

The Tissues, Membranes and Glands

INTRODUCTION

The tissues of the body consist of large number of cells and they are classified according to the size, shape and functions of these cells.

A tissue is a group of cells that usually have a common origin in an embryo and function together to carry out specialized activities.

There are four main types of tissue.

- EPITHELIAL TISSUE
- CONNECTIVE TISSUE
- MUSCLE TISSUE
- NERVOUS TISSUE (Fig. 4.1)



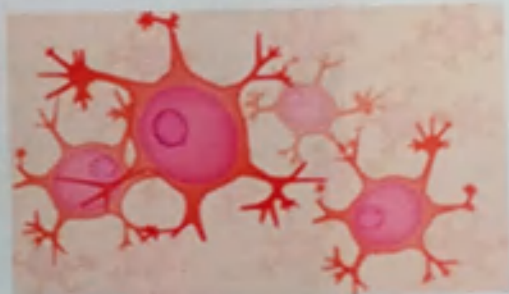
Epithelial tissue



Connective tissue



Muscle tissue



Nervous tissue

Fig. 4.1

EPITHELIAL TISSUE

- This group of tissue is found in covering the body lining cavities and tubes also found glands

Functions

- Protection
- Secretion
- Absorption

Epithelial tissues are classified into 3 type

TYPES OF EPITHELIAL TISSUE

1 Simple epithelial tissue-single layer of cells, subclassified into 5 types

- a. Simple epithelial tissue
- b. Squamous epithelial tissue
- c. Cuboidal epithelial tissue
- d. Columnar epithelial tissue
- e. Ciliated epithelial tissue

2 Stratified Squamous epithelial tissue –several layer of cells

3. Transitional epithelium

a. Simple epithelial tissue

- It consists of single layer of identical cells. The types are named according to the shape of the cells and their functions. The more active the tissue the taller the cells. (Fig. 4.2)



Fig. 4.2 : Simple epithelial tissue

b. Squamous epithelial tissue

- This is composed of a single layer of flattened cells. The cells fit closely together like flat stones, forming a thin and very smooth membrane. (Fig. 4.3)
- **Present in**
 - Heart
 - Blood vessels
 - Lymph nodes
 - Alveoli of the lung

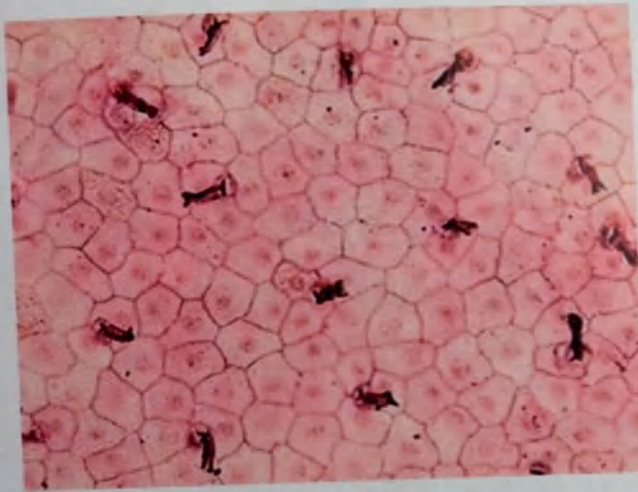


Fig. 4.3 : Squamous epithelial tissue

c. Cuboidal epithelial tissue

- This consist of cube-shaped cells fitting closely together lying on the basement membrane it is actively involved in secretion, absorption and excretion (Fig. 4.4)
- **Present in**
 - Tubules of the kidneys and glands



Fig. 4.4 : Cuboidal epithelial tissue

d. Columnar epithelial tissue

- Cells are rectangular in shape, found on lining of the digestive tract helps in mucus secretion. Mucus is the thick sticky substance secreted by modified columnar cells called goblet cells. (Fig. 4.5)



Fig. 4.5 : Columnar epithelial tissue

e. Ciliated epithelial tissue

- This is formed by the columnar cells which have many fine hair-like processes called cilia. Performs wave like movement. (Fig. 4.6)
- Present in
- Uterine tubes, respiratory system.

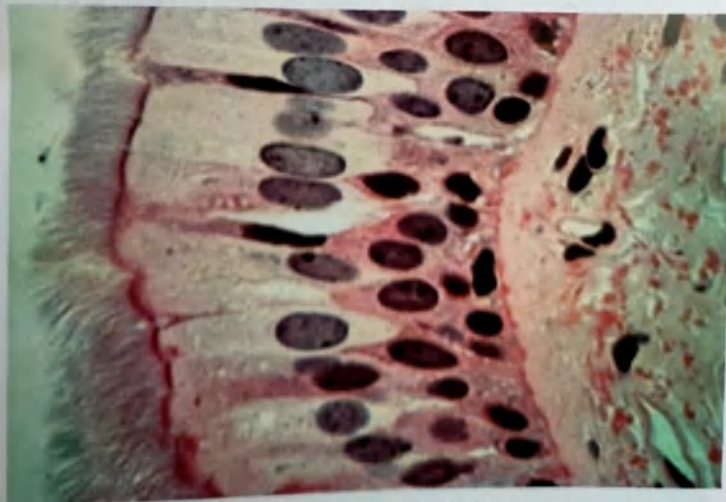


Fig. 4.6 : Ciliated epithelial tissue

2. Stratified Squamous epithelial tissue (Fig. 4.7)

- This is composed of many number of different type of cells.

• Types

- a. Non – keratinised stratified epithelium
- b. keratinised stratified epithelium

a. keratinised stratified epithelium

- This is found on dry surfaces that subject to wear and tear e.g. skin, hair and nails
- This prevents drying of the underlying live cells

b. Non – keratinised stratified epithelium

- This is found in wet surfaces e.g. conjunctiva of the eye, lining of mouth, esophagus and vagina
- This prevents drying of the underlying live cells

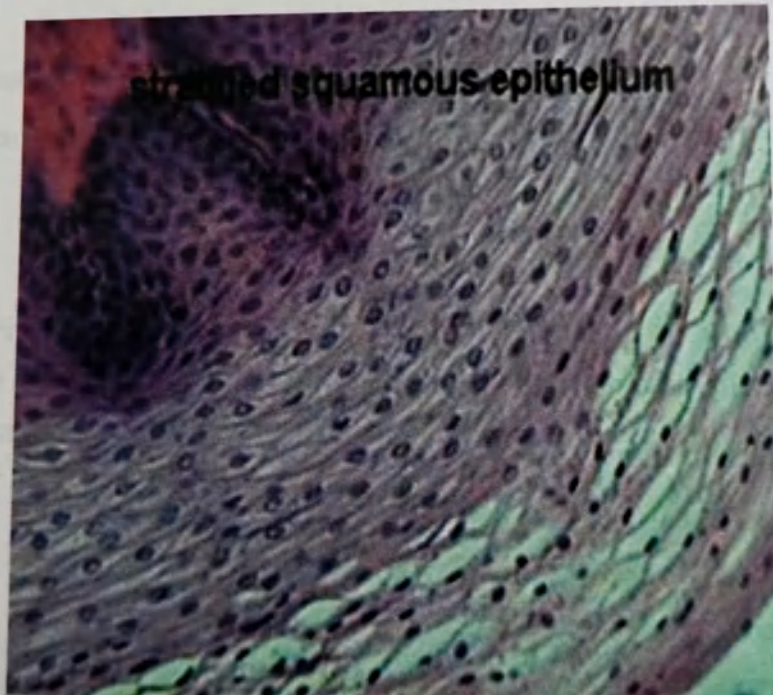


Fig. 4.7 : Stratified Squamous epithelial tissue

3. Transitional epithelium (Fig. 4.8)

- This is composed of several layer of pear-shaped cells found in the lining of the urinary bladder, renal pelvis and urethra. It allows stretching of the bladder. Transitional epithelium is also called as urothelium.

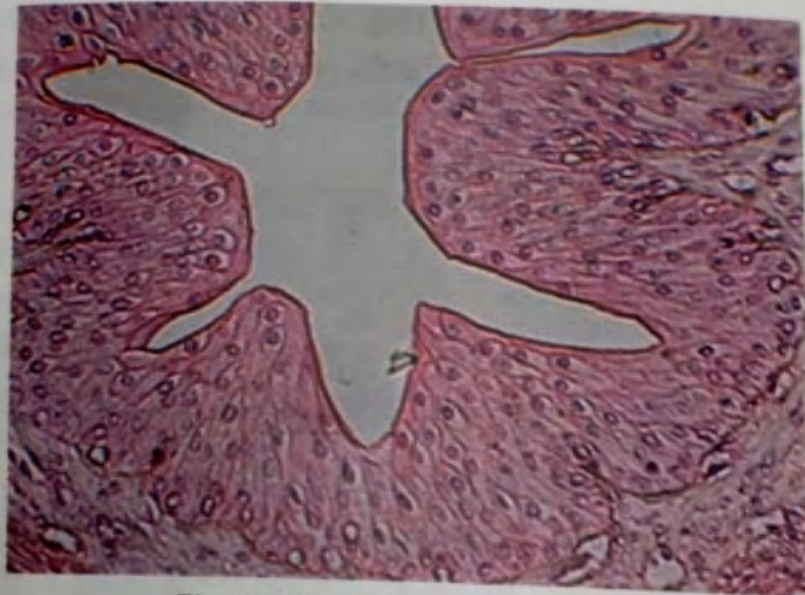


Fig. 4.8 : Transitional epithelial tissue

CONNECTIVE TISSUE

Functions

- a. Binding and structural support
 - b. Protection
 - c. Transport
 - d. Insulation
- **Cells present are**
 - Fibroblast, fat cells, macrophages, leukocytes, mast cells.

Types of connective tissue

Connective tissue is classified into 4 types

1. Loose (areolar) connective tissue
2. Adipose connective tissue
3. Fibrous connective tissue
4. Elastic connective tissue

1. Loose connective tissue (Fig. 4.9)

- **Present in**
- Under the skin
- Between muscle
- Blood vessel and nerves
- Digestive system
- Glands

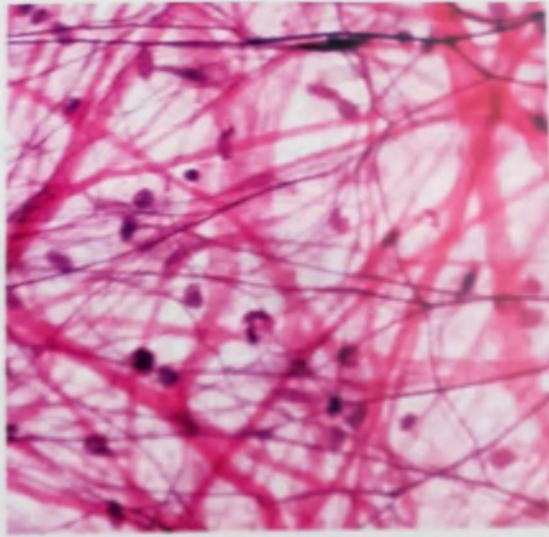


Fig. 4.9 : Loose connective tissue

2. Adipose connective tissue (Fig. 4.10)

- Helps in balancing between energy intake and expenditure.
- **Present in**
- Kidneys
- Eyes
- Muscle fibers
- Breast tissue
- Under the skin acts as a thermal insulator



Fig. 4.10 : Adipose connective tissue

3. Fibrous connective tissue (Fig. 4.11)

- Made up of collagen fibers
- **Present in**
- In between the bones
- Covering of brain, kidney

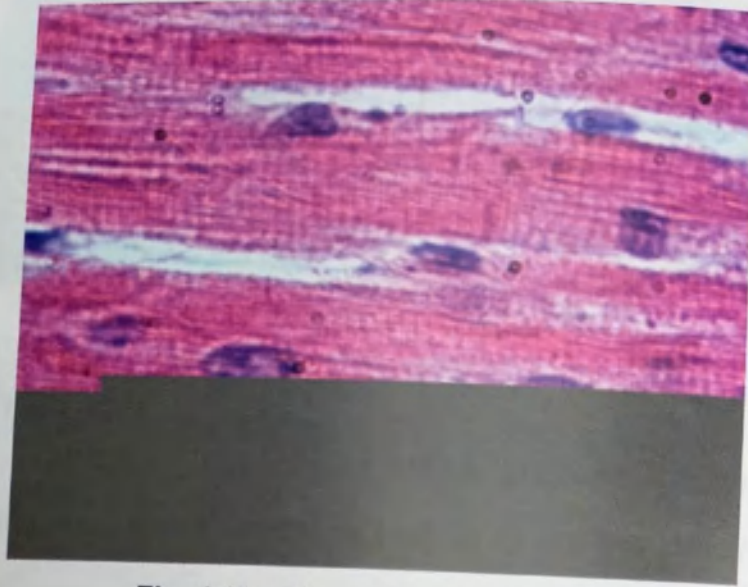


Fig. 4.11 : Fibrous connective tissue

4. Elastic connective tissue (Fig. 4.12)

- Capable of extension and recoil
- **Present in**
- Large blood vessels, epiglottis outer ear

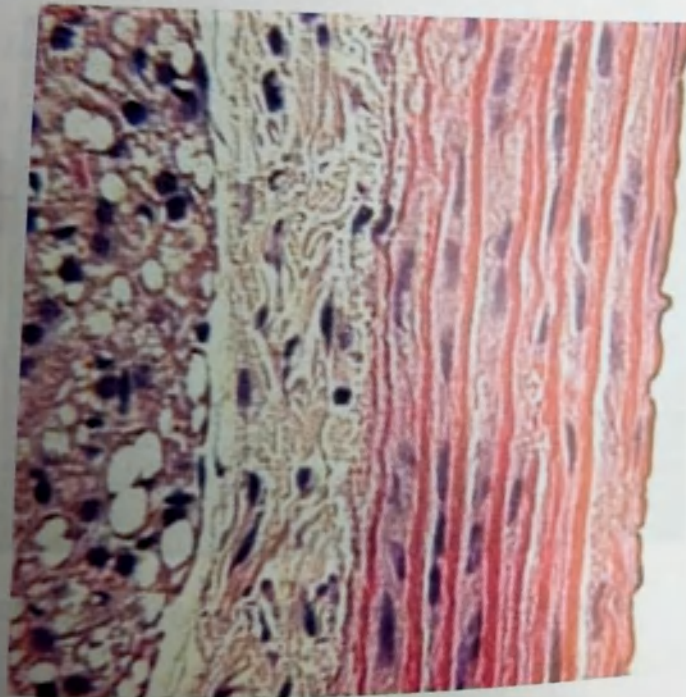


Fig. 4.12 : Elastic connective tissue

MUSCLE TISSUE

Muscular tissue consist of elongated cells called muscle fibers. Muscle tissue is able to contract and relax providing movement within the body. Muscle contraction requires an adequate blood supply, to provide sufficient Oxygen, Calcium, nutrients and to remove waste products. (Fig. 4.13)

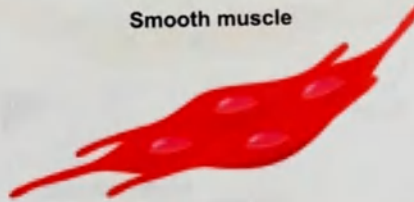
There are 3 type of muscles namely;

1. Skeletal muscle - Attach to the skeleton (Bones).
2. Smooth muscle - Present in the digestive, reproductive tract.
3. Cardiac muscle - Muscles of the heart.

Skeletal muscle



Smooth muscle



Cardiac muscle

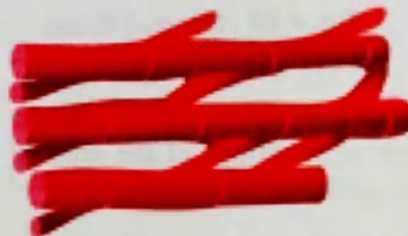


Fig. 4.13

Difference between all three types of muscles

Skeletal/Striated muscles	Smooth muscles	Cardiac muscles
1. Cells are cylindrical	Cells are cylindrical	Cells are cylindrical
2. Cells are unbranched	Cells are unbranched	Cells are branched
3. These are voluntary muscles	These are involuntary muscles	These are involuntary muscles
4. They contract rapidly and soon undergo fatigue	They contract slowly and do not undergo fatigue	They contract rapidly but do not undergo fatigue

NERVOUS TISSUE (Fig. 4.14)

Nervous tissues are made up of different type of nerve cells, all of which have an axon, the long stem-like part of the cell, that sends action potential signals to next cell. Nervous tissue is composed of neurons or nerve cells, which receive and transmit impulses all over the body. If they are damaged, they do not regenerate.

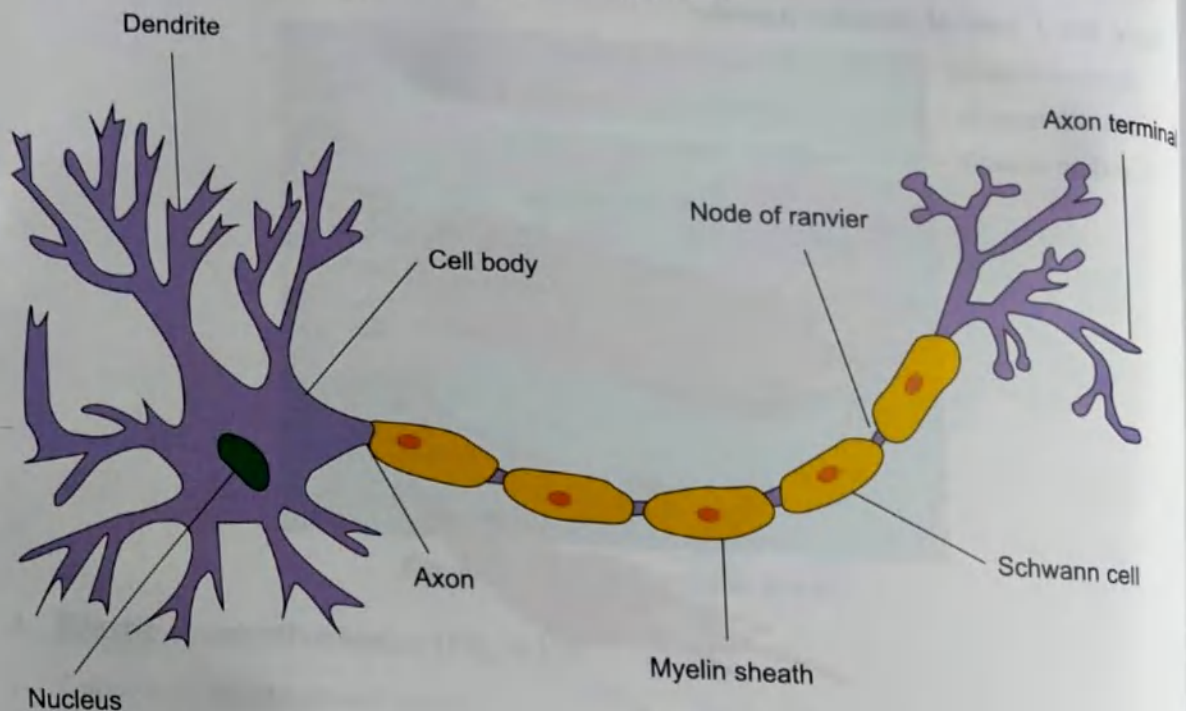


Fig. 4.14 : Nervous tissue

Membranes

Membranes are basically sheets or coverings of the internal organs (structures). There are mainly two types of membranes, epithelial and synovial

- **Epithelial membrane**- It is a supporting tissue, that cover or line many internal structures. The epithelial membrane are mucous membrane, serous membrane and cutaneous membrane (skin- refer chapter 15)
- **Mucous membrane** -The membrane consist of epithelial cells, many of them produce mucus (thick tenacious fluid). Mucus protects the lining of the organs from drying, mechanical and chemical injury. Mucous membrane is the moist lining of many organs like alimentary, genitourinary and respiratory tract.
- **Serous membrane** -It is also called as serosa, which secrete serous watery fluid. It is formed by the loose areolar connective tissue lined by simple squamous epithelium. It has two layer parietal layer, which lines a cavity and visceral layer, which surrounds organs within the cavity. Serous fluid is present in between parietal and visceral layers to avoid friction.

- **Synovial membrane**-This membrane lines the cavities of movable joints and surrounds tendons. Synovial membrane secretes clear, sticky, oily fluid called as synovial fluid, which provides nourishment and allows movement of the joint by preventing the friction.

Glands

Glands are mainly responsible for secretion of hormones, directly into the blood or onto the epithelial surface of hollow organs. There are mainly three types of glands as per the mode of secretion.

- **Exocrine glands**-The secretions of exocrine glands are carried through the ducts to the target organ surface. e. g Pancreatic acini
- **Endocrine gland**-The secretions of endocrine glands are directly poured into the bloodstream .e.g. Thyroid gland, pituitary gland.
- **Paracrine glands**- They are same like endocrine glands but their secretions diffuse locally into the adjacent cells or surrounding tissue rather than into the blood stream. E.g. testosterone produced by the Leydig cells.

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