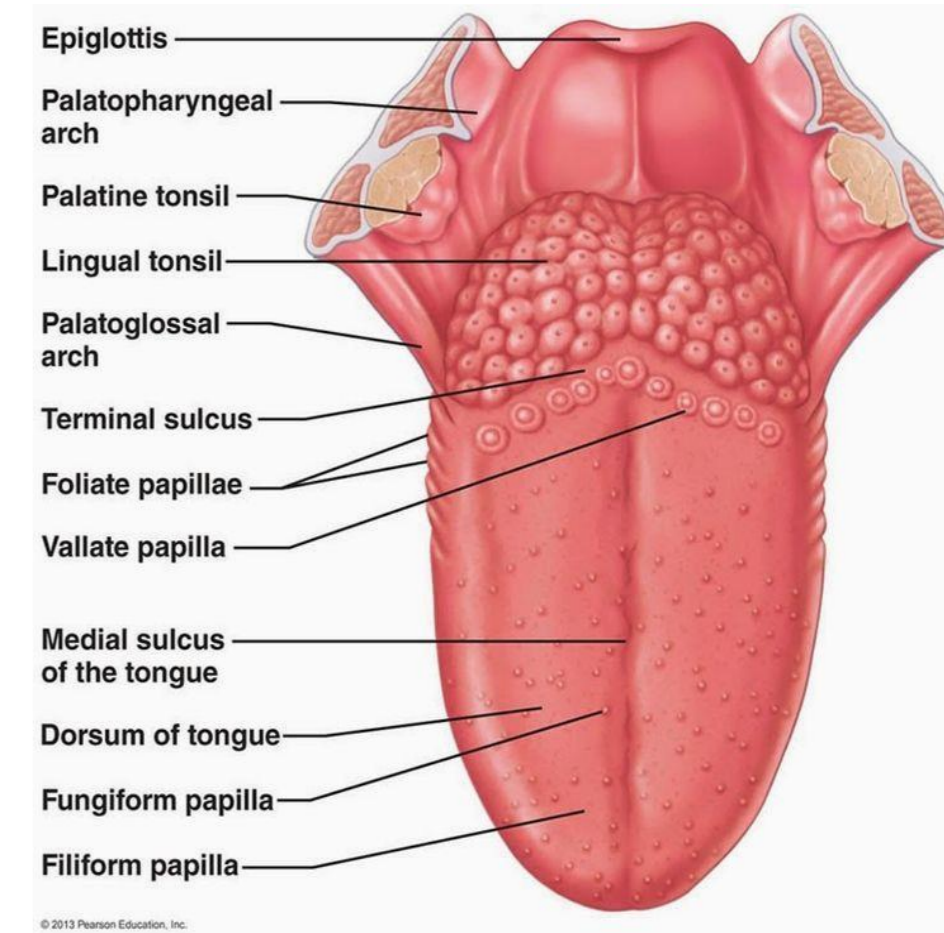
## Lymphatic drainage

- Submandibular lymph nodes
- Jugulo digastric lymph nodes
- Deep cervical lymph nodes

## Nerve supply

- hypoglossal nerve
- Taste and sensation: glossopharyngeal nerve

Functions - Mastication (chewing), Deglutition (swallowing), Speech, Taste





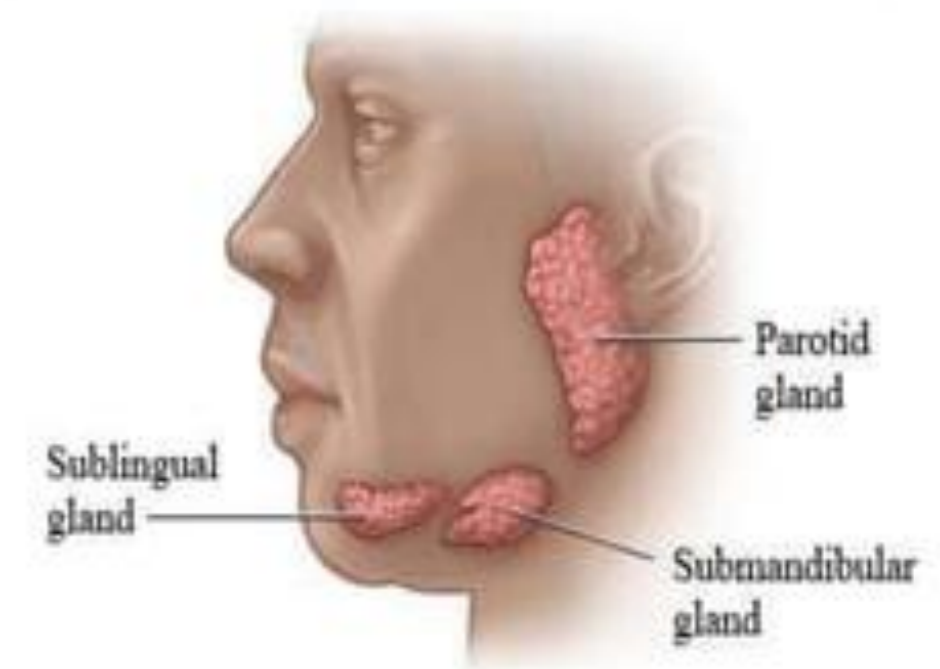
# Salivary Glands



- The salivary glands in are exocrine glands that produce saliva through a system of ducts.
- Humans have 3 paired major salivary glands:
  - **Parotid**
  - **Submandibular**
  - **Sublingual** as well hundreds of minor salivary glands.

## Parotid glands

- The largest of the salivary glands.
- They secrete saliva to facilitate **mastication and swallowing**, and amylase to begin the **digestion of starches**.
- It enters the oral cavity via the parotid duct.



# Salivary Glands (cont)

## Submandibular glands

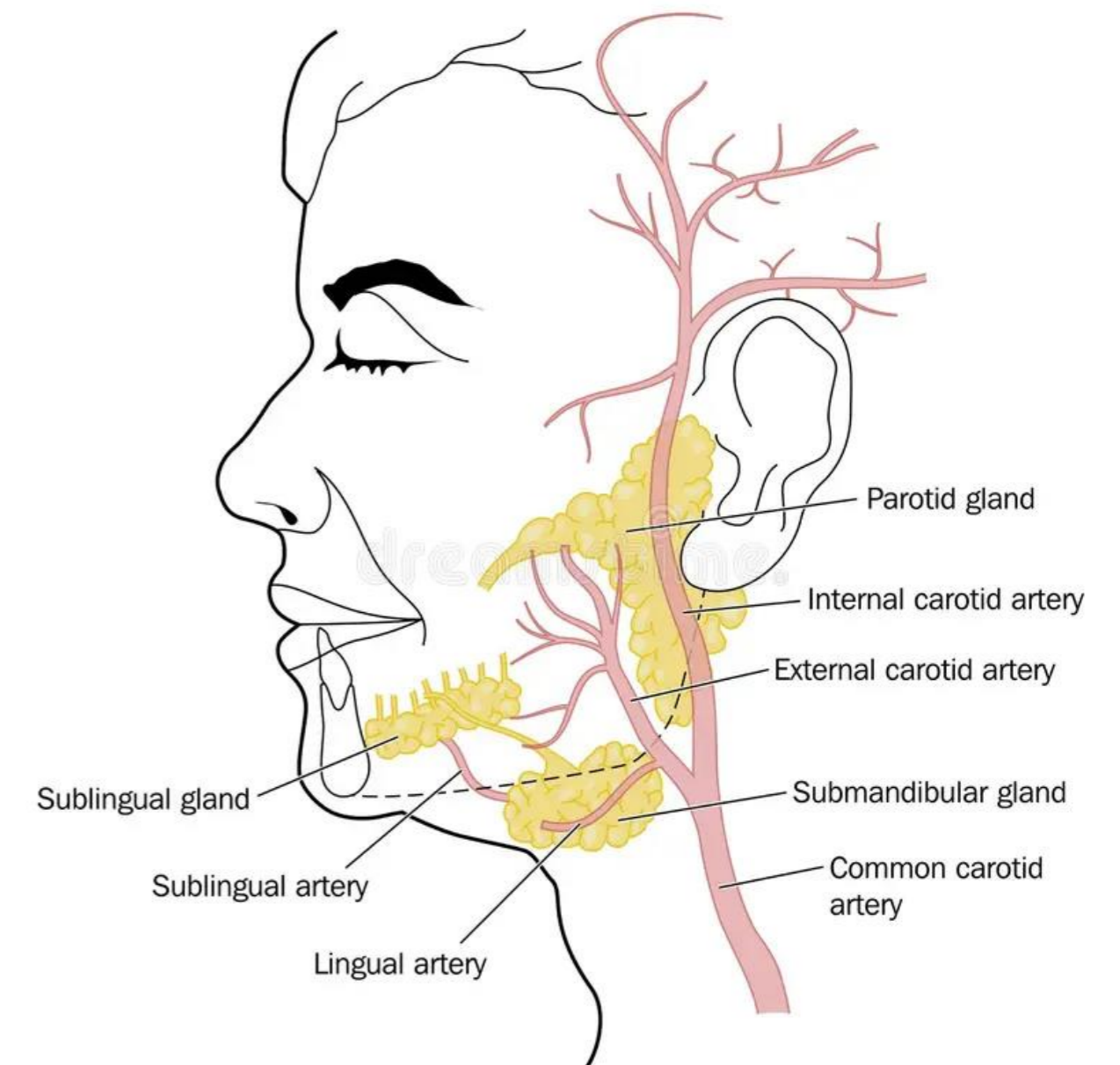
- The submandibular glands are a pair of major salivary glands located beneath the lower jaws, superior to the digastric muscles.
- The secretion produced is a mixture of both serous fluid and mucus, and enters the oral cavity via the submandibular duct.

## Sublingual glands

- The sublingual glands are a pair of major salivary glands located inferior to the tongue, anterior to the submandibular glands.
- The secretion produced is mainly mucous in nature

**BLOOD SUPPLY** - External carotid artery

**VENOUS DRAINAGE** - Jugular veins





# PHARYNX



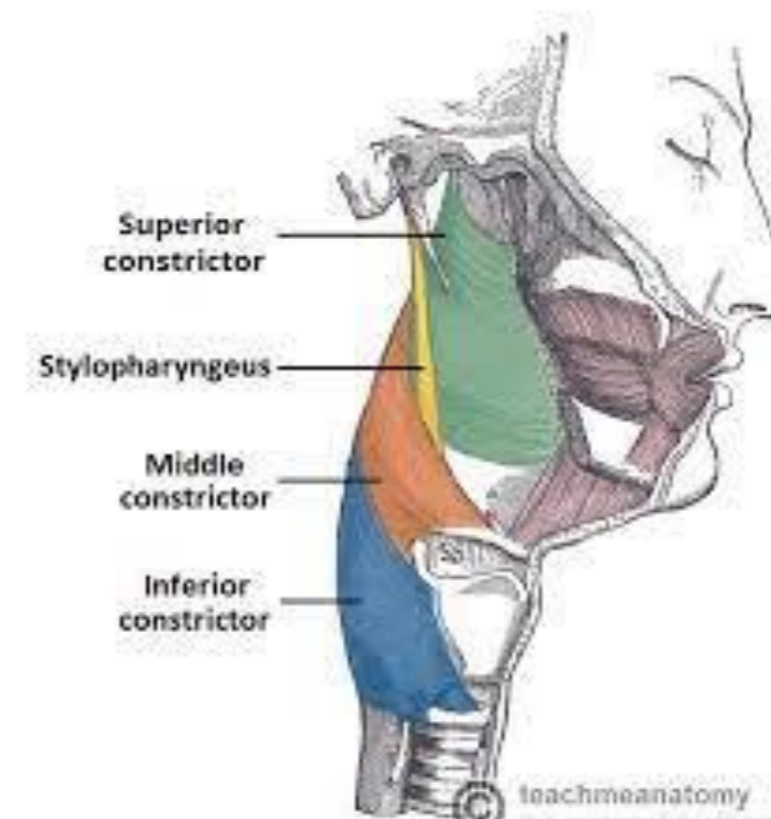
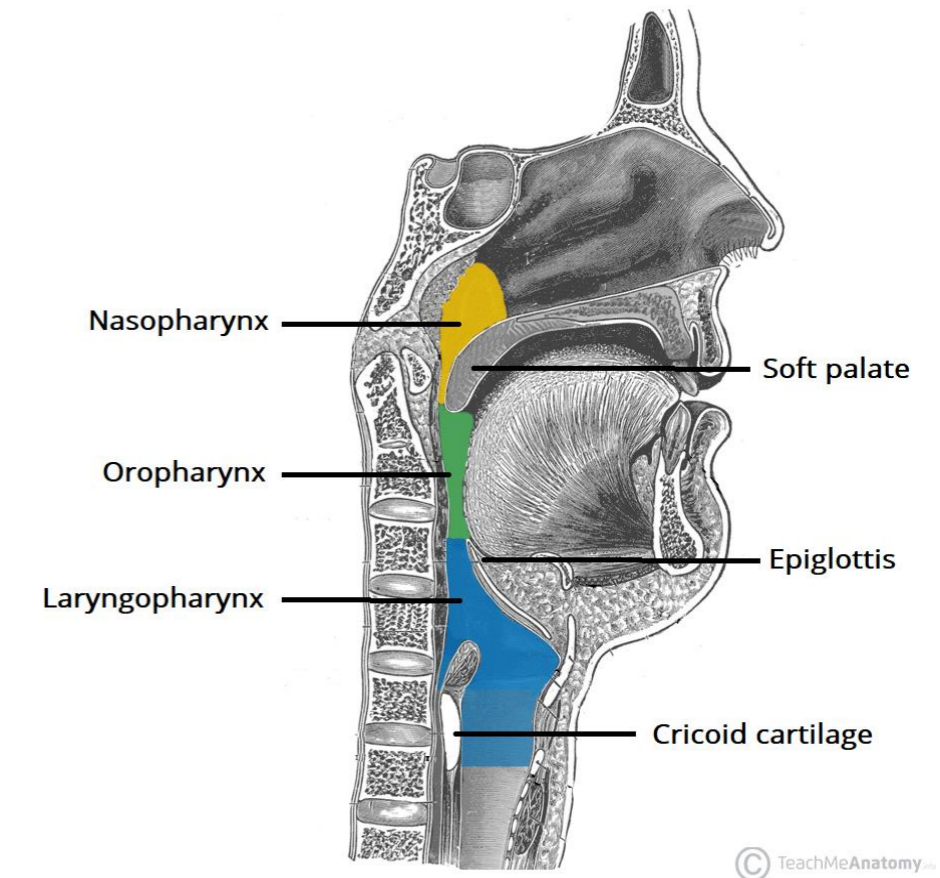
- LOCATION : common chamber for respiratory and digestive system.
- Located between mouth and oesophagus
- Parts: **nasopharynx, oropharynx and laryngopharynx**

## Functions

1. Nasopharynx conducts air
2. Oropharynx and laryngopharynx common chamber for the passage of food and air

## Muscles

1. Superior constrictor muscle
2. Middle constrictor muscle
3. Inferior constrictor muscle



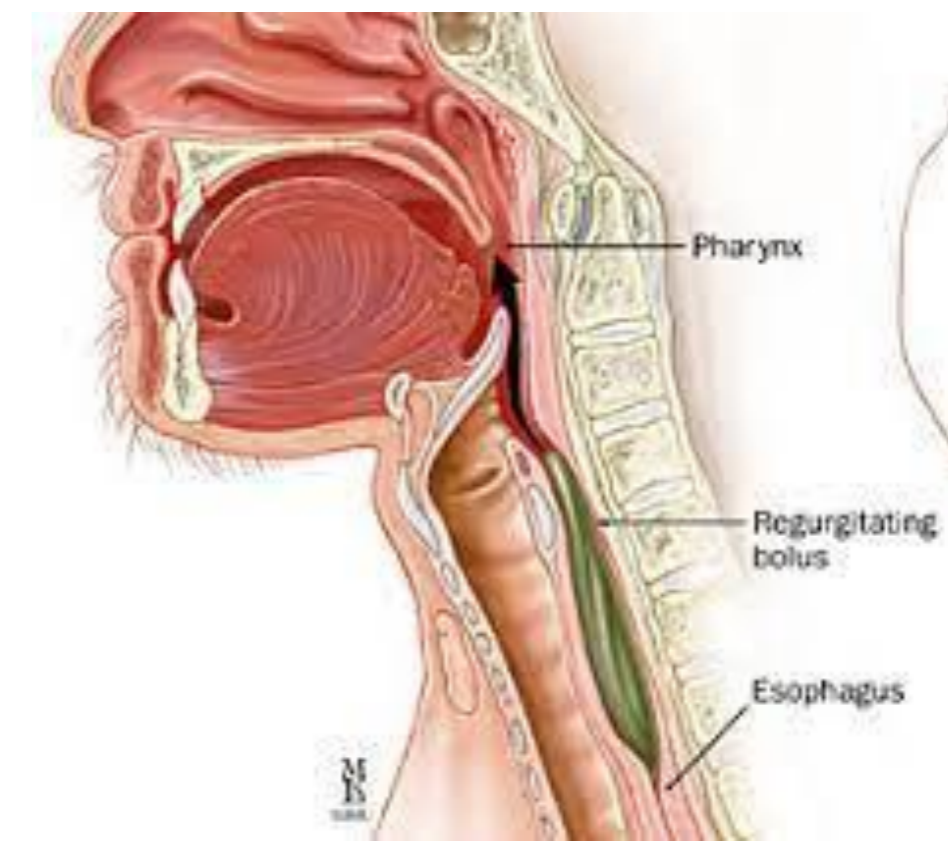
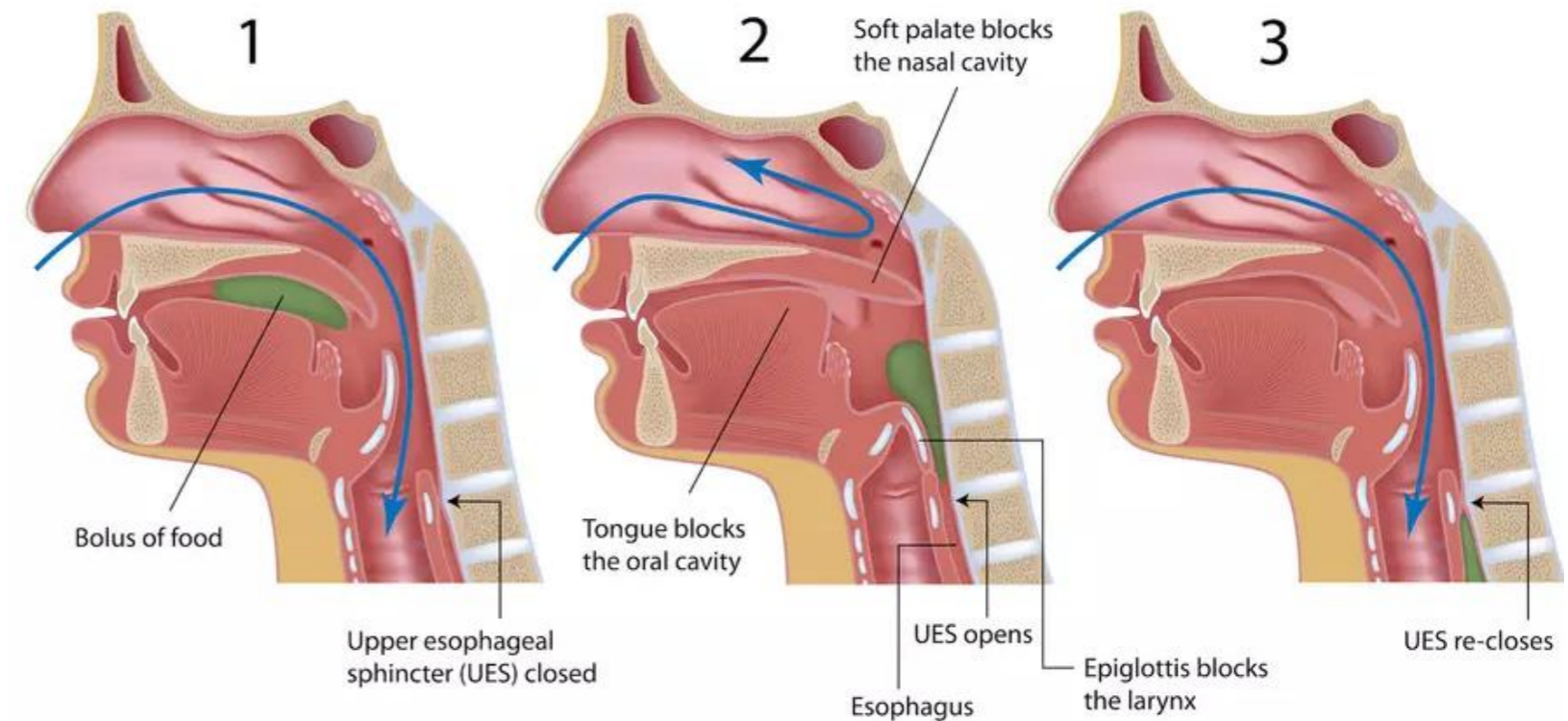
# DEGLUTITION

- Process of swallowing after mastication
- There are 3 stages
  - Voluntary stage
  - Pharyngeal stage
  - Oesophageal stage

## • APPLIED ANATOMY

1. **Odynophagia** – painful swallowing
2. **Nasal regurgitation** – due to the inadequate functioning of the soft palate, the food may enter the nose while eating.
3. **Pharyngitis** – inflammation of pharyngeal mucosa, causes painful swallowing

### Swallowing





# Oesophagus



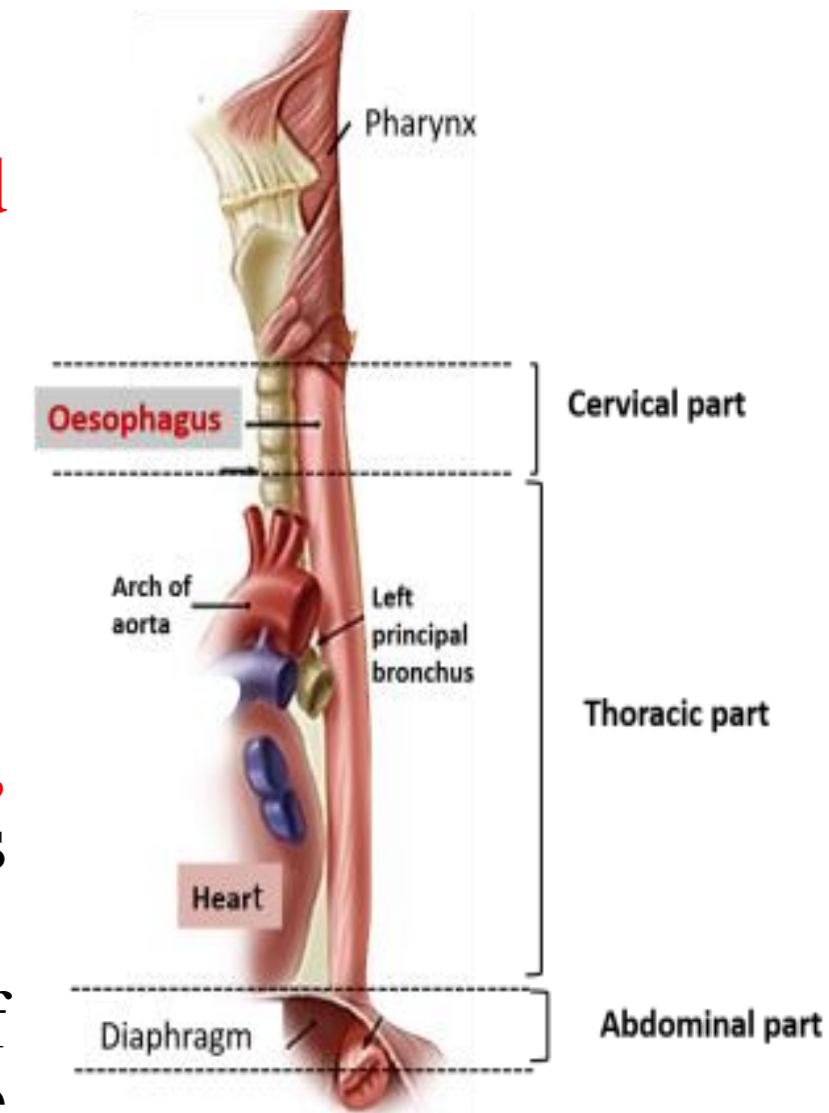
- It is a muscular tube. It is about 25cm long

## FUNCTIONS

- Conducts food and water from the pharynx to stomach, lined by **stratified squamous epithelium**
- Formation of a bolus
- Swallowing
- Reducing gastric reflux

## STRUCTURE

- The wall of the esophagus from the lumen outwards consists of **mucosa**, **submucosa** (connective tissue), layers of muscle fibers between layers of fibrous tissue, and an outer layer of connective tissue.
- The mucosa is a stratified squamous epithelium of around three layers of squamous cells, which contrasts to the single layer of columnar cells of the stomach.



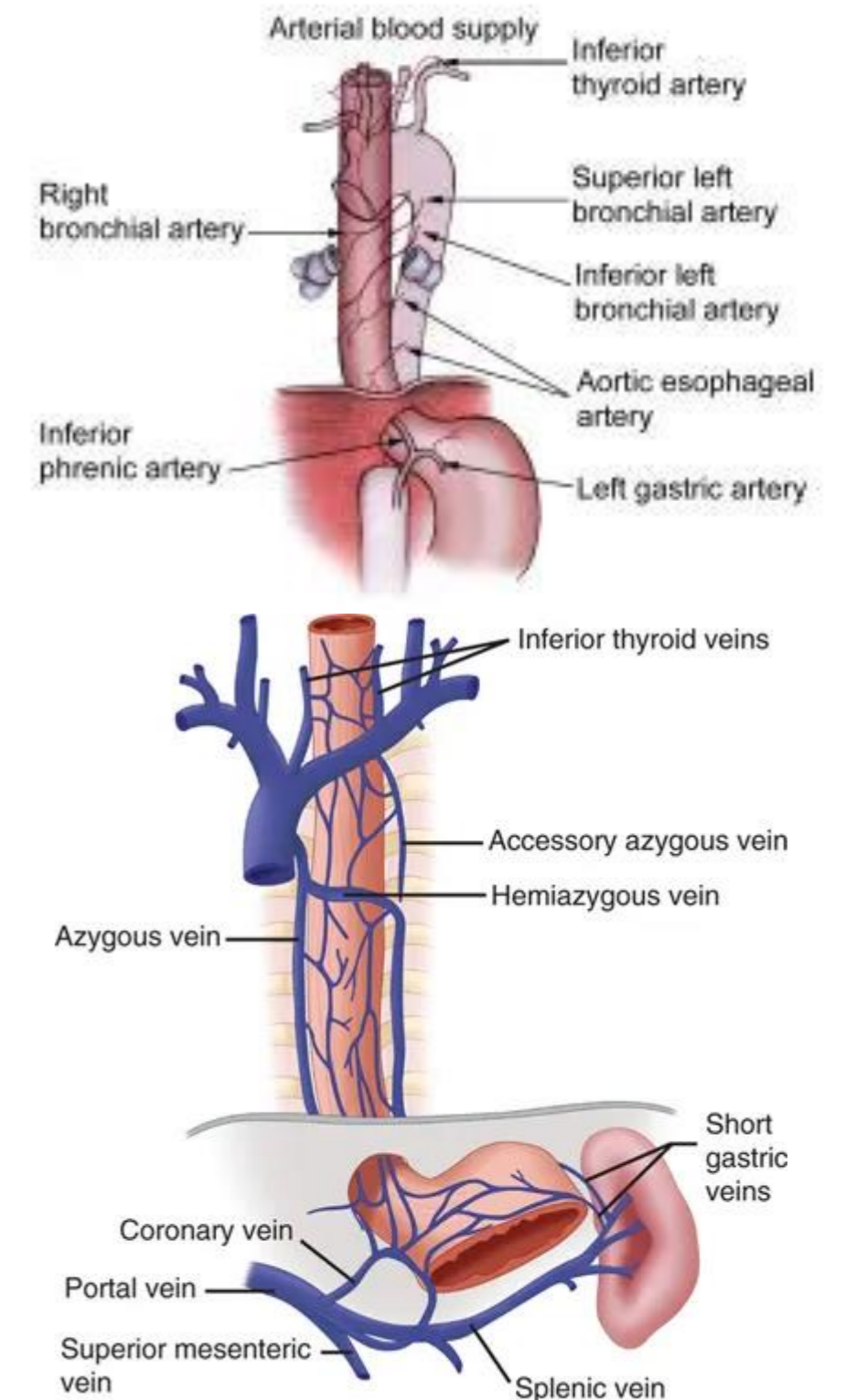
# Oesophagus (cont)

## Blood supply

1. Inferior thyroid artery
2. Intercoastal arteries
3. Left gastric arteries

## Venous drainage

1. Inferior thyroid vein
2. Azygous and left gastric vein





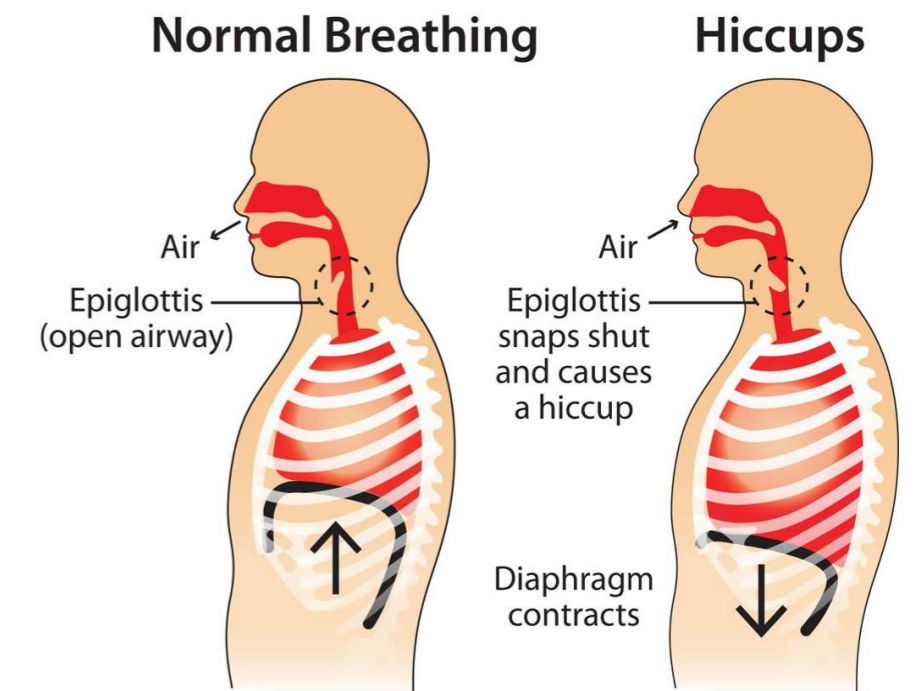
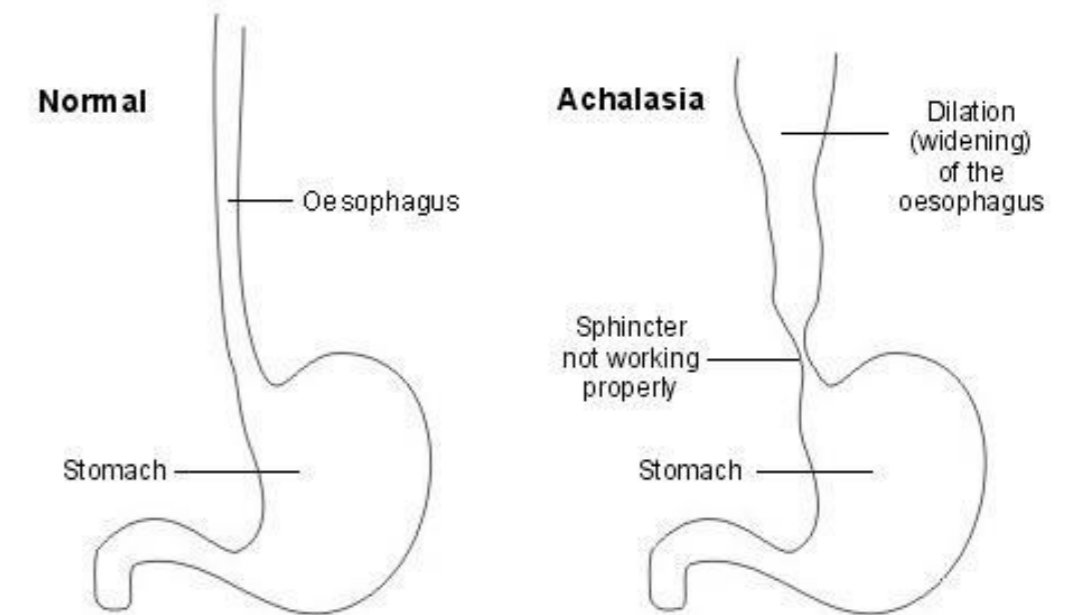
# Oesophagus (cont)



- Nerve supply – Left and right **vagus and symphathetic** nerves

## APPLIED ANATOMY

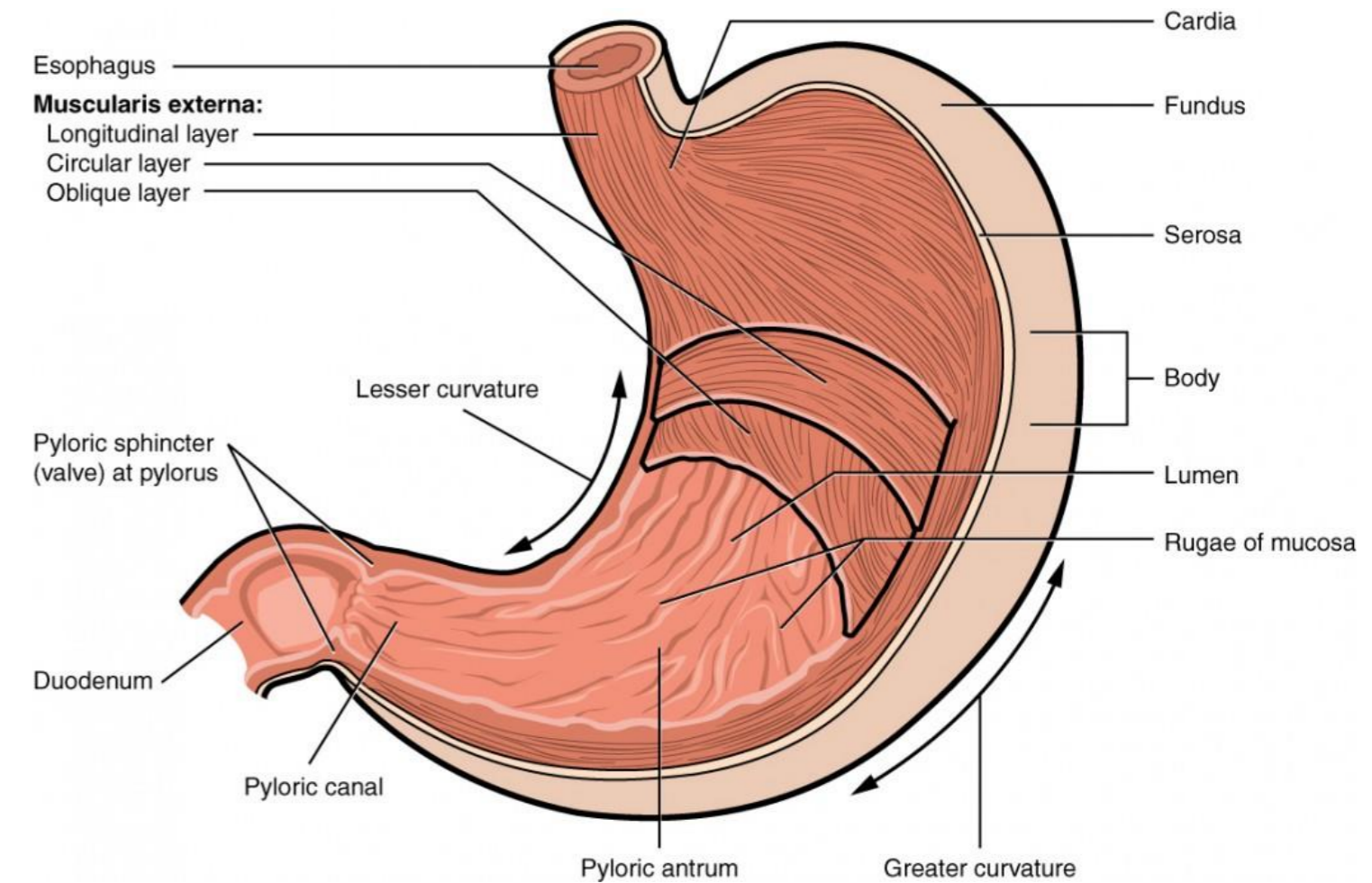
1. **Hiccup** – Contraction of diaphragm
2. **Dysphagia** – pharygo oesophageal junction and web may be developed during iron deficiency
3. **Aclasia cardia** – Contraction of muscles of the oesophagus
4. Barium swallow – radiological anatomy of the oesophagus





# STOMACH (cont)

- The stomach is a muscular organ located on the **left side of the upper abdomen**.
- The stomach receives food from the esophagus.
- Stomach is the most **dilated part** of digestive system of the alimentary canal
- As food reaches the end of the esophagus, it enters the stomach through a muscular valve called the **lower esophageal sphincter**

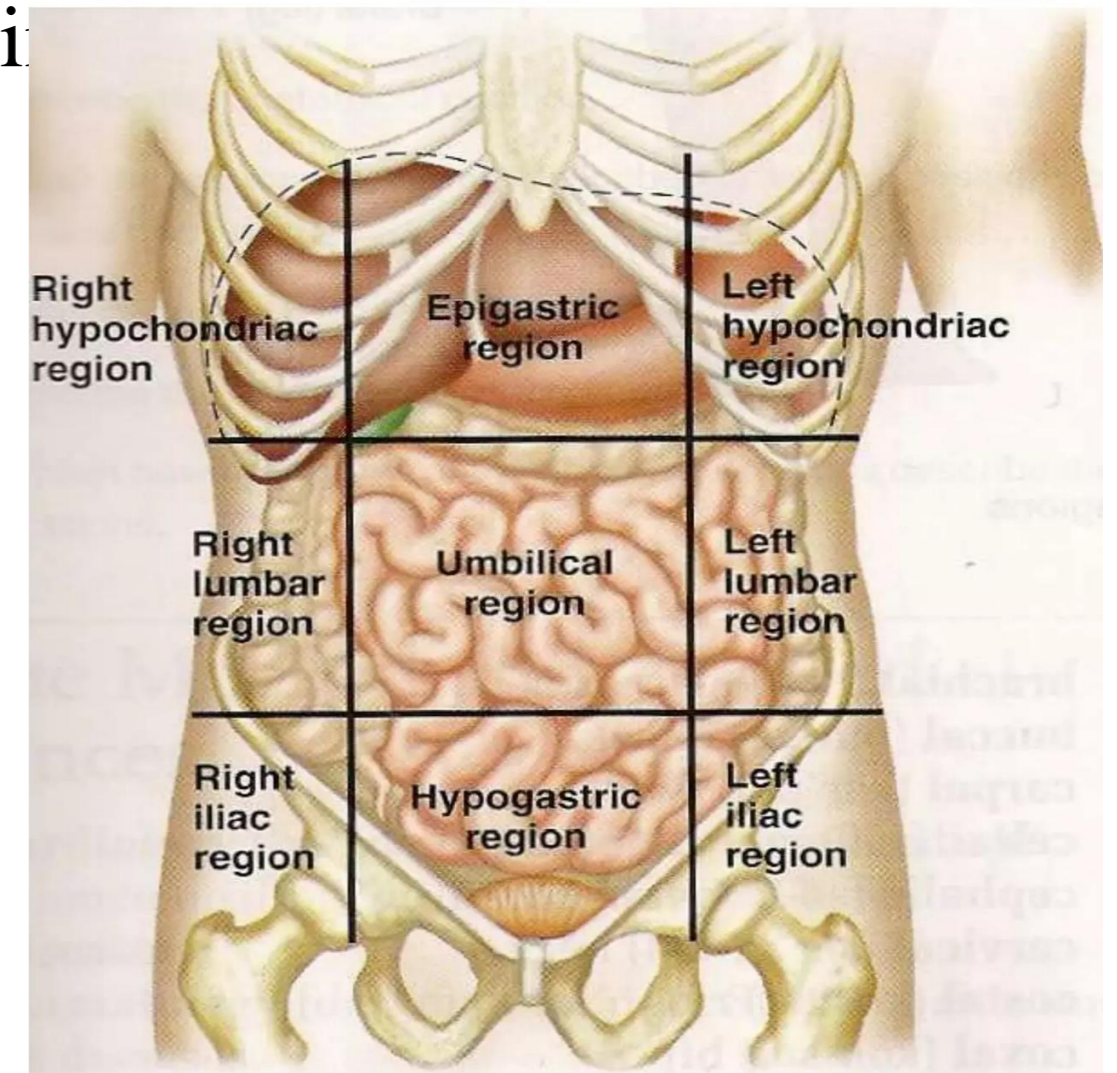




## Stomach (cont)



- Situated at the epigastric region
- Shape – **J shaped** and it has 2 ends, 2 surfaces, 2 borders and 2 sphincters
- Ends – Cardiac and Pyloric ends
- Borders – lesser and greater curvatures
- Surfaces – Anterior and Posterior surfaces
- Sphincters – Cardiac and Pyloric sphincters
- 4 regions:
  - cardiac stomach (or cardiac),
  - fundic stomach (or fundus),
  - body of stomach
  - pyloric stomach (or Pylorus).

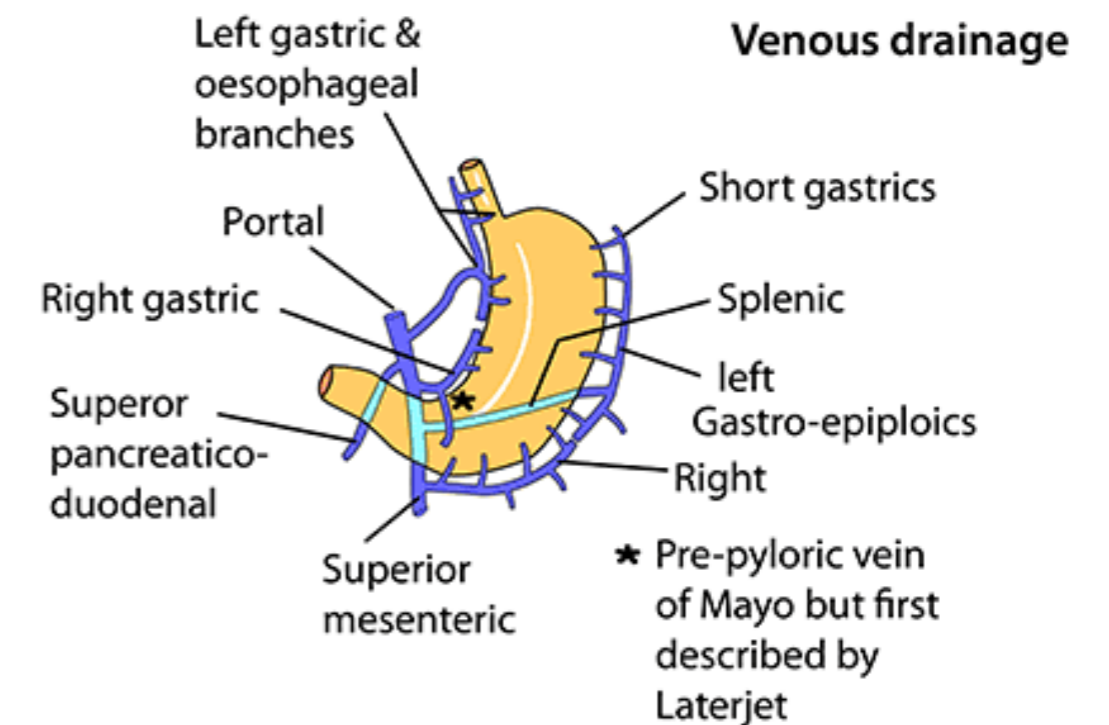
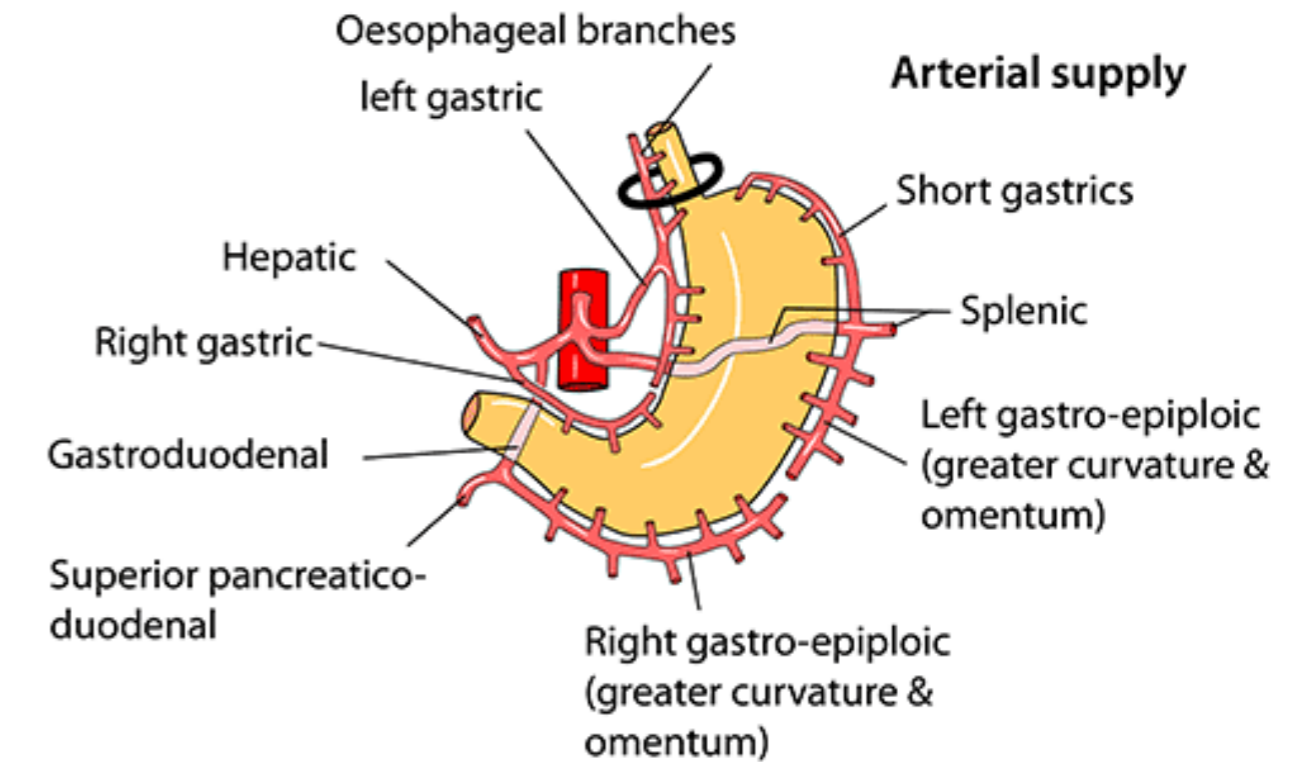


# Stomach (cont)

- Blood supply
  - left and right gastric arteries
  - left and right gastro epiploic arteries
  - Short gastric arteries
- Venous drainage – portal vein
- Nerve supply –
  - parasympathetic – right & left vagus
  - Sympathetic – coeliac plexus

## FUNCTIONS

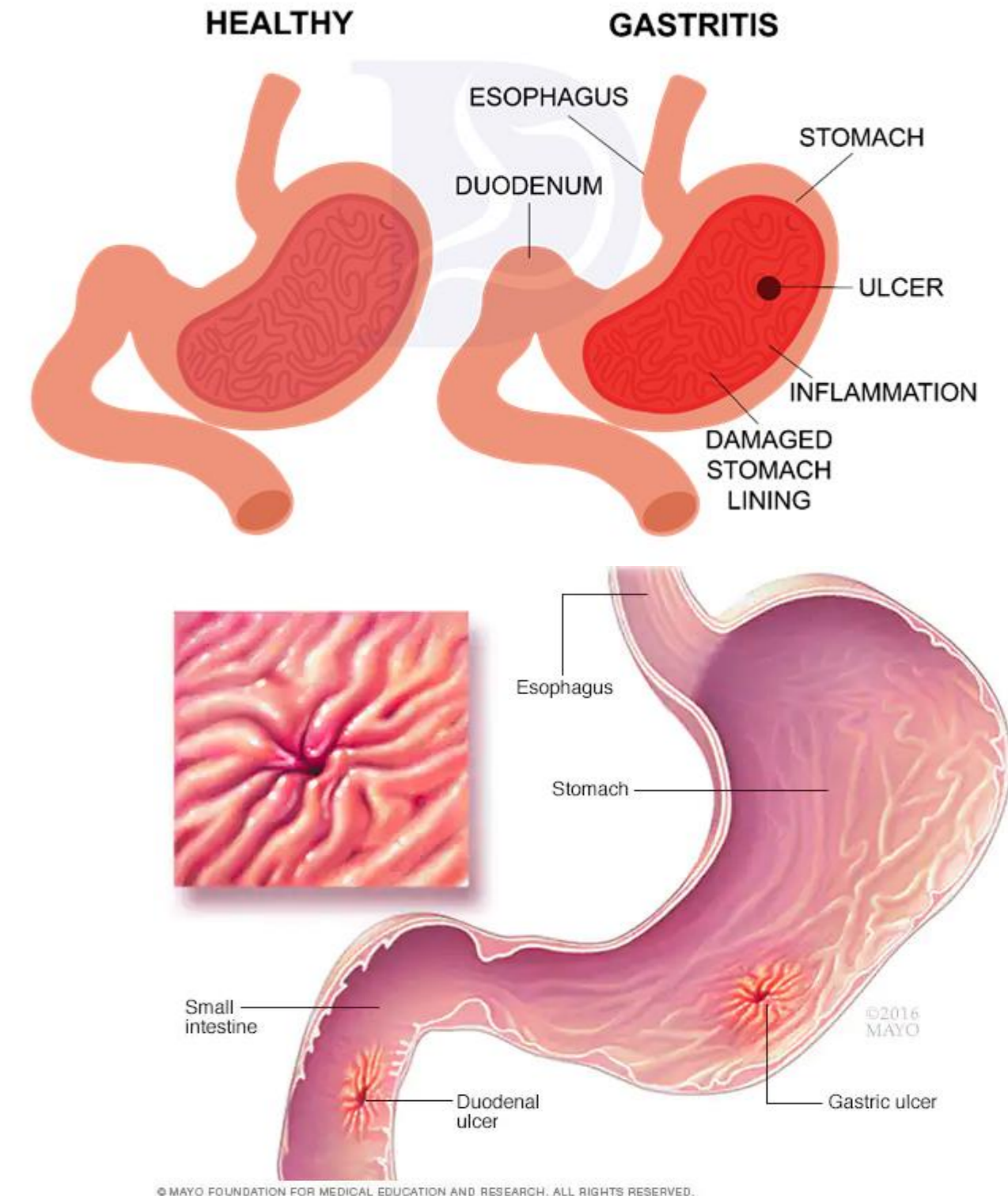
1. Digestive
2. Storage
3. Mechanical
4. Haematinic
5. Absorptive



# Stomach (cont)

## • APPLIED ANATOMY

1. Gastritis – irritation and inflammation of gastric mucosa
2. Peptic ulcer – ulceration of stomach mucosa
3. Vagotomy – dividing vagus nerve to treat ulcer
4. Gastrectomy – surgical removal of stomach
5. Carcinoma of stomach – cancer of the stomach
6. Barium meal - radiological study of stomach
7. Gastrosocopy - examination of interior of the stomch



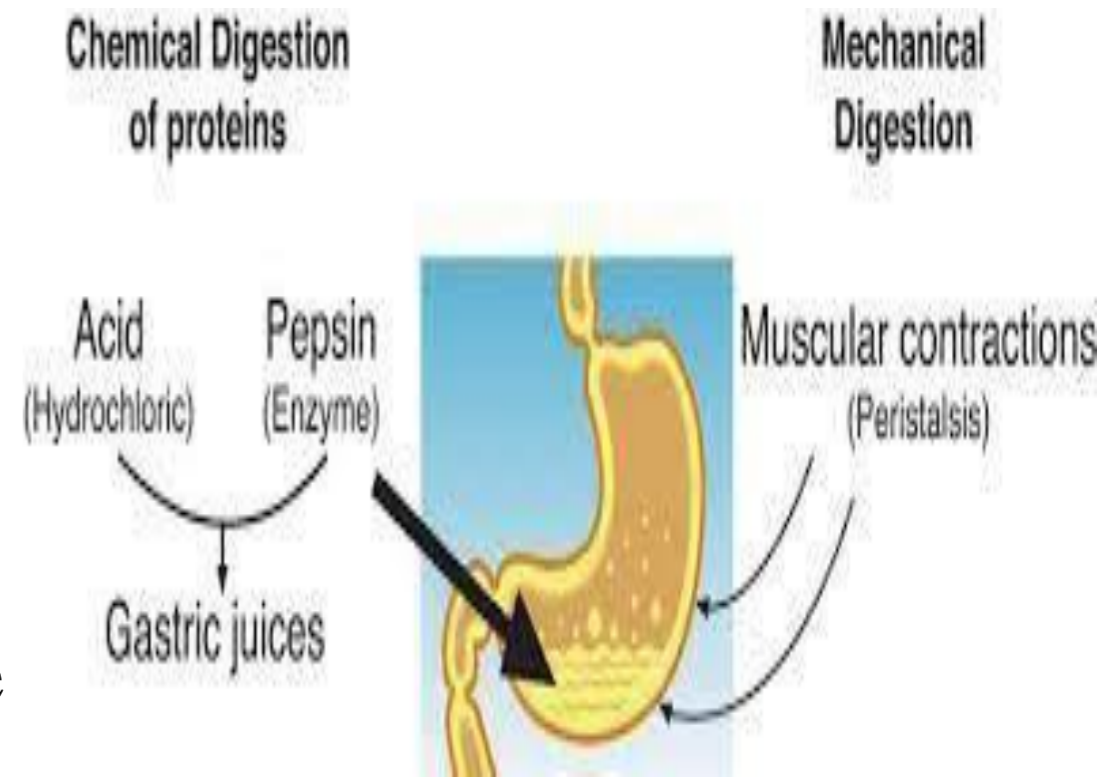
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# GASTRIC JUICE



- Gastric acid, gastric juice or stomach acid, is a digestive fluid formed in the stomach and is composed of hydrochloric acid (HCl), potassium chloride (KCl) and sodium chloride (NaCl).
- **GASTRIC SECRETORY CELLS**
- **Chief cells:** secrete pepsinogen (an inactive enzyme).
- **Parietal cells:** secrete hydrochloric acid (HCl) and "intrinsic factor" (which helps absorption of vitamin B12 in the intestines).
- **Mucous cells:** secrete mucus and alkaline substances to help neutralize HCl in the gastric juice.
- **G cells:** secrete a hormone called gastrin, which stimulates the parietal cells and overall gastric

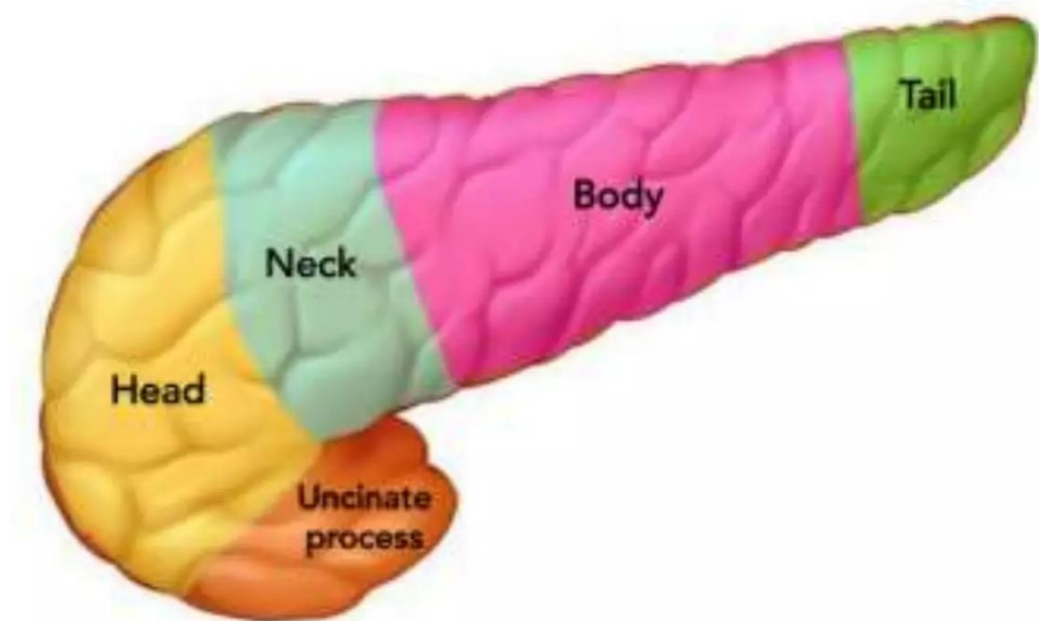
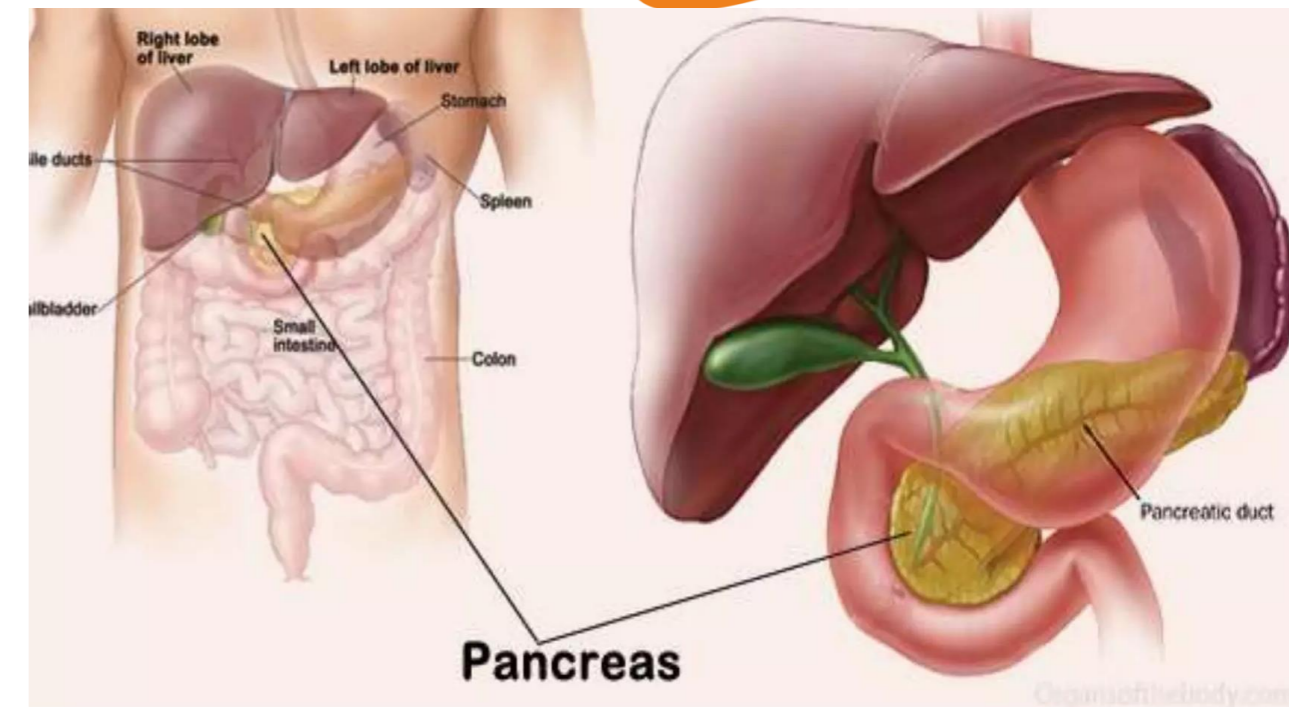


# THE PANCREAS

- The pancreas is a glandular organ in the digestive system and endocrine system of vertebrates.
- It is located in the **abdominal cavity behind the stomach**.
- It is an endocrine gland producing several important hormones, including **insulin, glucagon, somatostatin, and pancreatic polypeptide**, all of which circulate in the blood.
- Length: **15 cm or 6 inch**
- Parts – head, neck body and tail

**BLOOD SUPPLY** - superior mesenteric artery, splenic artery

**VENOUS DRAINAGE** - superior mesenteric veins, Splenic veins





# THE PANCREAS (CONT)

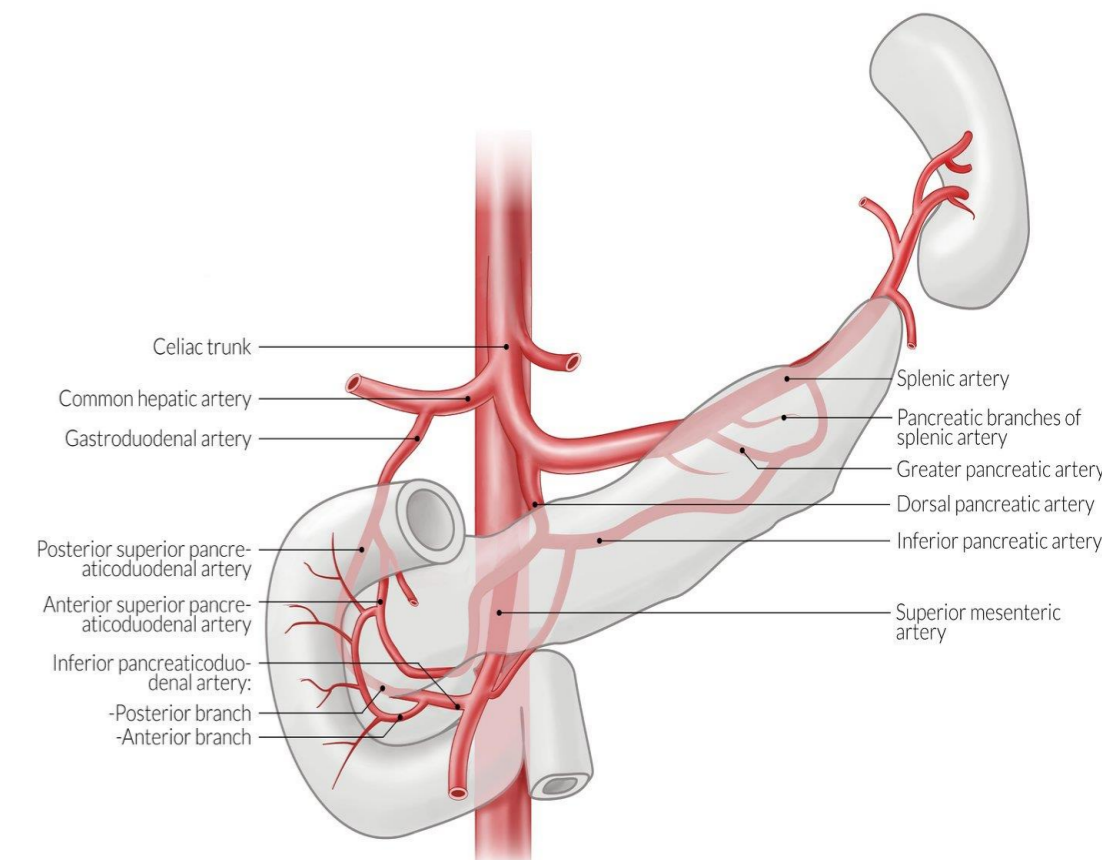


## NERVE SUPPLY

- Parasympathetic – vagus nerve
- Sympathetic – coeliac plexus

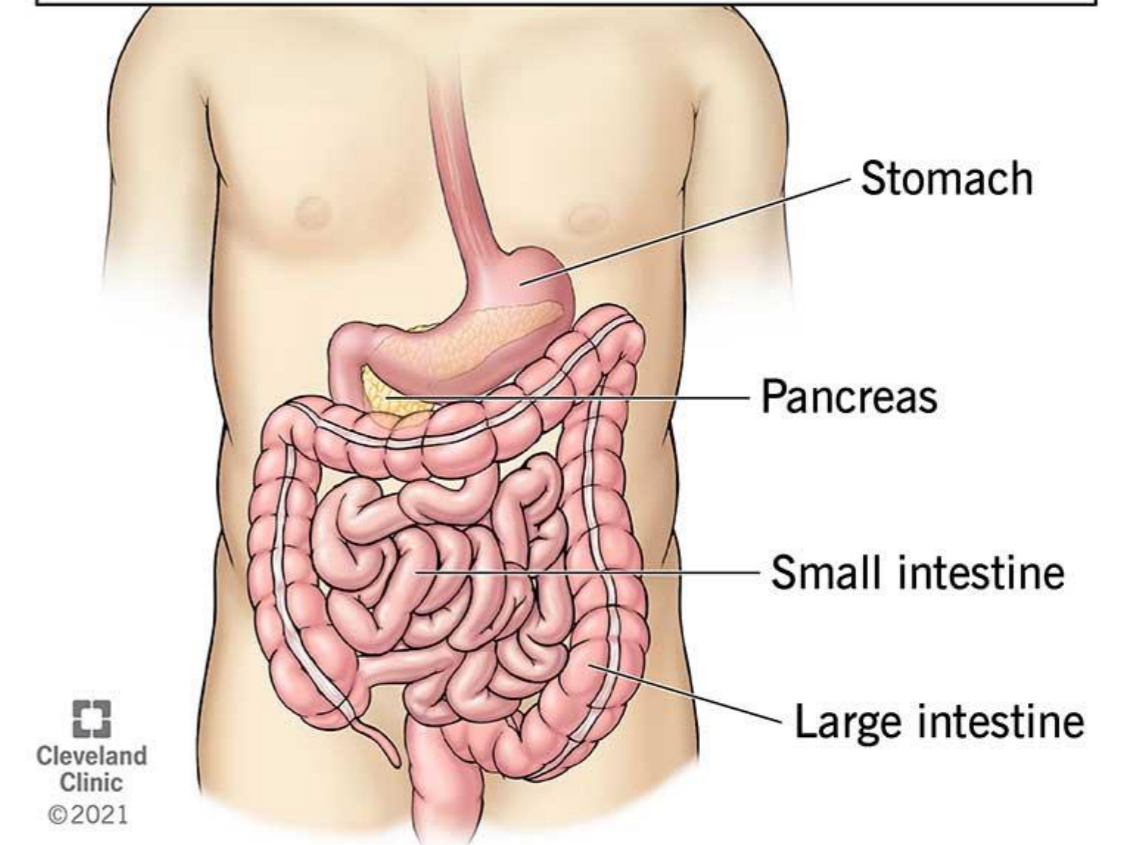
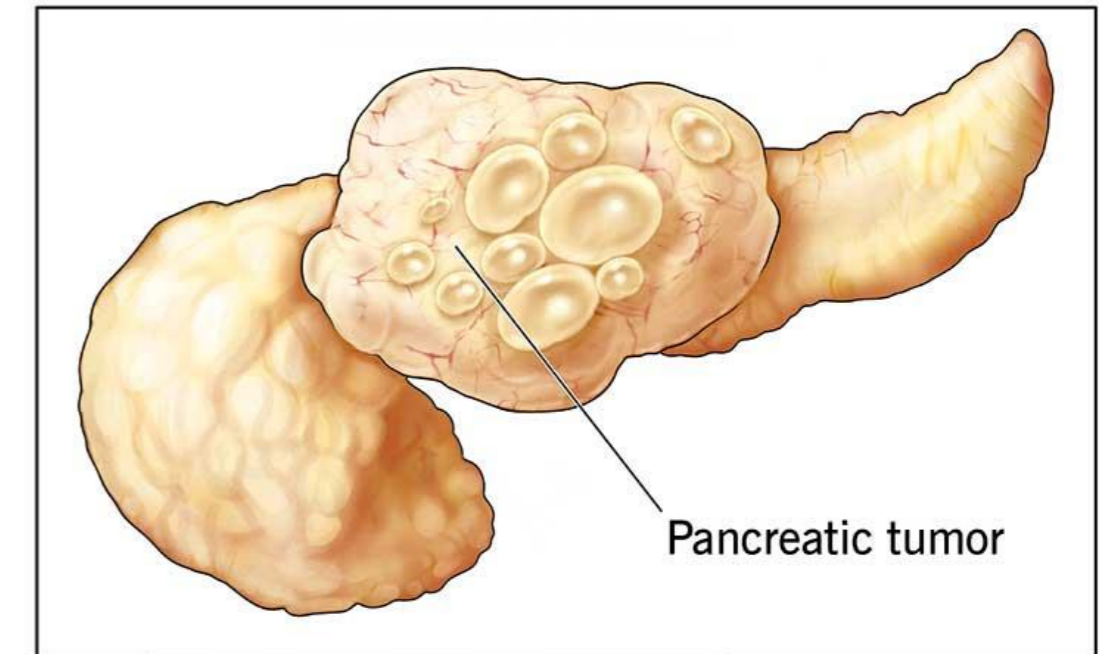
## FUNCTION

- The pancreas is involved in **blood sugar control and metabolism** within the body.
- pancreatic islets are present in the pancreas.
- Within these islets are four main types of cells which are involved in the regulation of blood glucose levels.
- Each type of cell secretes a different type of hormone:
- $\alpha$  alpha cells secrete glucagon (increase glucose in blood)
- $\beta$  beta cells secrete insulin (decrease glucose in blood)
- $\delta$  delta cells secrete somatostatin (regulates/stops  $\alpha$  and  $\beta$  cells) and
- $\gamma$  (gamma) cells, secrete pancreatic polypeptide.



# Applied Anatomy

1. Destruction of islets of Langerhans cause diabetes mellitus
2. Acute pancreatitis – inflammation of pancreas
3. Failure of pancreatic juice secretion cause steatorrhea (fatty stools)
4. Carcinoma of the head of the pancreas





# Liver

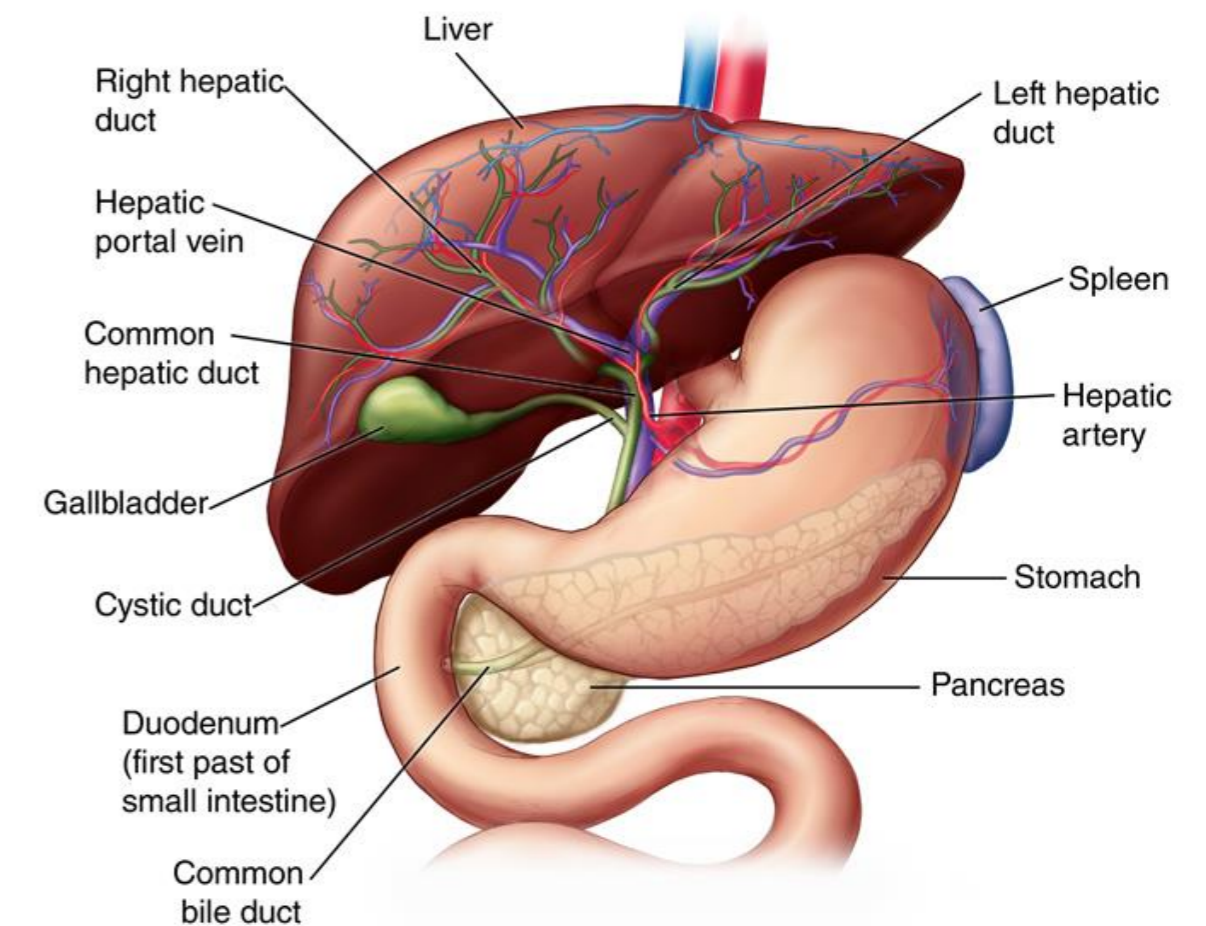
- The liver, an organ only found in vertebrates, **detoxifies various metabolites, synthesizes proteins, and produces biochemicals necessary for digestion**
- **Relations:**
- Anteriorly-diaphragm & anterior abdominal wall
- Posteriorly-oesophagus, inferior venacava, aorta, gall bladder, vertebral column & diaphragm
- Laterally-lower ribs & diaphragm
- Superiorly-diaphragm & anterior abdominal wall
- Inferiorly-stomach, bile ducts, duodenum, hepatic flexure of colon, right kidney

## BLOOD SUPPLY

- Hepatic artery

## VENOUS DRAINAGE

- • Hepatic veins



# Structure

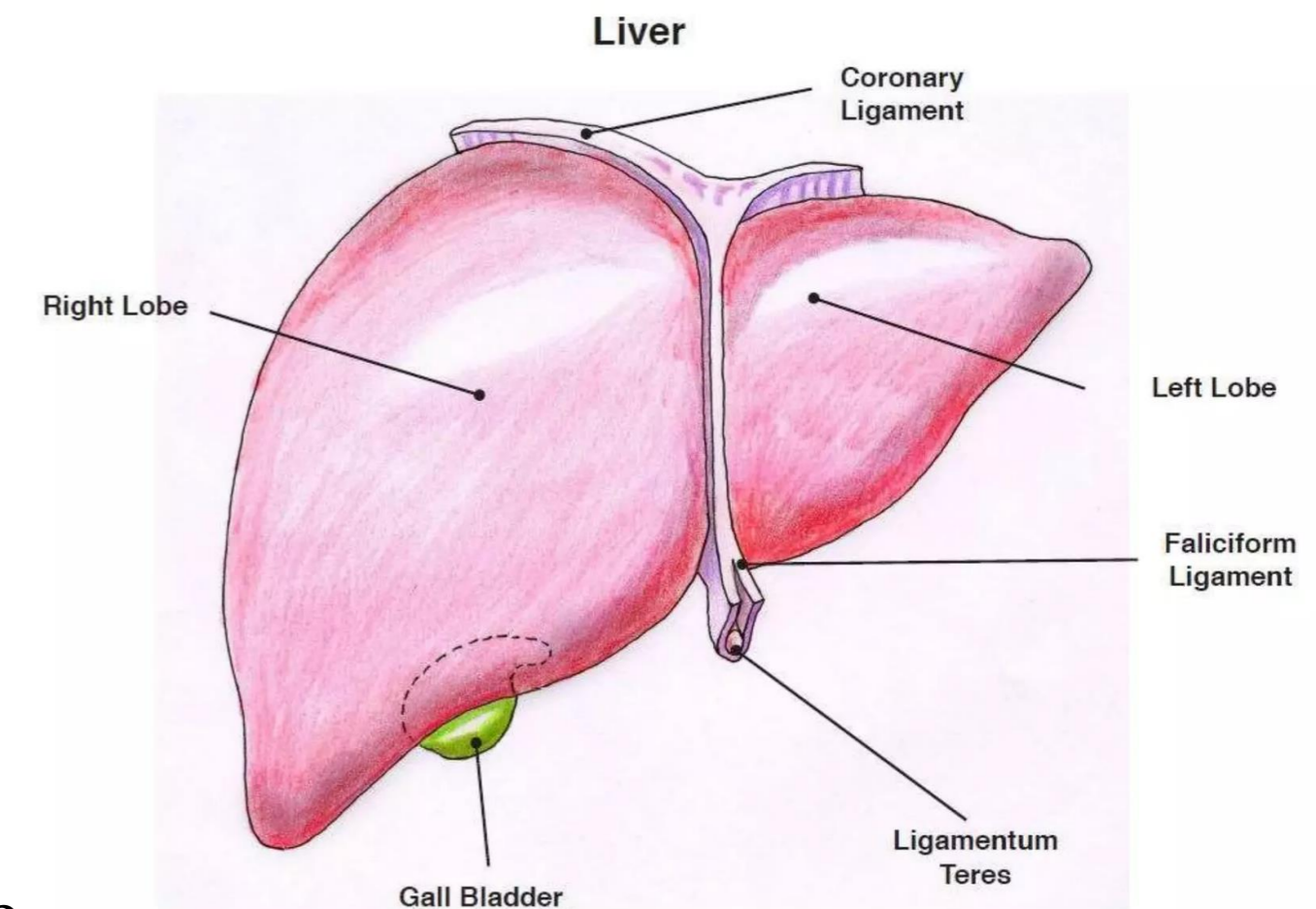
- The liver is a reddish-brown wedge-shaped organ with four lobes of unequal size and shape.
- weighs 1.3 – 1.5 kg
- width -15 cm.
- It is both the heaviest internal organ and the largest gland in the human body.

## LOBES

- Right lobe
- Left lobe
- Quadrate lobe
- Caudate lobe

The liver is grossly divided into two parts when viewed from above – a right and a left lobe.

The falciform ligament, divides the liver into a left and right lobe.

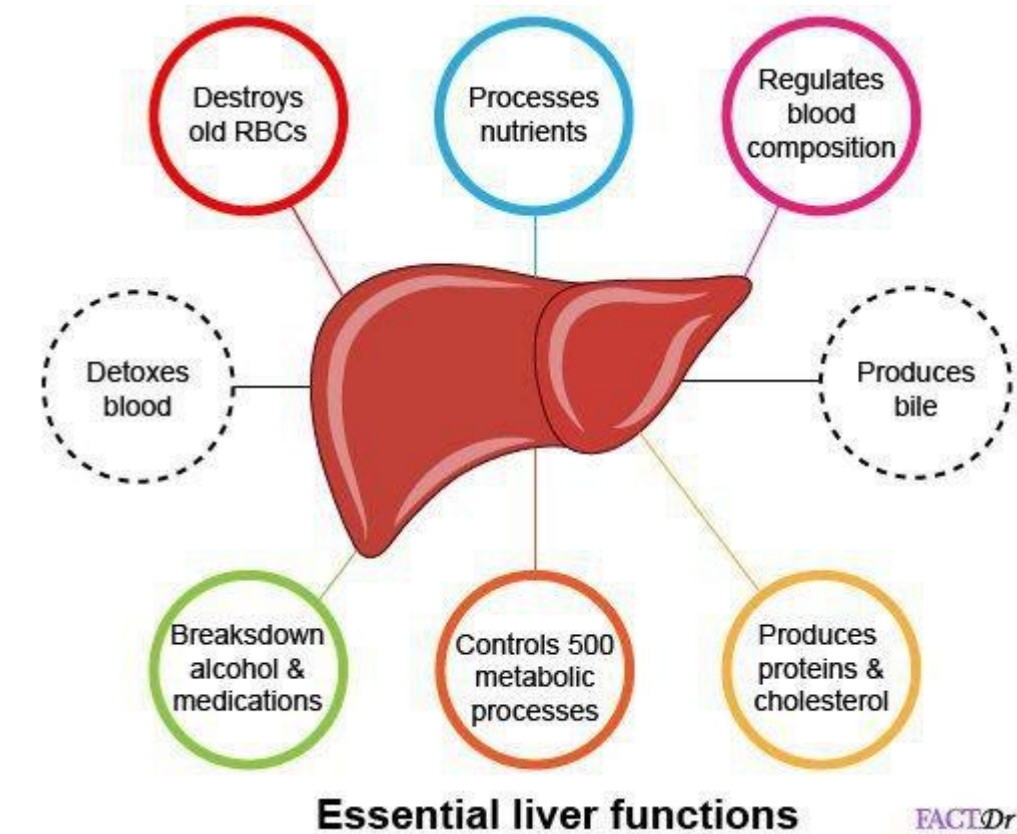




# Function



1. It secretes bile
2. It stores glycogen, protein, vitamin A, D, B12 and folic acid
3. Albumin prothrombin and fibrinogen are synthesised in liver
4. It synthesises heparin which is an anticoagulant
5. Carbohydrates, proteins and fats are synthesised in liver
6. Blood is formed in the liver
7. It protects our body from infection by engulfing the bacteria and other foreign bodies
8. Antibodies and antitoxins are formed in the liver
9. Liver helps in detoxification





# THE GALLBLADDER



- The gallbladder is a small hollow organ where bile is stored and concentrated before it is released into the small intestine.
- In humans, the pear-shaped gallbladder lies beneath the liver.

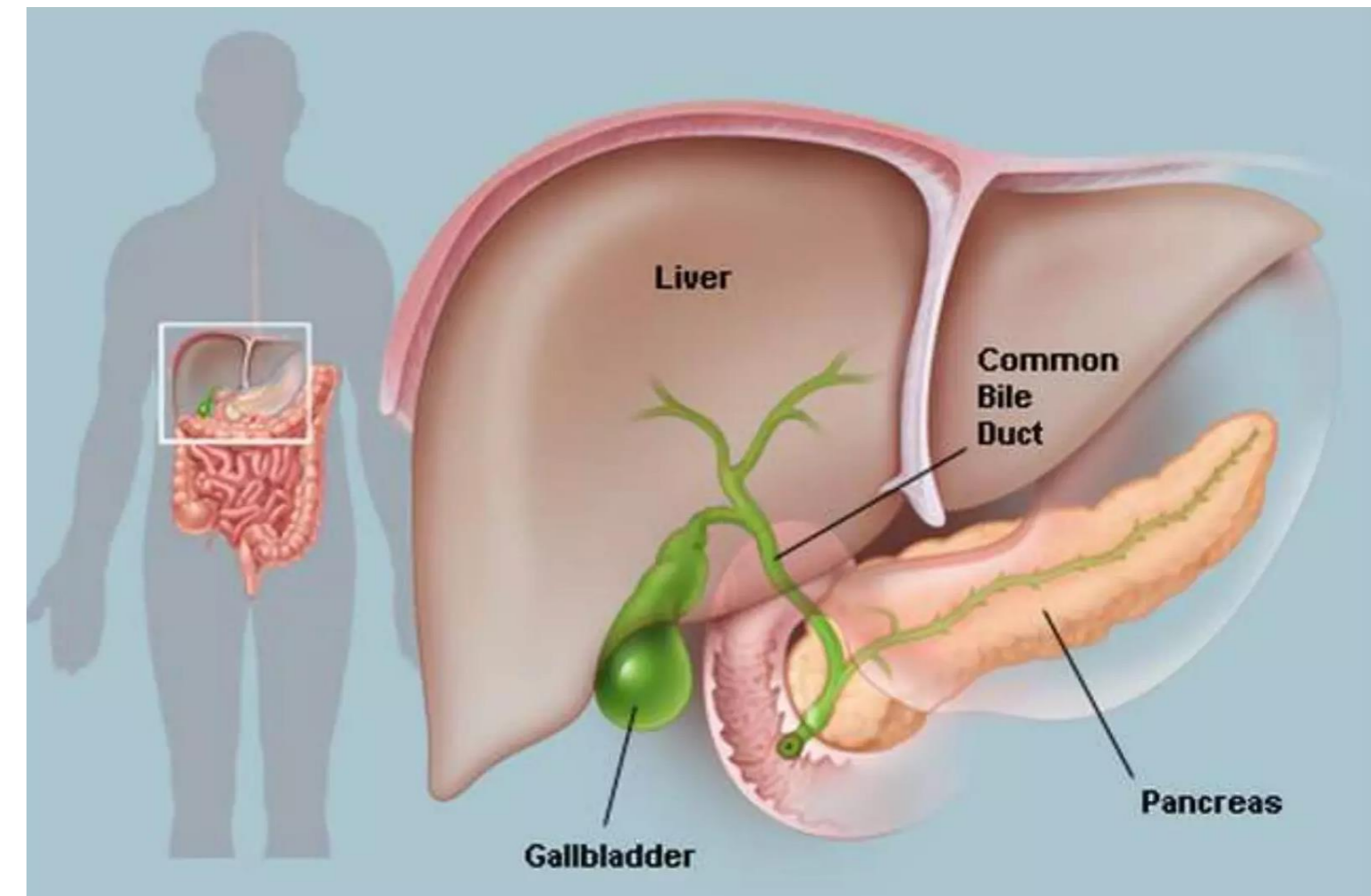
Situation – below the right lobe of liver

Colour - slate blue

Shape – pear shaped

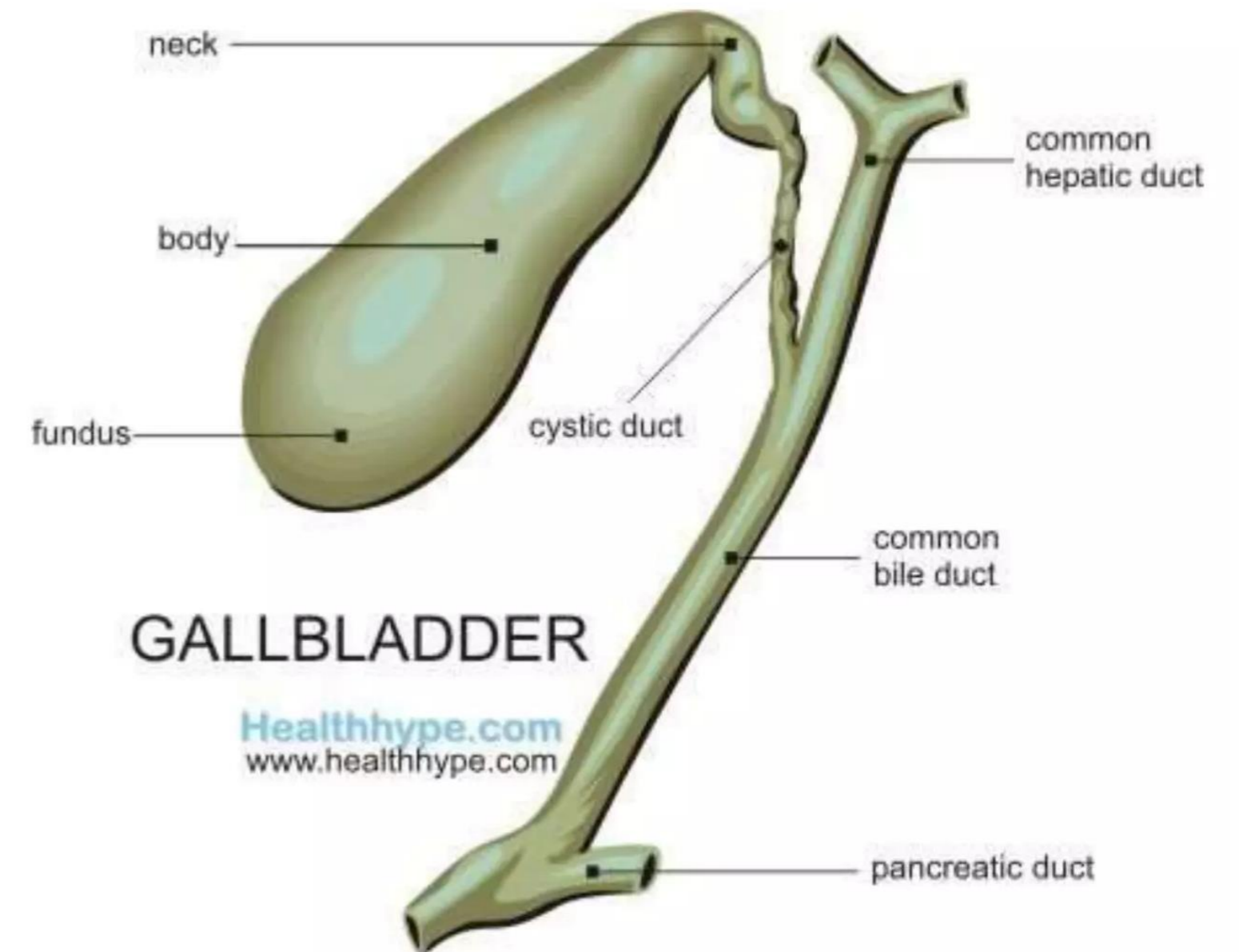
Capacity – about 50ml

Function – reservoir of bile



# THE GALLBLADDER

- Parts of gall bladder – Fundus, body, neck
- Blood supply – Cystic artery
- Venous drainage – Cystic vein
- Nerve supply – vagus, coeliac plexus and right phrenic nerve





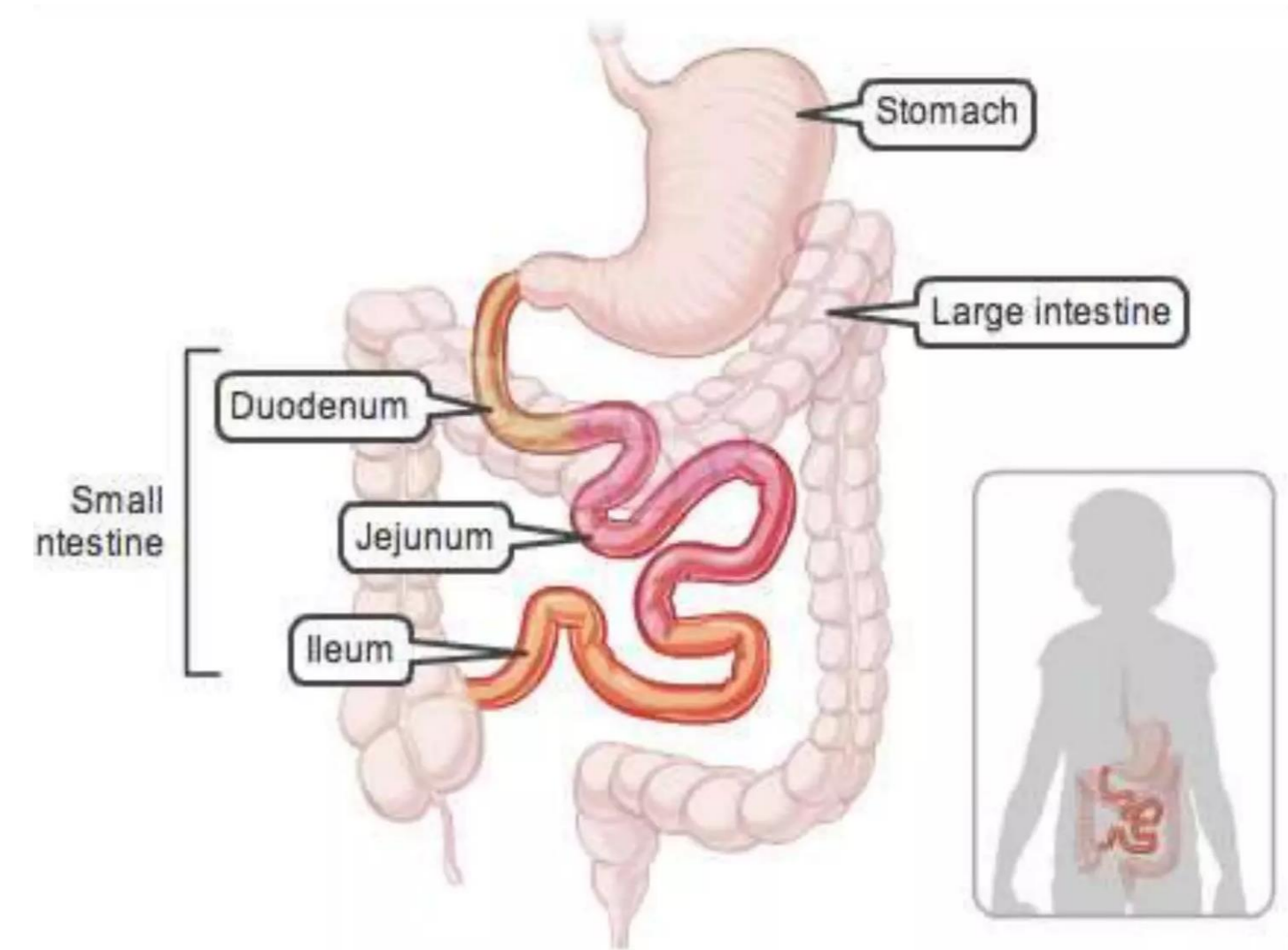
# THE SMALL INTESTINE



- The small intestine or small bowel is the part of the gastrointestinal tract between the stomach and the large intestine, and is where **most of the end absorption of food takes place.**

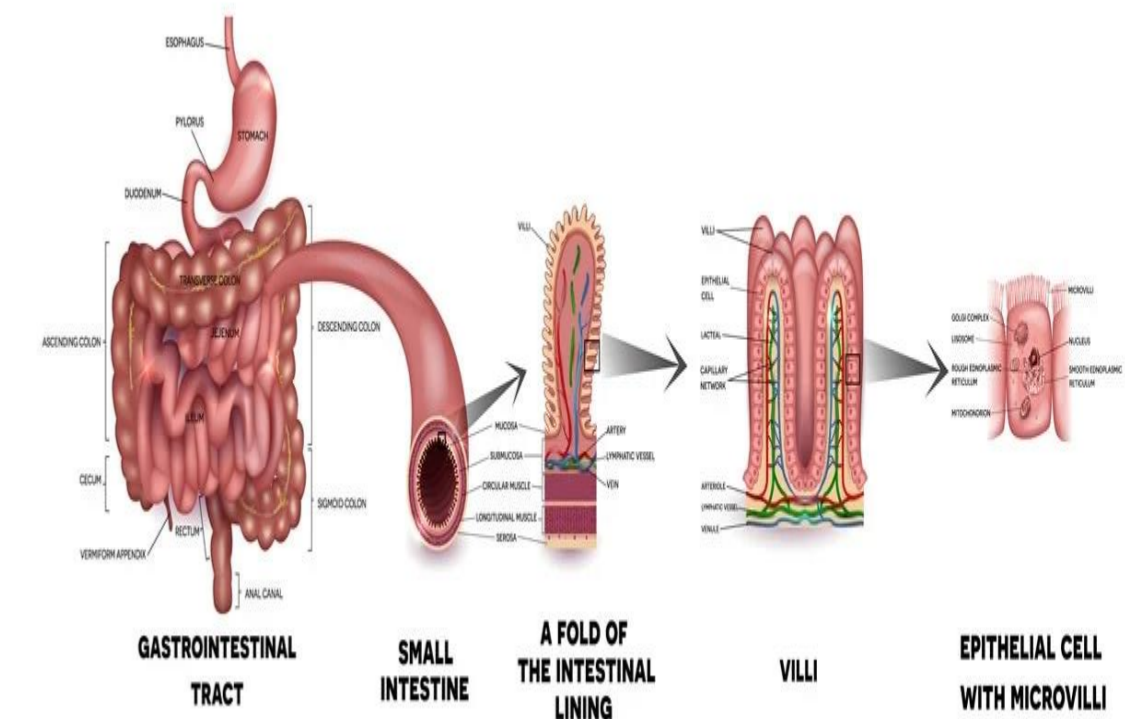
## STRUCTURE

- Length – about 6m
- Parts – Duodenum, jejunum, ileum
- **The duodenum** is a short structure ranging from 20 cm to 25 cm in length, and shaped like a "C".
- Blood supply - coeliac artery, superior mesenteric artery
- Nerve supply – vagus nerve and sympathetic nerve



# Small Intestine

- **The jejunum** is the midsection of the small intestine, connecting the duodenum to the ileum. It is about 2.5 m long.
- **The ileum** is the final section of the small intestine. About 3 m long, and contains villi similar to the jejunum
- **FUNCTIONS**
- Digestion
  - The small intestine is where most chemical digestion takes place.
  - Digestion of proteins & carbohydrate
- Absorption
  - The small intestine is the site where most of the nutrients from ingested food are absorbed.
- Immunological
  - The small intestine supports the body's immune system.





# Small Intestine

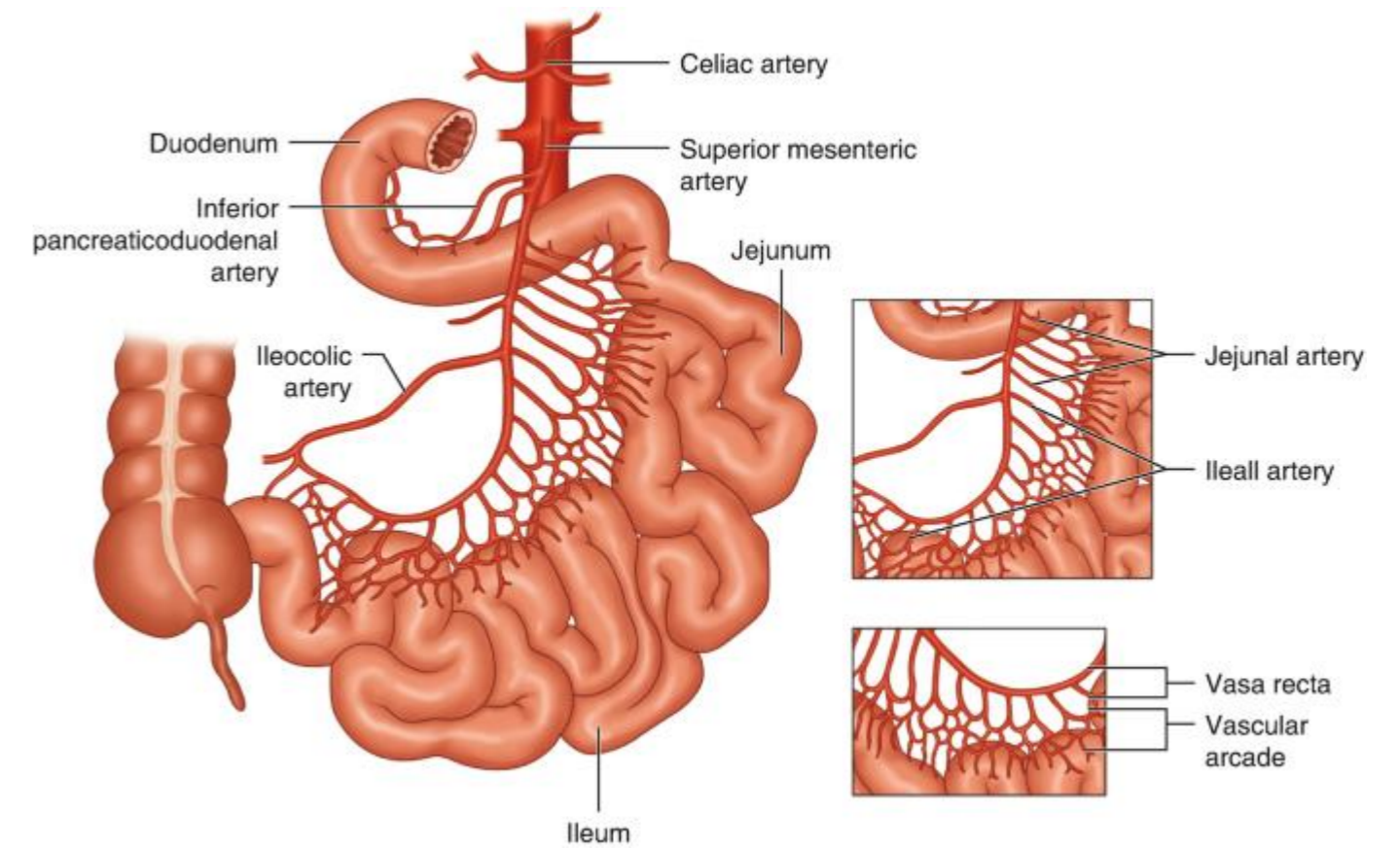


## BLOOD SUPPLY

- the coeliac trunk
- the superior mesenteric artery

## VENOUS DRAINAGE

- the superior mesenteric veins







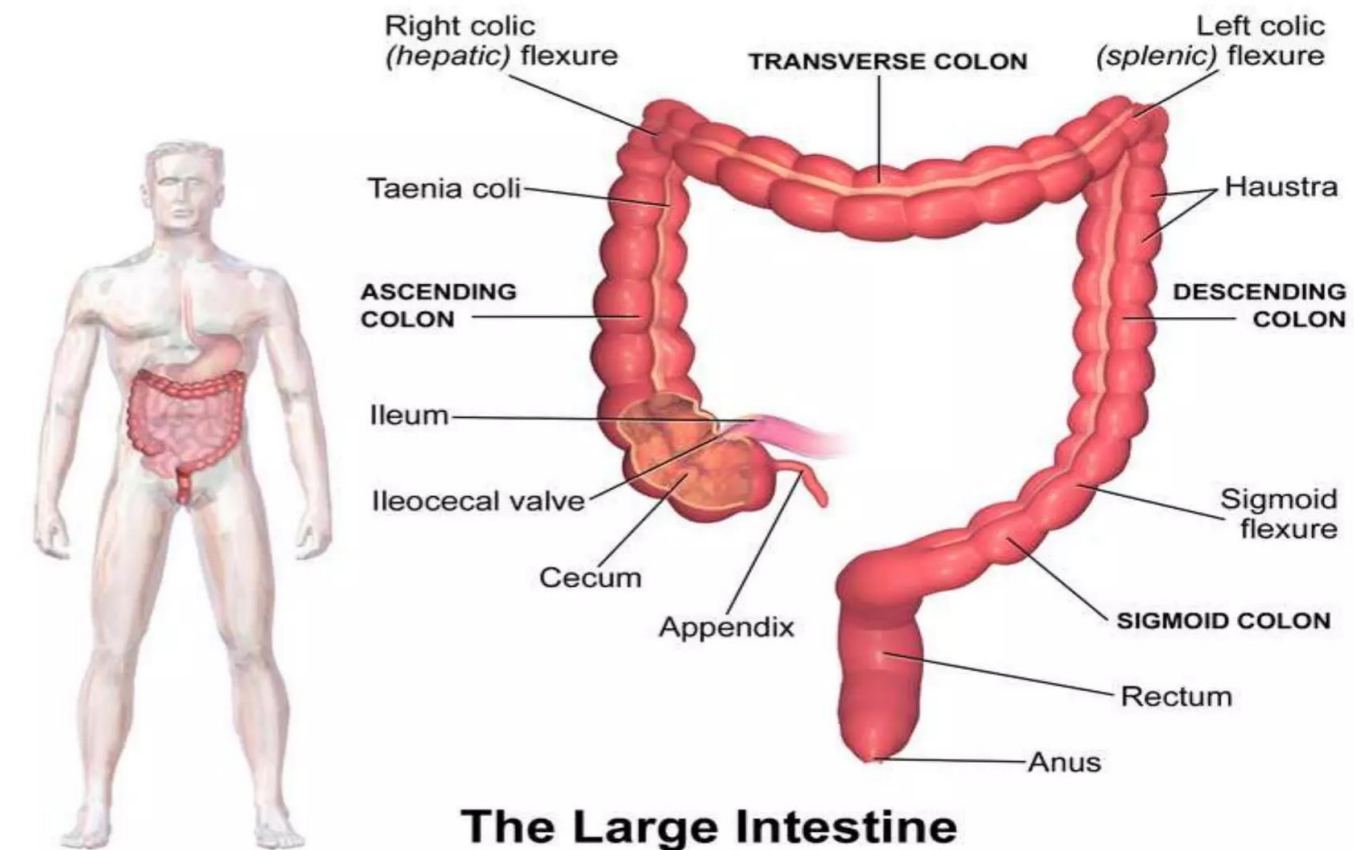
# THE LARGE INTESTINE



- The large intestine, also known as the large bowel or colon, is the last part of the gastrointestinal tract and of the digestive system in vertebrates.
- Water is absorbed here and the remaining waste material is stored as feces before being removed by defecation.
- Parts – Vermiform appendix, caecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectum and anal canal
- **VERMIFORM APPENDIX**

Blood supply – branch of superior mesenteric artery

Venous drainage – superior mesenteric vein drains into portal vein

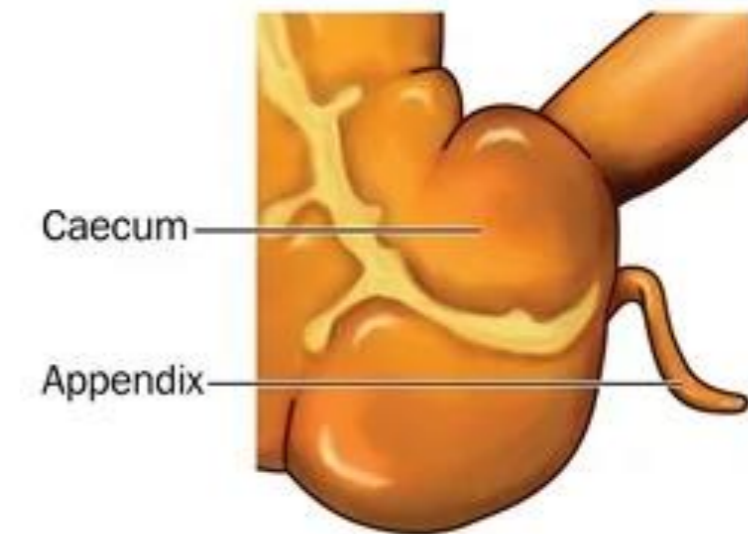




# THE LARGE INTESTINE



- **APPLIED ANATOMY**
  1. Infections of appendix cause infections of the liver
  2. Appendicitis – inflammation of appendix
  3. Appendicectomy – surgical removal of appendix
- **CAECUM**
  - Located in the right iliac fossa
  - Blood supply – Superior mesenteric artery
  - Venous drainage – Portal vein
- **ASCENDING COLON**
  - Situated below the right lobe of liver
  - Blood supply – Superior mesenteric artery
  - Venous drainage – Portal vein
- **TRANSVERSE COLON**
  - Length – 45 -50cm
  - Blood supply – Superior and Inferior mesenteric arteries
  - Venous drainage – portal system of veins

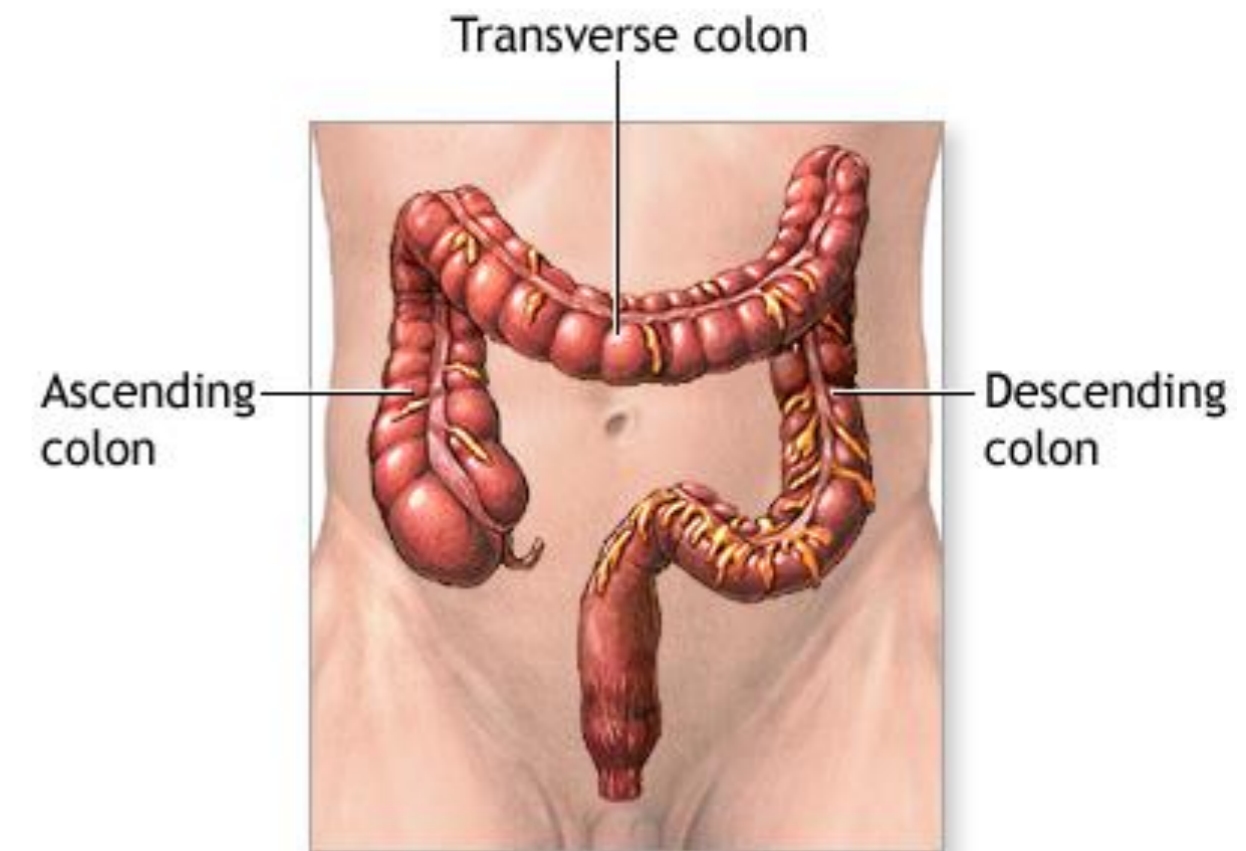




# THE LARGE INTESTINE



- **DESCENDING COLON**
  - Located left side of the abdominal cavity
  - Blood supply – Inferior mesenteric arteries
  - Venous drainage – portal veins
- **SIGMOID COLON**
  - Continuation of descending colon
- **RECTUM**
  - Lies in pelvis
  - The rectum is the last section of the large intestine. It holds the formed feces awaiting elimination via defecation.
- **THE ANUS**
  - The anus is the external opening of the rectum.
  - Its function is to control the expulsion of feces.





# FUNCTIONS OF LARGE INTESTINE

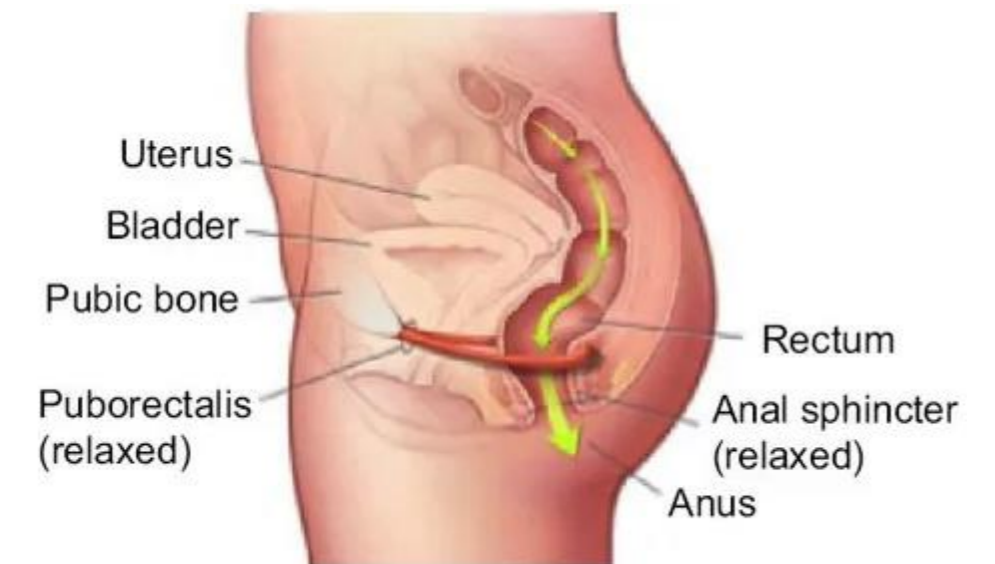
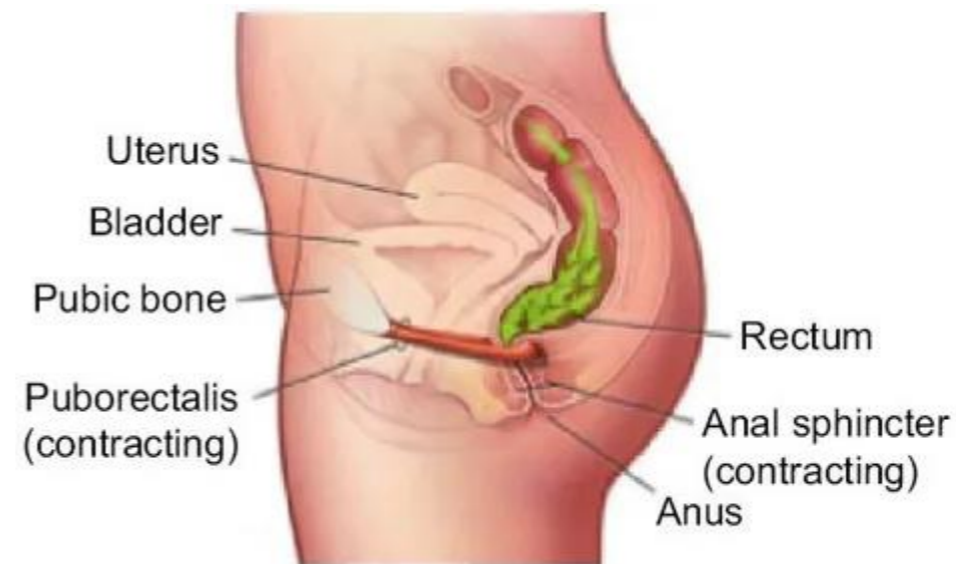


1. Digestion
2. Absorption
3. Secretion
4. Excretion
5. Synthesis

# DEFAECATION

- Evacuation of faecal matter is known as defaecation
  1. Relaxation of internal sphincter of Rectum
  2. Contraction of levator ani muscle
  3. Contraction of anterior abdominal muscle
  4. Contraction of diaphragm

This mobilises the faeces downwards and thus causes defaecation





## References



- <https://youtu.be/X3TAR0otFfM>
- Manipal manual of Anatomy



THANK YOU