Essentials of Zoology

(Cytology and Histology)

1st year General Biology/Ecology students

2019-2020

Lec. 6

Histology

(The science of studying tissue structures and functions)

Intended learning outcomes (ILO's):

By the end of this lecture, students should be able to:

1- Define what is tissue.

2- List the different types of tissues.

3- State the general functions of epithelia.

4- Classify epithelia.

5- Relate the structure to the function of epithelia.

Histology

Tissue: a group of cells that coordinate together to perform one function.

Types of tissues:

1. Epithelial tissue
2. Connective tissue
3. Muscular tissue
4. Nervous tissue

There are 2 basic types of epithelial tissues:

1- Covering and lining epithelia

2- Glandular epithelia

1-Covering or lining epithelial cells:

These form a continuous layer over all the free surfaces of the body:

- The outer layer of the skin.
- The inner surface of the digestive and respiratory cavities.
- The inner surface of the blood vessels.
- The ducts of the exocrine glands.

2-Glandular epithelia:

These make up most of the glands in the body.

Functions of epithelia

1. Protection:

Epithelia protect underlying tissues against physical damage, drying out, chemical injury and infection.

2. Permission:

Epithelia permit and regulate the passage of materials (diffusion, absorption, filtration, secretion, excretion) into and out of the tissues of the body which they cover or line.

3. Sensory reception:

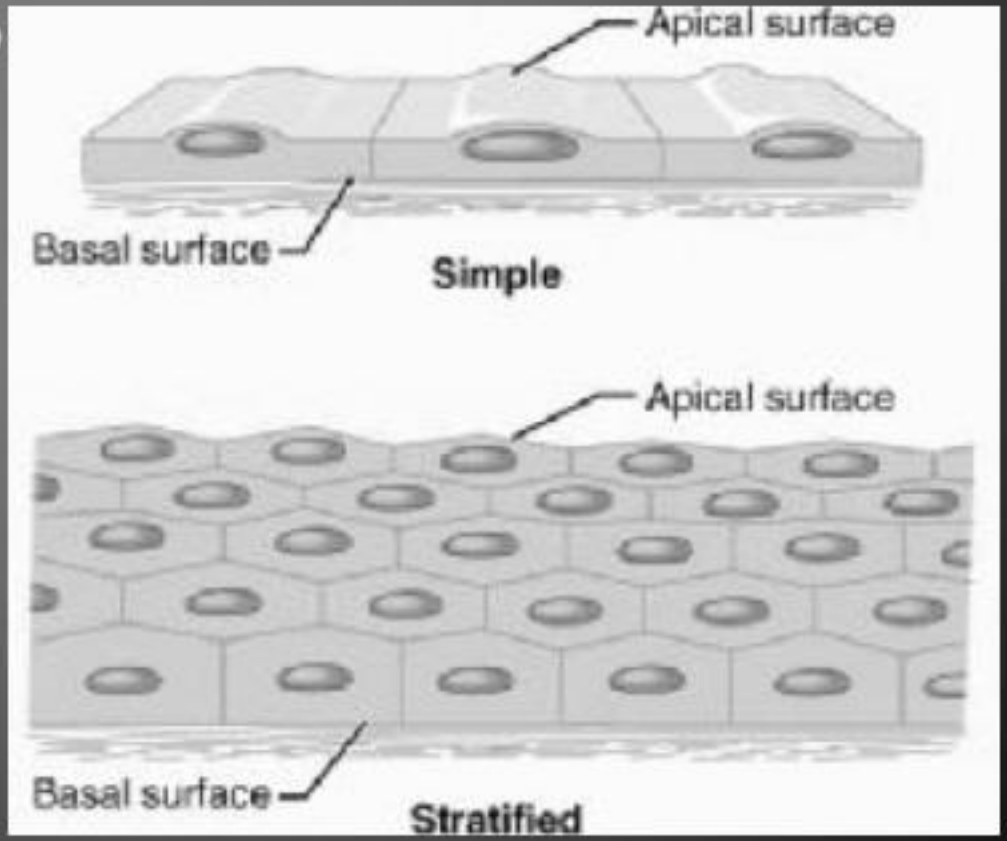
Specialized epithelia form sensory parts of organs such as the eye, ear, mouth (taste buds), and nose (olfactory epithelium).

4. Secretion:

Most glands are derived from epithelial cells specialized for producing secretions.

2. Stratified epithelia:

- Composed of several layers of cells.
- Very thick.
- Main function is to protect the tissues that they cover.
- The cells closest to the basement membrane are quite different from that of the cells at the top



C. Classification based on surface specialization

- If the epithelial surface cells are covered with cilia, the tissue is called **ciliated**.

- If the surface cells are dead and filled with an inert protein (keratin) forming flakes, the tissue is then called **keratinised.**

General features of epithelia

1. Maximum cell-to-cell contact.
2. Minimum extracellular material.
3. Always lying on basement membrane.
4. No blood vessels within the epithelial layer.
5. No nerves within the epithelial layer.
6. With cell junctions: Several types of junctions unite adjacent epithelial cells (tight junctions, desmosomes and gap junctions).

Classification of covering and lining epithelia

Classification of covering and lining epithelia is based on:

A. Number of cell layers

B. Cell shape

C. Surface specialisation (if any) e.g. keratinised, ciliated.

A. Classification based on number of cell layers

1- Simple epithelia:

- Composed of one cell layer only

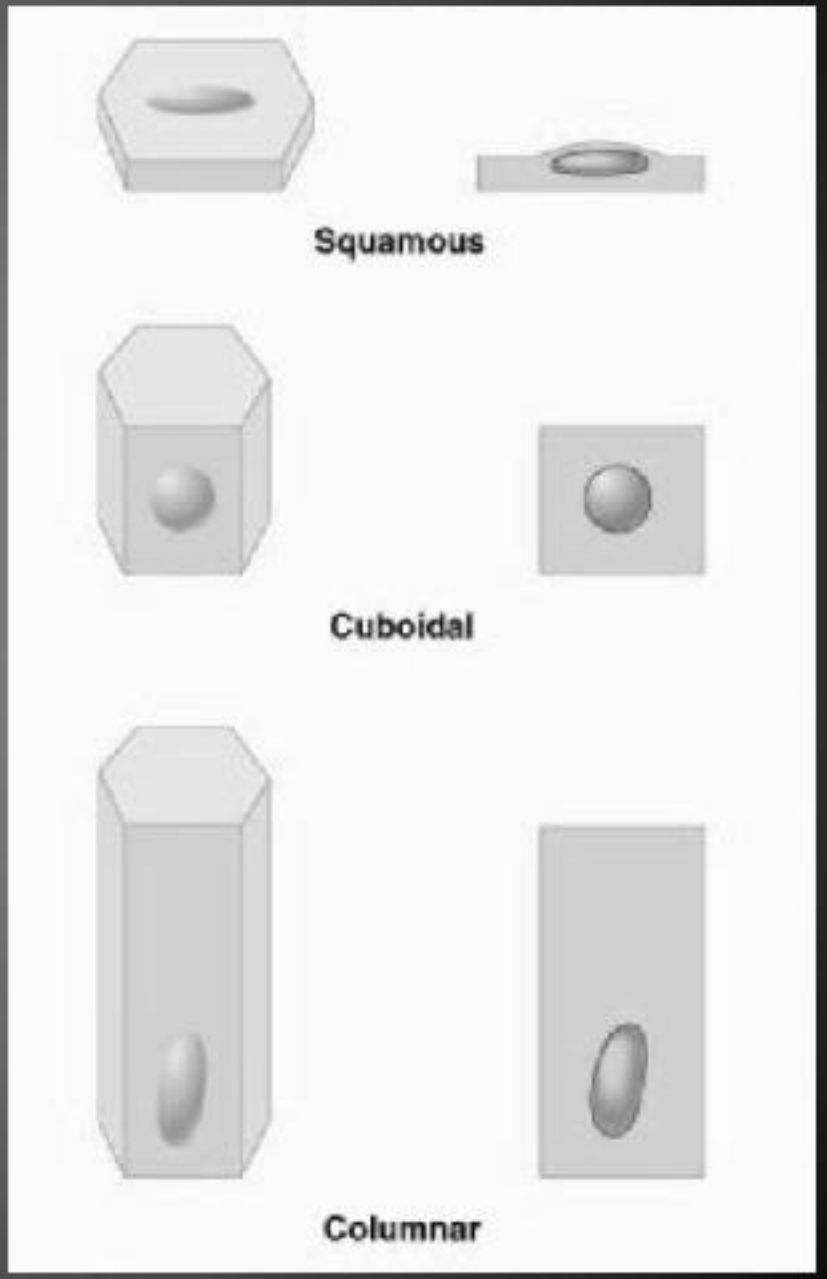
- Very thin and found in areas of minimum wear and tear.

- Main function is to allow passage of substances between the lumen and the surrounding tissues.

B. Classification based on the shape of the layers

- Flat: squamous epithelium
- Square: cuboidal epithelium
- Rectangular: columnar epithelium
- Transitional epithelium: If the shape changes depending of the degree of stretching of the tissue.

The stratified epithelia are classified according to the shape of cells of the free surface.

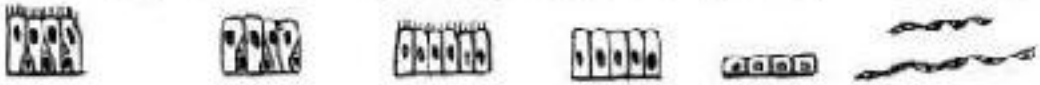


الأنسجة الطلائية
Epithelial tissues

- Simple بسيطة
- Stratified مركبة (طبقية)

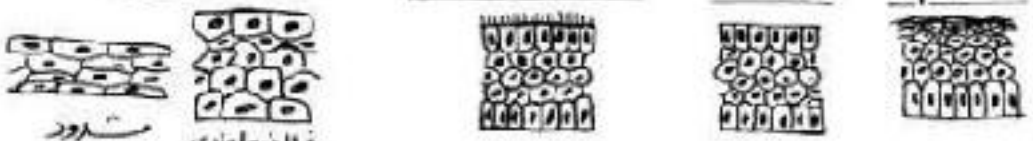
Simple Epithelial tissues
الأنسجة الطلائية البسيطة

- طبقية كاذبة مهدبة Ciliated Pseudostratified
- طبقية كاذبة Pseudo-Stratified
- عمودية مهدبة Ciliated Columnar
- عمودية Columnar
- مكعبية Cuboidal
- حرشفية Squamous



Stratified Epithelial tissues
الأنسجة الطلائية الطبقية

- انتقالية Transitional
- عمودية مهدبة ciliated columnar
- عمودية Columnar
- حرشفية squamous



Classification of glands

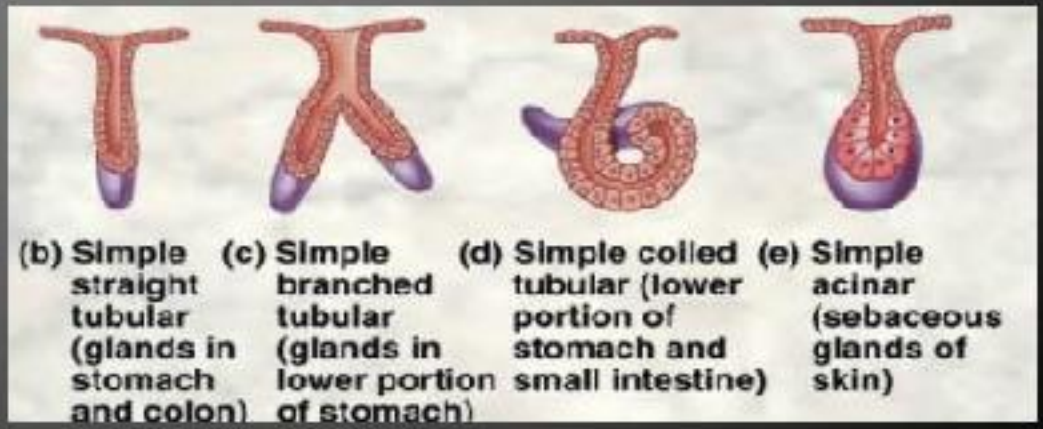
- Glandular epithelium is a modified type of epithelial tissue specialized in production of secretions.
- A gland is one or more cells that make and secrete a product.
- A Secretion is protein in aqueous solution: hormones, acids, oils.

Classification of glands

1- Unicellular glands (goblet cells) secrete mucus.

2- Multicellular glands that can be further classified according to the shape of the secretory portion into:

1. Simple tubular gland: e.g. in large intestine.
2. Simple coiled tubular gland: e.g. sweat glands.
3. Simple branched tubular gland: e.g. in stomach.



4. Simple acinar (alveolar) gland: (rounded secretory unit) mucus-secreting glands of penile urethra.

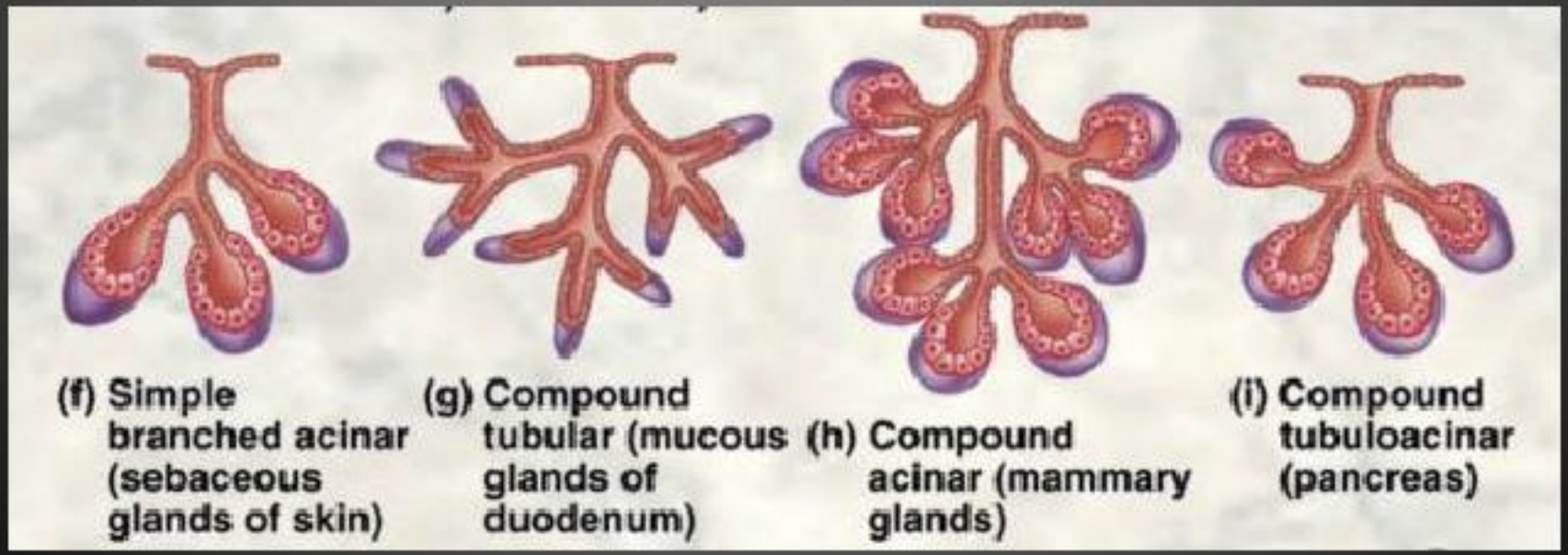
5. Simple branched acinar gland: e.g. sebaceous gland

6. Simple branched tubulo-alveolar glands: glands of oral cavity.

7. Compound tubular gland: in liver, kidney

8. Compound acinar (alveolar) gland: mammary gland

9. Compound tubulo-acinar gland: in pancreas



Thank you