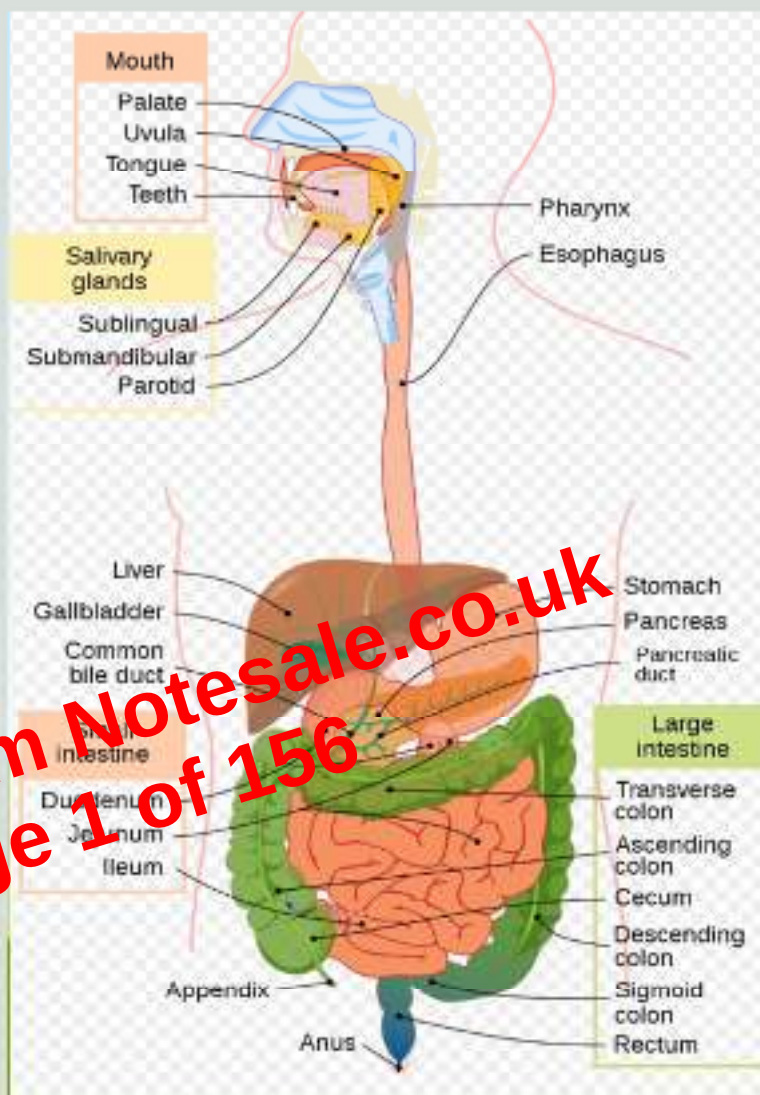


ANATOMY

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BY
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Tissues of the body

A tissue is defined as an organized aggregation of related of similar cells specialized to carry out some particular function (or functions).

All tissues consist of cells and variable amount of extracellular matrix (intracellular substance)

TYPES OF TISSUES

The human body is generally classified into four main types of tissues:

1. The epithelial tissues (epithelium)
2. The connective tissues
3. The muscle tissues
4. The nervous tissues

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EPITHELIUM

The epithelium is defined as

“A collection of closely apposed cells with very small amount of extracellular matrix”

- The epithelium is avascular (having no vessels), therefore it is supported by a layer of loose connective tissues containing blood vessels
- There is a layer known as **basement membrane or basal lamina** present between epithelium and connective tissues

Groups of epithelia

The epithelium is divided into two major groups

- Is a layer of variable thickness which contains reticular fibers and a variety of glycosaminoglycan and fibrils of collagen type VII
- This layer anchor basement membrane to the underlying connective tissues

Functions of Basement membrane

- A. It serves to bind the epithelial cells to the underlying or surrounding connective tissues
- B. It serves as a molecular sieve or ultrafilter
- C. The basement membrane serves as a scaffolding during epithelial regeneration or wound healing
- D. It also plays an important role in cell growth, proliferation, and differentiation

FUNCTIONS OF EPITHELIUM

1. Protection:

All covering epithelium protect underlying connective tissues

Example include the stratified squamous epithelium of epidermis, oral cavity protect against mechanical trauma

2. Secretion:

Epithelial cells synthesize substances and pass them out on to a surface or into the blood

3. Absorption:

Some epithelial cells are selectively permeable to substances in solution

Example, in epithelial lining of small intestine the absorptive epithelial cells take up appropriate material from lumen but leave unwanted substance behind

4. Excretion:

i. Migrant cells:

- These include those cells that enter the connective tissues from the bloodstream

- These cells include

1) Macrophages

2) Mast cells

3) Plasma cells

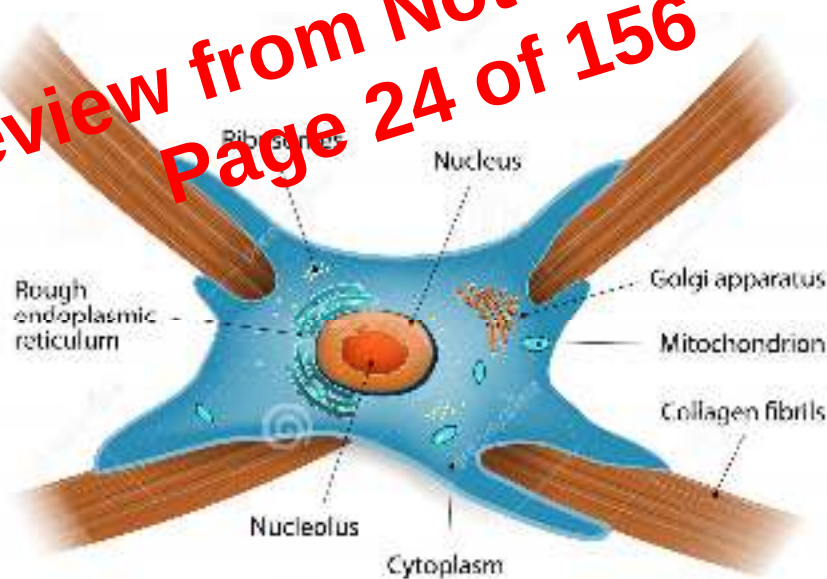
4) Various types of WBCs

i. Resident cells:

1) Fibroblasts

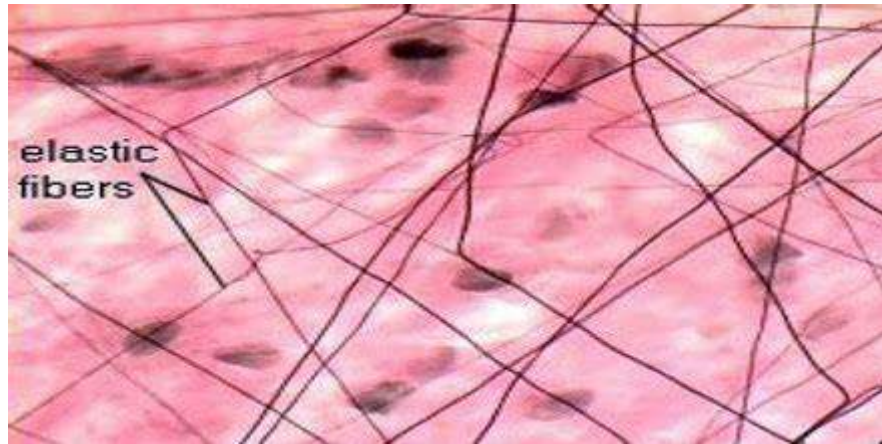
- Most abundant variety of connective tissue cells
- Their structure varies in relation to function being performed by the cell
- They can be inactive and active fibroblasts

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Inactive fibroblasts:

- Also known as fibrocytes



Synthesis:

Synthesized by fibroblast

Location:

Found in skin, ligamentum nucha & nuchae and large arteries

3. Reticular fibers

- Fine delicate strands
- Immature collagen fibre (type -3)

Synthesis:

- Synthesized by fibroblasts

Functions:

- Provide support and strength
- Framework of lymphoid tissue

Location:

- In organ capsules of liver, kidney & endocrine glands

Stained by silver salts (argyrophilic)

seen. These structures are called **areolae** and loose connective tissue is also known as **LOOSE AREOLAR CONNECTIVE TISSUE**

Cells:

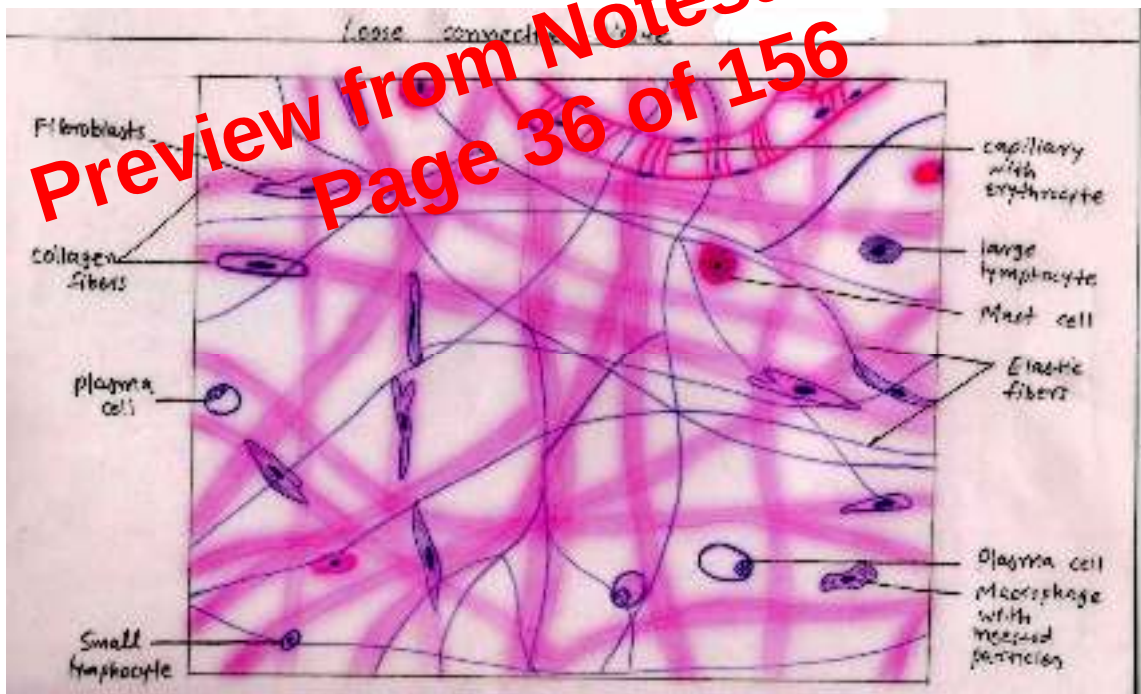
- The most common cells in this type are fibroblasts and macrophages
- Mast cells and adipose cells are also present

Fibers:

The fibers commonly present in their ECM is collagen fiber, elastic fiber is also present

Examples

Examples include subcutaneous tissues, mesentery, and omentum

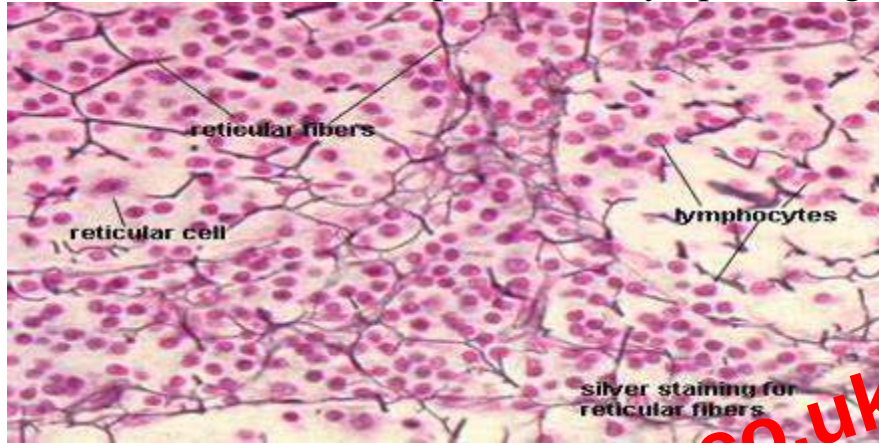


2. Dense connective tissue

- This type of tissue is characterized by close packing of its fibers

The reticular cells are considered to be a special variety of fibroblasts

- Most of the protoplasmic processes of reticular cells are wrapped around or extend along the reticular fibers
- This arrangement creates a special trabecular system that forms architectural framework of hemopoietic and lymphoid organs



4. Adipose tissues

- Adipose cells consist of adipocytes which consists of abundant of blood vessels
- Individual adipocytes and small group of adipocytes are found throughout the loose connective tissues
- Large aggregates of adipocytes are known as ADIPOOSE TISSUE
- The fats present in adipose cells represents nutritional calories and are used when required

Types of adipose tissues

There are two types of adipose tissues differentiated on the basis of the color

i. White adipose tissues:

- The stratum lucidum is a thin, transparent layer of keratinocytes that are becoming less round and have a flatter shape

iii. **Stratum granulosum:**

- It is present between stratum lucidum and spinosum
- Keratinocytes have granules within them, and in this layer they're visible under a microscope.

iv. **Stratum spinosum:**

- Between the stratum basale layer and the stratum granulosum layer.
- This layer mostly consists of keratinocytes held together by sticky proteins called desmosomes
- The stratum spinosum helps make your skin flexible and strong.

v. **Stratum basale:**

- It is also known as stratum germinativum
- The deepest layer of epidermis
- New skin cells develop in this layer, and it also contains the keratinocyte (cur-at-in-o-site) stem cells, which produce the protein keratin.
- Keratin helps form hair, nails and your skin's outer layer, which protect you from the harsh environment.
- It also contains **melanocytes**, which are responsible for producing melanin, which provides the pigment of your epidermis.

APPENDAGES OF SKIN

The skin has four appendages

1. Hair
2. Nails
3. Sebaceous glands
4. Sweat glands

1. Hair:

- The word hair is taken from Latin word PILUS
- It is a thread like structure composed of dead cornified cells

Composition of Hair:

Each hair has a hair shaft, root, hair bulb, hair papilla, and arrector pili

- **Shaft:**

It projects above the skin surface

- **Root:**

It is embedded in the skin

- **Bulb:**

The deep end of hair follicle is dilated to hair bulb

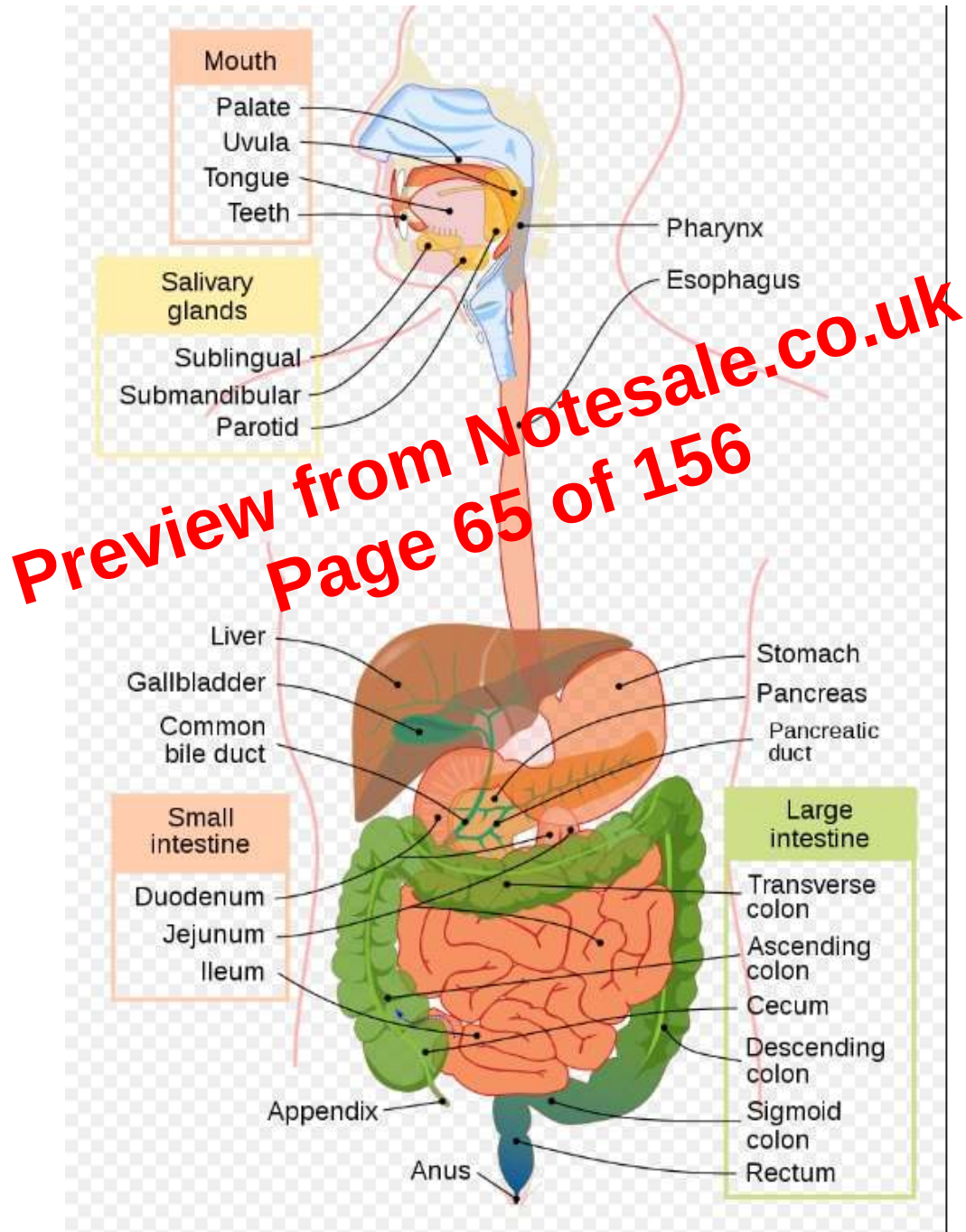
- **Papilla:**

The connective tissues of dermis indents the base of the hair bulb as hair papilla

- **Arrector pili:**

Gastrointestinal tract

Alimentary canal

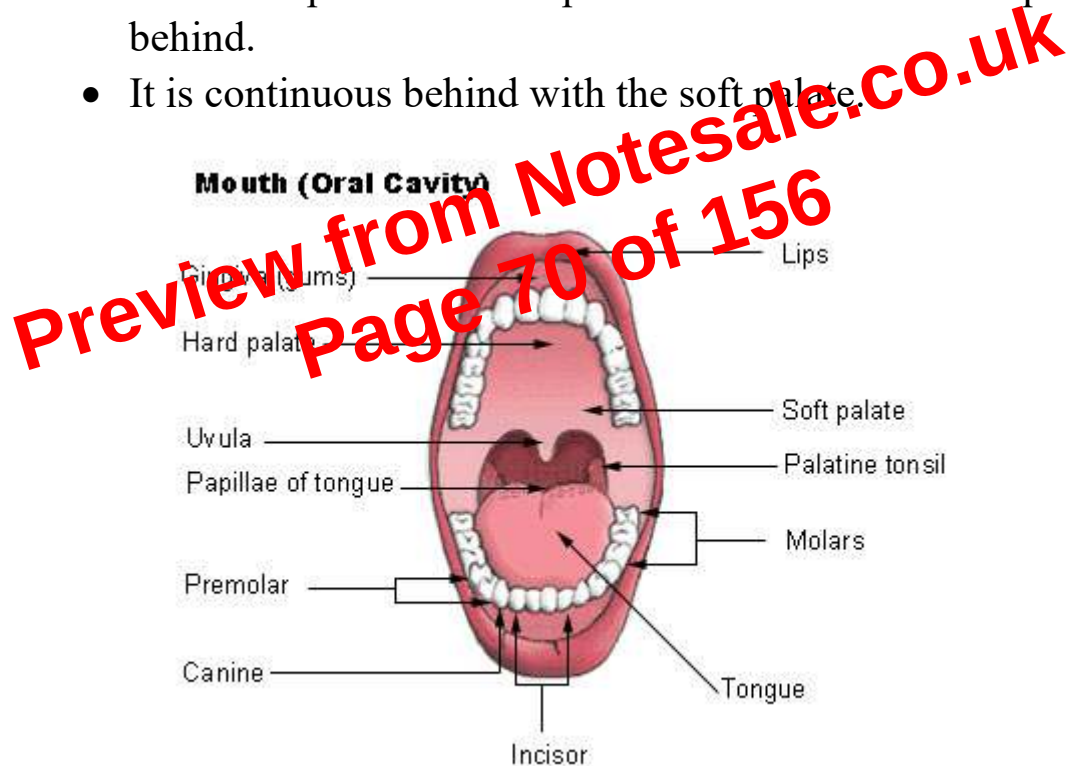


Blood supply

- The lingual artery, the tonsillar branch of facial artery, and the ascending pharyngeal artery supply blood to the tongue
- The veins drain into the internal jugular vein

5. Palate

- The palate forms the roof of the oral cavity and the floor of the nasal cavity.
- It has two parts: the hard palate in front and the soft palate behind.
- It is continuous behind with the soft palate.



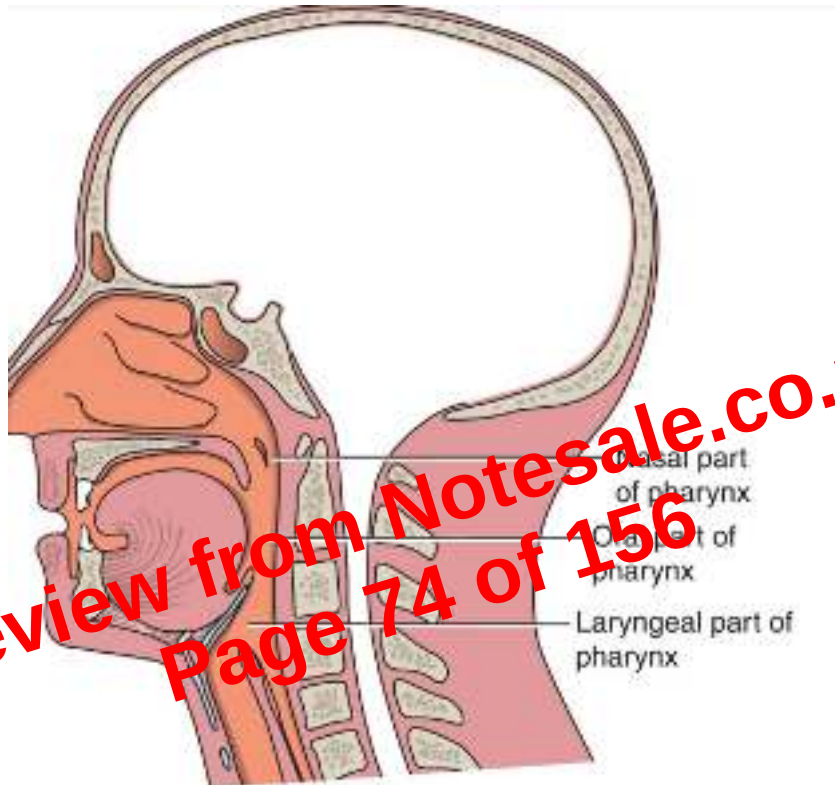
i. Soft palate:

- The soft palate is a mobile fold attached to the posterior border of the hard palate

Muscles of pharynx:

The muscles of pharynx are

Superior, middle and inferior constrictor muscles



Process of Swallowing (Deglutition)

Voluntary Action:

- Masticated food is formed into a ball or bolus on the dorsum of the tongue and voluntarily pushed upward and backward against the undersurface of the hard palate.
- This is brought about by the contraction of the styloglossus muscles on both sides, which pull the root of the tongue upward and backward.

Relation with other organs:

1st part

Anterior: quadrate lobe of liver and gallbladder

Posterior: lesser sac, gastroduodenal artery, and bile duct

2nd part

Anterior: fundus of gallbladder, right lobe of liver, and coils of small intestine

Posterior: hilum of right kidney and ureter

3rd part

Anterior: root of mesentery of small intestine, coils of jejunum

Posterior: right ureter, aorta, right psoas muscle

4th part

Anterior: beginning of root of mesentery, coils of jejunum

Posterior: left margin of aorta, and medial border of psoas muscle

2. Jejunum and Ileum

- Jejunum and Ileum are 6m long, the upper 2/5th of this layer is jejunum
- Each fold have distinctive features but are gradual changes from one another

Blood supply:

Arteries: branches from superior mesenteric artery

Veins: branches towards superior mesenteric veins

It is separated from the ileum by the ileocecal valve (ICV) or Bauhin's valve. It is also separated from the colon by the cecocolic junction

Its length is 2.5 inch (6cm)

Function:

It receives chyme from the ileum, and connects to the ascending colon of the large intestine.

Ileocecal valve:

- It consists of two horizontal folds of mucous membrane that projects around ileum
- Prevents the reflux of cecal content into ileum

Sphincter:

Prevents the flow of content from ileum to colon

Blood supply

Arteries: anterior and posterior cecal arteries from ileocolic artery (part of superior mesenteric artery)

Veins: anterior and posterior cecal veins from ileocolic vein (part of superior mesenteric vein)

Relation with other organs

Anterior: coils of small intestine, anterior abdominal wall in right iliac region

Posterior: psoas muscle, femoral nerve, appendix

2. Appendix

- The descending colon extends from the left colic flexure to the pelvis below.
- It occupies the left upper and lower quadrants.
- Its length is 10 inch (25cm)

Relation with other organ:

Anterior: Coils of small intestine, greater omentum, anterior abdominal wall

Posterior: lateral border of left kidney, iliacus muscle, iliac crest, femoral nerve

Blood supply:

Arteries: left colic and sigmoid branches from inferior mesenteric artery

Veins: left colic and sigmoid branches from inferior mesenteric vein

4) Sigmoid colon:

- The sigmoid colon begins at the pelvic inlet, where it is a continuation of the descending colon
- It hangs down into the pelvic cavity in the form of an S-shaped loop.
- It joins the rectum in front of the sacrum.

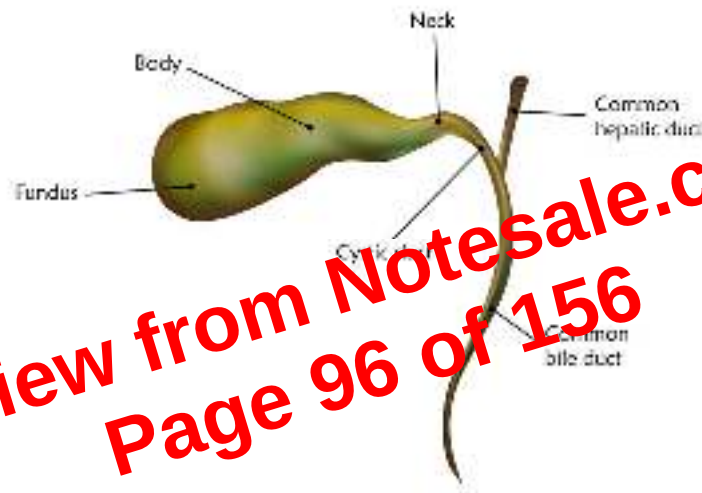
Rectum:

- The rectum occupies the posterior part of the pelvic cavity. It continuous above with the sigmoid colon and descends in front of the sacrum to leave the pelvis by piercing the pelvic floor.
- Here, it becomes continuous with the anal canal in the perineum.

2. Gallbladder

Introduction

- The gallbladder is a pear-shaped sac lying on the undersurface of the liver
- It has a capacity of approximately 30 mL, and it both stores and concentrates bile by absorbing water



Parts

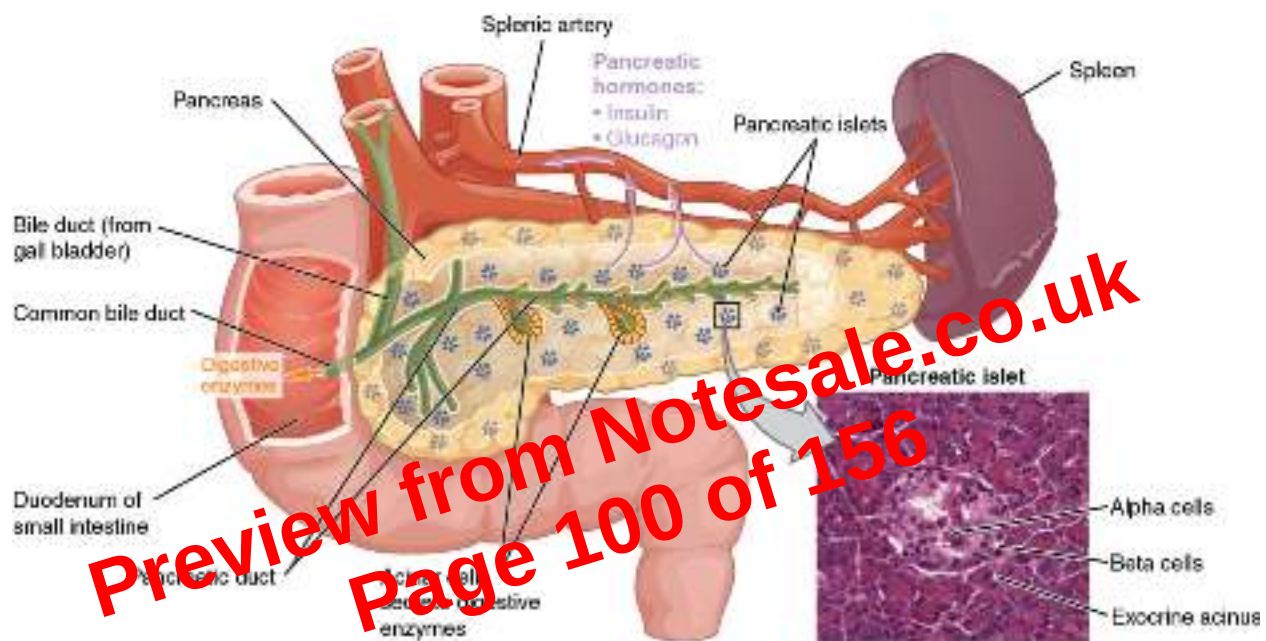
It is divided into

- a fundus,
- a body,
- and a neck.

The neck is continue with cystic duct.

4. Pancreas

The pancreas is both an exocrine and an endocrine gland.



Structure

It is an elongated structure

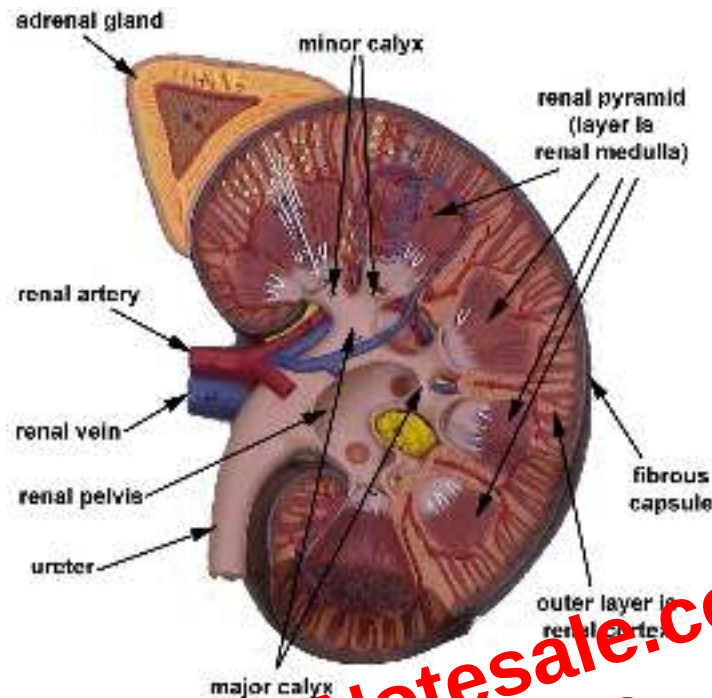
Secretions

- Exocrine portion of the gland produces a secretion that contains enzymes capable of hydrolyzing protein fats and carbs
- Endocrine portion of gland islets of Langerhans produces hormones like insulin and glucagon.

Location

Posterior:

Diaphragm, pleura, 11th and 12th rib



BLOOD SUPPLY

Artery

The renal artery, which is a branch of the aorta, supplies the kidneys.

Vein:

The renal vein drains into the inferior vena cava.

LYMPH DRAINAGE

The lymph drains into the lateral aortic lymph nodes around the origin of the renal artery.

NERVE SUPPLY

The renal sympathetic plexus supplies the kidneys.

Route of Blood supply to kidneys:

Heart → abdominal aorta → renal artery

Interior of Bladder

Trigone:

- The internal surface of the base of the bladder is called the trigone.
- Here, the mucous membrane firmly adheres to the underlying muscle and is always smooth.
- The trigone has small, slitlike openings of the ureters at its lateral angles and below the crescentic opening of the urethra.
- The interureteric ridge runs from one ureteric orifice to the other.
- It is caused by the underlying muscle, and it forms the upper limit of the trigone.
- In males, the median lobe of the prostate bulges slightly upward into the bladder, behind the urethral orifice, to form a swelling (the uvula vesicae).

Muscular Coat of the Bladder Wall

The muscular coat consists of three interlacing layers of smooth muscle fibers

- At the neck of the bladder, the circular muscle forms the sphincter vesicae.

Ligaments

- The neck of the bladder is held in position by the puboprostatic ligaments in males and by the pubovesical ligaments in females.
- These ligaments are formed from pelvic fascia

Blood Supply

Arteries

Blood Supply of the Testis and Epididymis

Arteries:

The **testicular artery** is a branch of the abdominal aorta.

The testicular vein emerges from the testis and the epididymis as a venous network (the pampiniform plexus), which becomes reduced to a single vein as it ascends through the inguinal canal.

Veins:

The right **testicular vein** drains into the inferior vena cava, and the left vein joins the left renal vein.

Lymph Drainage of the Testis and Epididymis

Para-aortic lymph nodes on the side of the aorta at the level of the first lumbar vertebra.

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2. Penis

The penis has a fixed root and a body that hangs free

- The bulb continues forward into the body of the penis and forms the **corpus spongiosum**

Crus:

- Each crus attaches to the side of the pubic arch, and the **ischiocavernosus muscle** covers its outer surface.
- The two crura converge anteriorly and come to lie side by side in the dorsal part of the body of the penis, forming the **corpora cavernosa**

ii. Penile body:

The essential components of the body of the penis are three cylinders of erectile tissue enclosed in a tubular sheath of deep fascia (Buck's fascia).

Erectile tissues:

- The erectile tissues are the two dorsally placed corpora cavernosa and the single corpus spongiosum that is applied to their ventral surface

Glans penis:

- The corpus spongiosum expands at its distal extremity to form the glans penis, which covers the distal ends of the corpora cavernosa.
- The pronounced posterior edge of the glans is the **corona**.
- The slitlike orifice of the urethra, the external urethral meatus, is at the tip of the glans penis.

Prepuce:

- The prepuce (foreskin) is a hoodlike fold of skin that covers the glans.

4. Bulbourethral gland:

- The bulbourethral glands are two small glands that lie in the deep perineal space, embedded in the sphincter urethrae muscle
- Their ducts pierce the perineal membrane and enter the penile portion of the urethra.
- They pour their secretion into the urethra in response to erotic stimulation

5. Prostate gland:

The prostate is a fibromuscular glandular organ that surrounds the prostatic urethra

Location:

It is about 1-2.5 in. (3 cm) long and lies between the neck of the bladder above and the urogenital diaphragm below

- The two ejaculatory ducts pierce the upper part of the posterior surface of the prostate to open into the prostatic urethra at the lateral margins of the prostatic utricle.
- The numerous glands of the prostate are embedded in a mixture of smooth muscle and connective tissue, and their ducts open into the prostatic urethra
- The prostate is incompletely divided into five lobes:
 - i. Anterior lobe
 - ii. Median lobe
 - iii. Posterior lobe
 - iv. Left lateral lobe
 - v. Right lateral lobe

- Also known as PARS INFUNDIBULUM, surrounds the infundibulum in the form of collar
- It consists of mainly of groups or cords of faintly basophilic cuboidal cells containing lipid droplets and glycogen granules
- It contains sparse population of gonadotrophins which secrete LH and FSH

ii. Neurohypophysis

The neurohypophysis consists of infundibulum and pars nervosa

Infundibulum:

- It is also known as Infundibular stalk
- It is the short stalk by which hypophysis attaches to hypothalamus
- It contains hypothalamo-hypophyseal tract which consists of axons of the supraoptic and paraventricular nuclei of the hypothalamus

Pars nervosa:

- **Pituicytes:**
- Pars nervosa consists of unmyelinated nerve fibers, fenestrated capillaries, and specialized glial cells called Pituicytes
- The pituicytes are specialized glial cells which resemble the astrocytes
- They are abundant in pars nervosa and plays an important supportive role for the axons present in this part of the pituicytes
- The unmyelinated nerve fibers are about 10,000 in number

i. Zona glomerulosa:

- Is the outermost zone and lies just beneath capsule
- It consists of 15% of the cortical volume
- It is composed of columnar or pyramidal cells consisting of darkly stained, spherical nuclei

Secretion:

The zona glomerulosa cells secrete mineralocorticoids chiefly **ALDOSTERONE**

ii. Zona Fasciculata:

- is the thickest zone and covers 70-80% of cortical volume
- it consists of large polyhedral cells arranged in long straight cords that are one of two cells thick and run at right angles to the surface of the gland
- the cells in this zone is larger than that of zona glomerulosa

Secretion:

The zona fasciculata produce glucocorticoids such as **CORTISOL**

iii. Zona Reticularis:

- Is adjacent to medulla
- Makes up to 10% of the cortical volume
- This zone consists of polyhedral or rounded cells arranged in a branching and anastomosing cords

Secretion:

The cells in this zone secrete weak androgens such as **ESTROGENS, PROGESTRONE, and CORTISOL**

2. The Adrenal Medulla

- The adrenal medulla contains anastomosing cords of large polyhedral cells called **MEDULLARY CELLS**
- The cells are supported by the meshwork of reticular fibers
- Due to their affinity for chromium salt, the medullary cells are also known as **CHROMAFFIN CELLS**
- These cells have neurons that lack axons and dendrites

Secretion:

The secretions consists of two catecholamine

i. **Epinephrine:**

Epinephrine is chief hormone produced by the medullary cells and accounts for 80% of the total catecholamine output of the adrenal medulla

ii. **Norepinephrine**

Depending on the basis of secretory granules, the medullary cells can be divided into two types

- Norepinephrine producing cells
- Epinephrine producing cells