

## Chapitre I - Epithelial tissue (Epithelium)

**Definition:** Epithelial tissue is defined as:

A **group** of cells:

**Juxtaposed,**

**Joining:** the cells are associated with each other by intercellular junctions.

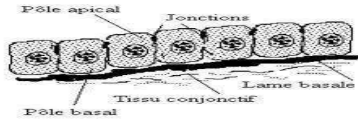
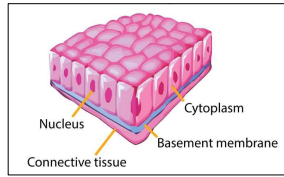
**Polarised with two poles:**

**an apical pole** (sometimes with differentiation).

**a basal pole.**

**Non-vascular:** the supply of nutrients and the export of waste products is done in relation to the underlying connective tissue

**l'apport des nutriments et l'export des déchets se fait en relation avec le tissu conjonctif sous-jacent**

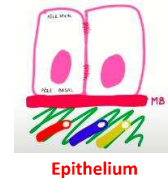


## Classification of the epithelium

We can classify tissues according to criteria

**A. According to the function :**

- Covering epithelium
- Glandular epithelium



### I - Covering epithelium

It covers the surface of the body (epidermis) and lines cavities (such as the stomach), natural conduits (such as the intestine), etc...

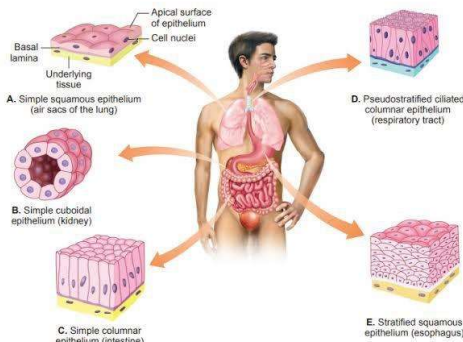


Figure 3.2. Types of Epithelial tissues

### I - Covering epithelium

• **MORPHOLOGY**

1) General criteria of classification:

- ➔ {
  - The shape of the cells
  - The number of cell layers
  - Type of apical differentiation

❖ **Shape of the cells:**

- **Flat** (cells that are larger than they are high), these are called **squamous** cells → Nucleus : *flat disc*
- Small and simple in shape (cells as high as they are large), they are called **Cuboidal** cells → Nucleus : *Spherical*
- Very elongated (the cells are higher than they are large), the cells are called **Columnar** (prismatic = cylindrical). → Nucleus : *ovoid or elongated*



- **Polymorphic** where the cells are varied, we speak of a **particular epithelium**

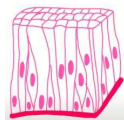
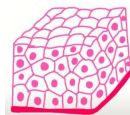
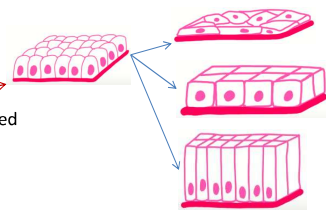
### I - Covering epithelium

❖ **Arrangements:**

• **Simple-** Cells are found in a single layer attached to the basement membrane

• **Stratified-** Cells are found in 2 or more layers stacked atop each other. The innermost layer rests on the basement membrane.

• **Pseudostratified-** a single layer of cells that appears to be multiple layers due to variance in height and location of the nuclei in the cells. The nuclei of the cells are located at different levels but all cells touch the basement membrane



### I - Covering epithelium

❖ **Type of apical differentiation** (Special Features of Epithelium)

**Specializations apical**

- 1) **Microvilli**
  - Striated tray
  - Brush border
- 2) **Cilia**
  - Stereocilla
- 3) **Keratin and melanin**
- 4) **Mucous cells**



## I - Covering epithelium

❖ **Type of apical differentiation** (Special Features of Epithelium)

**1) Microvilli**- smaller projections that arise from the cell's surface that also increase surface area. Ce sont des expansions cytoplasmiques cylindriques. Elles augmentent la surface membranaire du pôle apical des cellules.

It can be :

**Striated tray** : *Plateau strié* (ex : cellule de l'épithélium intestinale)

Nombreuses microvillosités rectilignes de même calibre, de même longueur disposées parallèlement de façon très ordonnée.



**Brush border** : *Bordure en brosse* (ex : pole apical des cellules du tube contournée proximal du rein)

Microvillosités sont habituellement plus longues et moins régulièrement disposées que dans le plateau strié.



## I - Covering epithelium

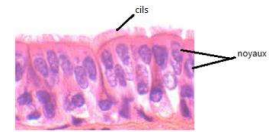
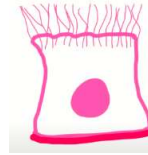
❖ **Type of apical differentiation** (Special Features of Epithelium)

• **Stereocilia**- epididymus, internal ear (kinocilia), olfactory cilia  
Long, flexuous and immobile microvilli.  
Elles s'agglutinent en touffes ou de mèches



**2) Vibratile cilia:**

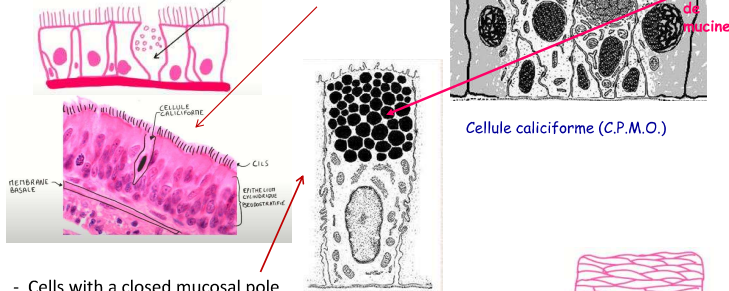
mobile cytoplasmic prolongements  
with pendular or undulatory movements. ....



## I - Covering epithelium

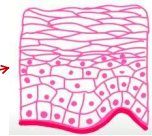
**4) Mucous cells:** two types can be distinguished:

- *Caliciform cells* (or open mucosal pole)



- Cells with a closed mucosal pole  
*Cellule à pôle muqueux fermé*

**3) keratin** stored in the superficial cells of the epidermis.



## I - Covering epithelium

### Function

- **Function of the covering epithelium:** depending on the location of the epithelium, the function can be
  - mechanical protection
  - chemical protection
  - physical protection
  - absorption
  - exchange

## II - Glandular epithelium

Glandular epithelium are tissues composed of cells that produce substances for the benefit of the body.

### Classification of glandular epithelium

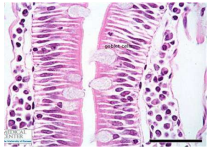
1. Anatomical organisation of the glands
2. Function
3. Mode of secretion
4. Nature of the secretion product
5. Shape of the gland adenomere

## 1. Anatomical organisation of the glands

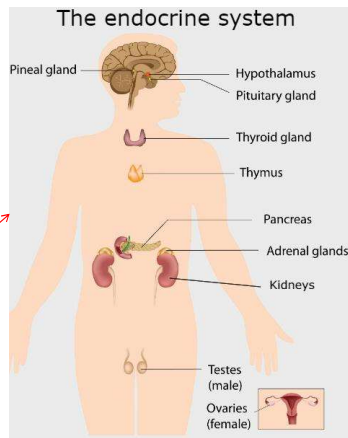
Depending on the location: there are two types:

### 1. Intra-epithelial glands:

located within a covering epithelium, they can be unicellular or multicellular



2. Extra-epithelial glands: the glandular cells are grouped into microscopically or anatomically individualised organs.



## 3. Nature of the secretion product

- **Mucous gland:** the secreted products (=mucus) are rich in mucopolysaccharides.
- **Serous gland:** the secreted products are *enzymatic proteins* (example: exocrine pancreas)
- **Mixed mucous-serous gland:** contains cells which secrete mucus and others which secrete enzymes.

## 5. Shape of the gland adenomere

can be found:

- Tubular
- Acinar
- Alveolar

2. Function: - Depending on the milieu into which these glands release their secretion products:

- 1) Exocrine glands
- 2) Endocrine glands
- 3) Amphicrine glands

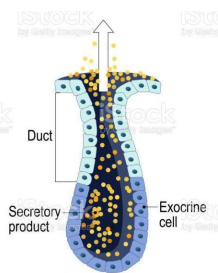
### 1) Exocrine glands: Unicellular & Multicellular

Synthesize and secrete their products onto a surface:

- Directly: unicellular glands → Secrete by exocytosis
- Via a tube (duct): multicellular glands → Secreted by ducts

#### • Examples:

- Salivary glands
- Mucous glands in the intestinal and respiratory tracts
- **Pancreas (digestive enzymes)**



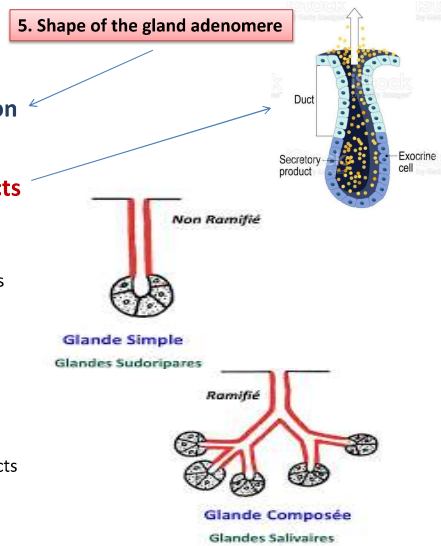
## 2. Mode of secretion

### 1) Exocrine glands:

#### 1. Structural classification

##### a. Based on the ducts

- **Simple glands:** unbranched ducts



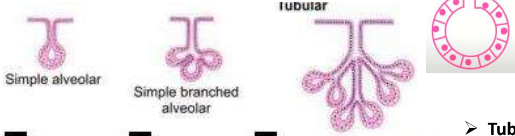
## 2. Mode of secretion

### 1) Exocrine glands:

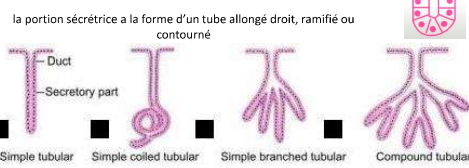
#### 1. Structural classification

##### b. Based on the secretory unit shape:

- **Alveolar (secretory cells forming small sacs)**



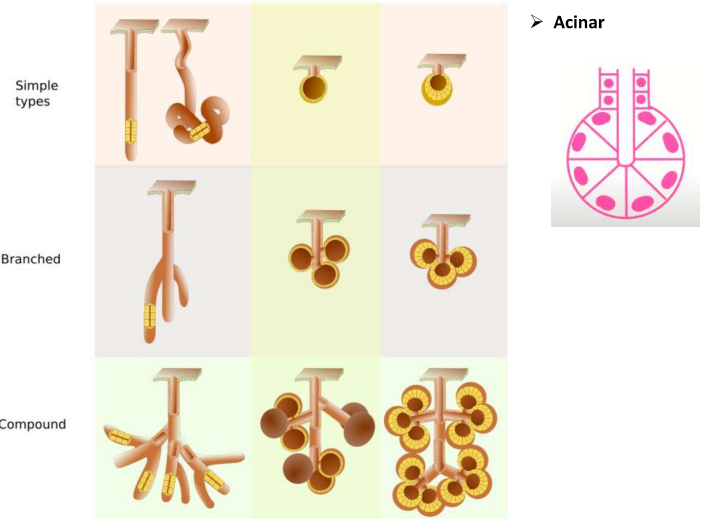
- **Tubular (secretory cells forming tubes)**



- **Tubuloalveolar (a mix of alveolar and tubular)**



Tubular Alveolar Acinar

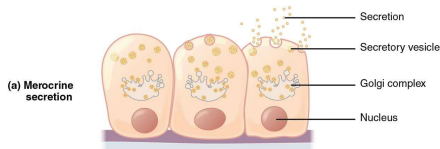


## 1) Exocrine glands:

Ways (mode) of secretion / 3<sup>th</sup> criteria Classification of glandular epithelium

### (a) Merocrine secretion:

- Most glands are merocrine.
- Secretory cells are not altered by the process of secretion.
- Cells produce and store the products at the apex of the cell → stimulation → granules move to the apical surface and release products by **exocytosis**
- Examples: pancreas, salivary and sweat glands



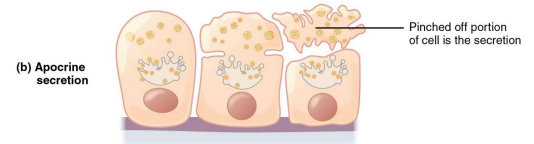
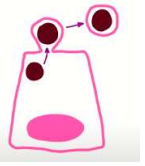
## 1) Exocrine glands:

Ways of secretion

### (b) Apocrine secretion:

Secretion product is stored at the apical surface → component of apical surface breaks off → secretion product + part of the cytoplasm released

- The release of lipid droplets by mammary glands is an example of apocrine secretion.
- Secretions of the mammary glands are merocrine when proteins are released in milk.

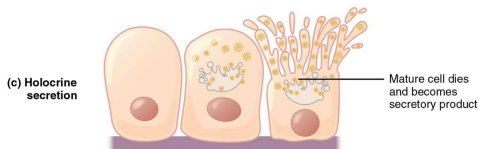
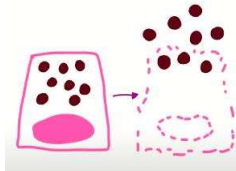


## 1) Exocrine glands:

Ways of secretion

### (c) Holocrine secretion:

- Cells synthesize the product and accumulate it in the cytoplasm → undergoes apoptosis → cell is lost in the luminal space
- Example: sebaceous glands of the skin



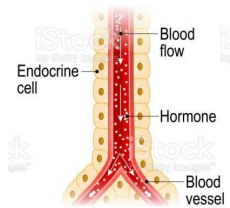
## 2) Endocrine glands:

- Synthesize and secrete their products into the extracellular space
- Ductless (Without ducting)
- Secretory products reach target cells via the blood.
- Have an abundant vascularisation.

### • Examples:

- Pancreas (insulin, glucagon)
- Thyroid

- **Hormones** : produced in epithelial cells are released into the interstitial fluid



## Types:

According to the morphological plan we say :

### • Glands of the cordal or trabecular type:

The cells are organised in thick cords separated by conjunctivo-vascular spaces rich in capillaries. Example: the adrenal gland.

### • Vesicular glands:

The cells delimit vesicles formed by a simple epithelium bordering a large lumen filled with colloid. Example: the thyroid gland.

### • Mixed glands:

These glands have both cell trabeculae organised according to the cordal type and vesicles. Example: the parathyroid.

## 3) Amphicrine glands:

These are glands with both exocrine and endocrine functions.

**Examples:** Pancreas

### Types

Morphologically, we can distinguish :

### Homotypic amphicrine glands:

The secreting cells are both exocrine and endocrine.

**Examples:** the hepatocytes of the liver.

### Heterotypic amphicrine glands:

The gland is made up of two cell types: some are exocrine, others endocrine.

**Example:** the pancreas, which has acini responsible for exocrine pancreatic secretion (digestive enzymes) and islets of Langerhans responsible for the synthesis of endocrine hormones (insulin and glucagon).