

## TYPES OF EPITHELIA

Epithelia can be divided into two main groups

- A-covering (or lining) epithelia
- B- Secretory (glandular) epithelia.

# Glands

Glandular epithelial cells may synthesize, store, and secrete:

- **Proteins** (e.g; pancreas)
- **Lipids** (e.g; adrenal, sebaceous glands)
- **Complexes of carbohydrates and protein** (e.g; salivary glands).

The mammary glands secrete all 3 substances.

# 1-Formation of glands from covering epithelia

2-Epithelial cells proliferate



Proliferation of cells and their downgrowth into the subjacent connective tissue

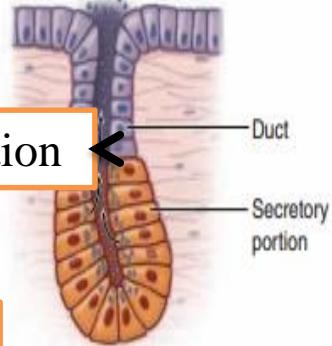
2-Epithelial cells proliferate

3- Penetrate connective tissue followed by



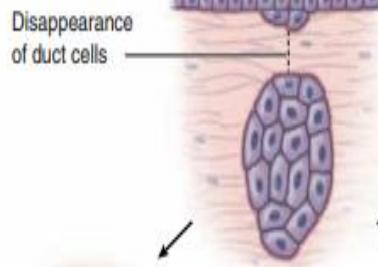
3- Penetrate connective tissue followed by

4-Further differentiation

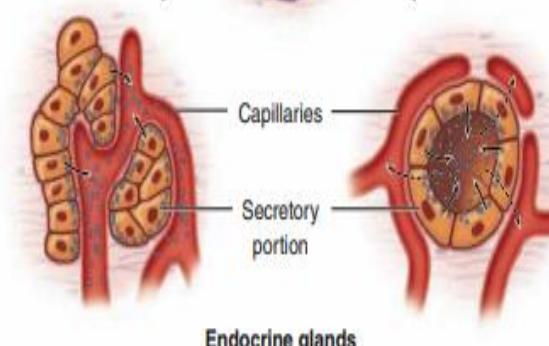


5-If they maintain contact with the surface, exocrine glands are formed

Exocrine glands



4-Further differentiation



5-If they lose contact with the surface, endocrine glands are formed

Endocrine glands

# Classification of glands:

- Glands are generally classified into two major groups:
- **Exocrine glands**
- Release their products onto an epithelial surface, either directly or through a **duct** e.g; the **salivary glands**.
- **Endocrine glands** release their products ( hormones) into the **blood stream**,  
e.g; **thyroid gland**.
- **Mixed variety:** some glands possess both **exocrine and endocrine** function .e.g; **pancreas, liver cells**.

Glands can be also classified according to the number of cells :

## A. Unicellular glands

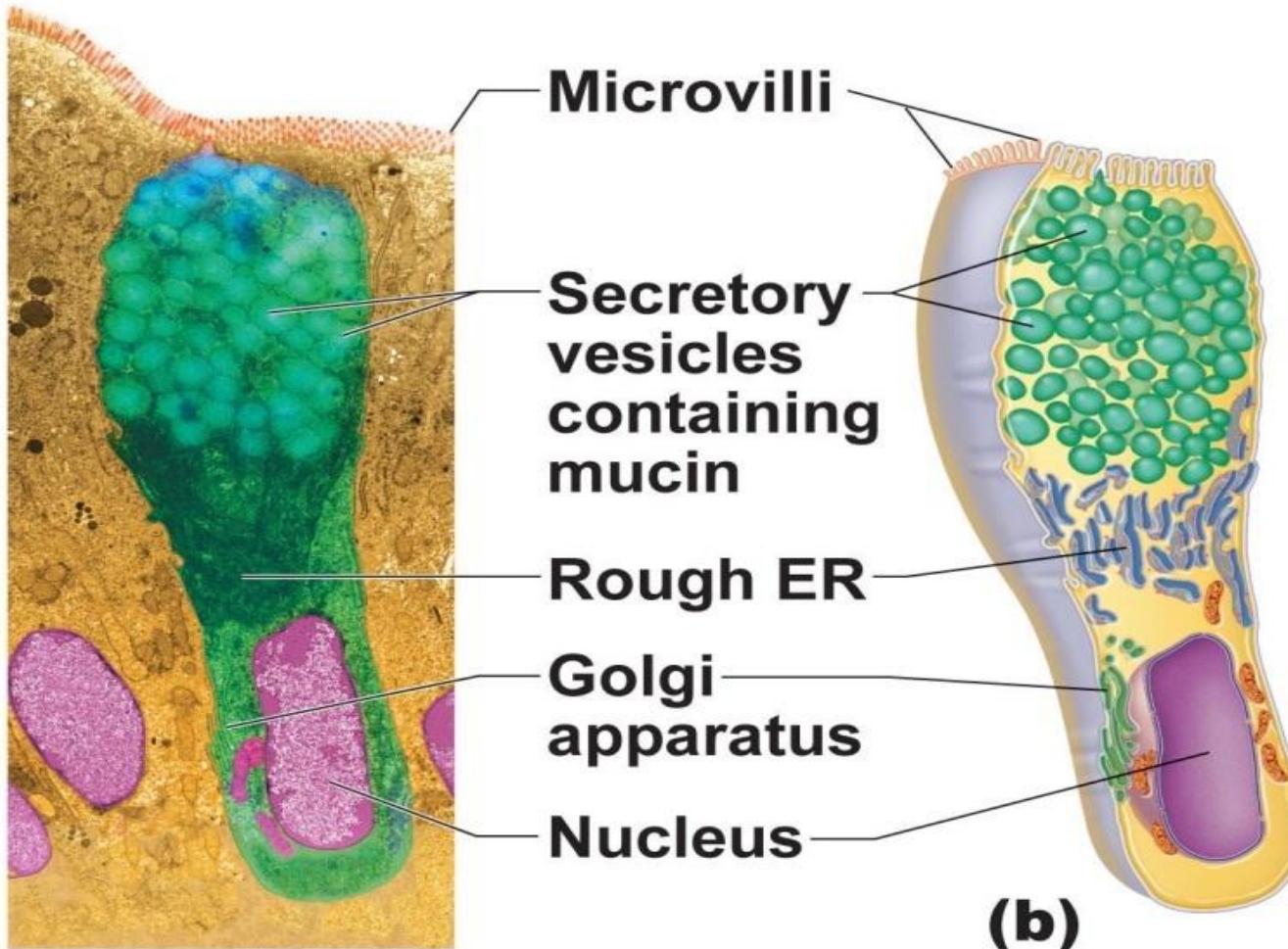
- **Goblet cells** which are present in the lining epithelia of large intestine and the respiratory tract.
- **DNES (Diffuse Neuro-Endocrine Systems), or APUD (Amine Precursor Uptake and Decarboxylation)** in small intestine.

## B. Multicellular glands

- They form most of the glands of the body
- **Salivary glands, Lacrimal gland, sweat glands**

Unicellular gland

# Mucus cells or goblet cells



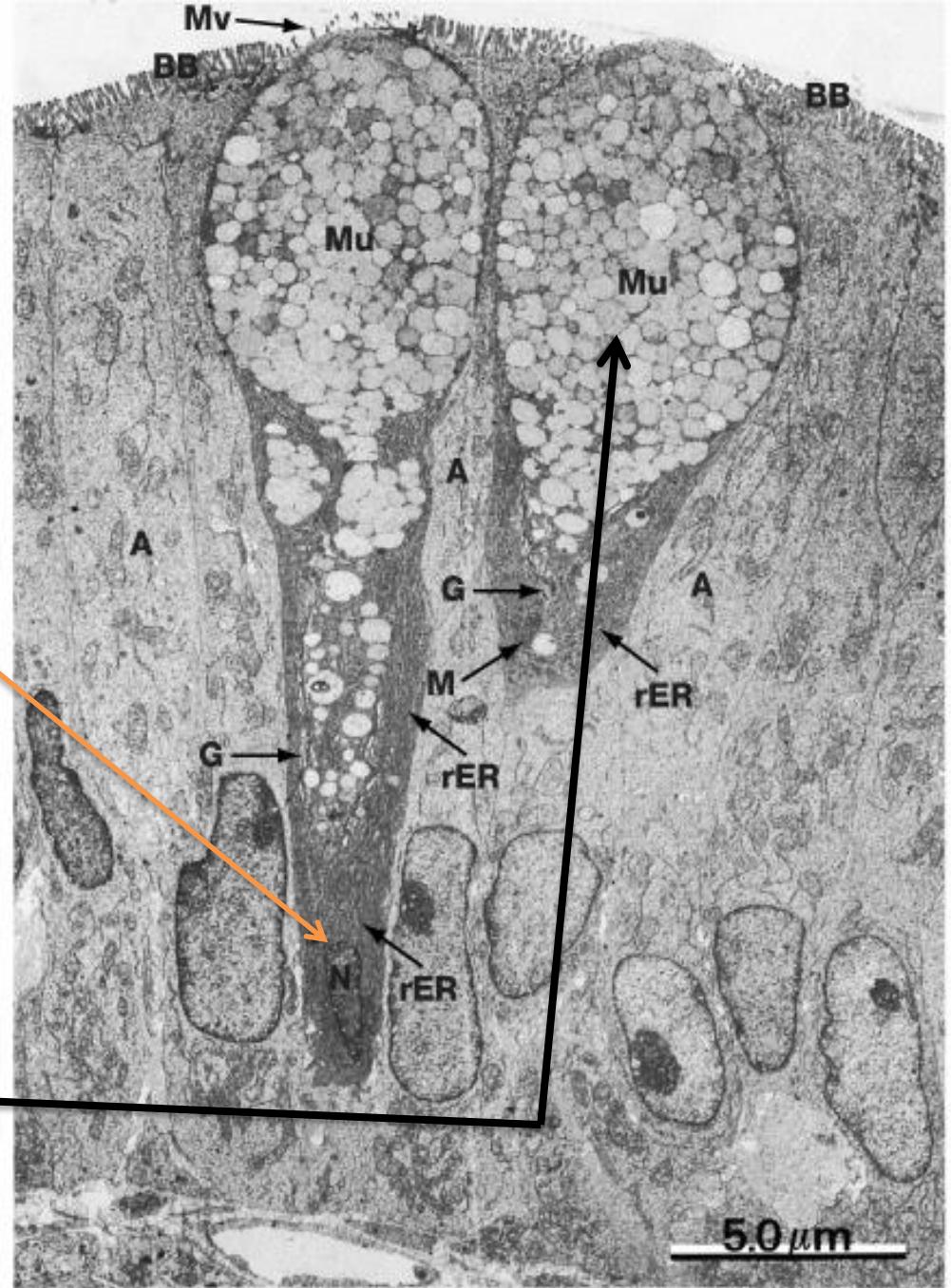
(a)

(b)

# Goblet cell

The goblet cell is **highly polarized**: its nucleus and other organelles are concentrated at the base of the cell.

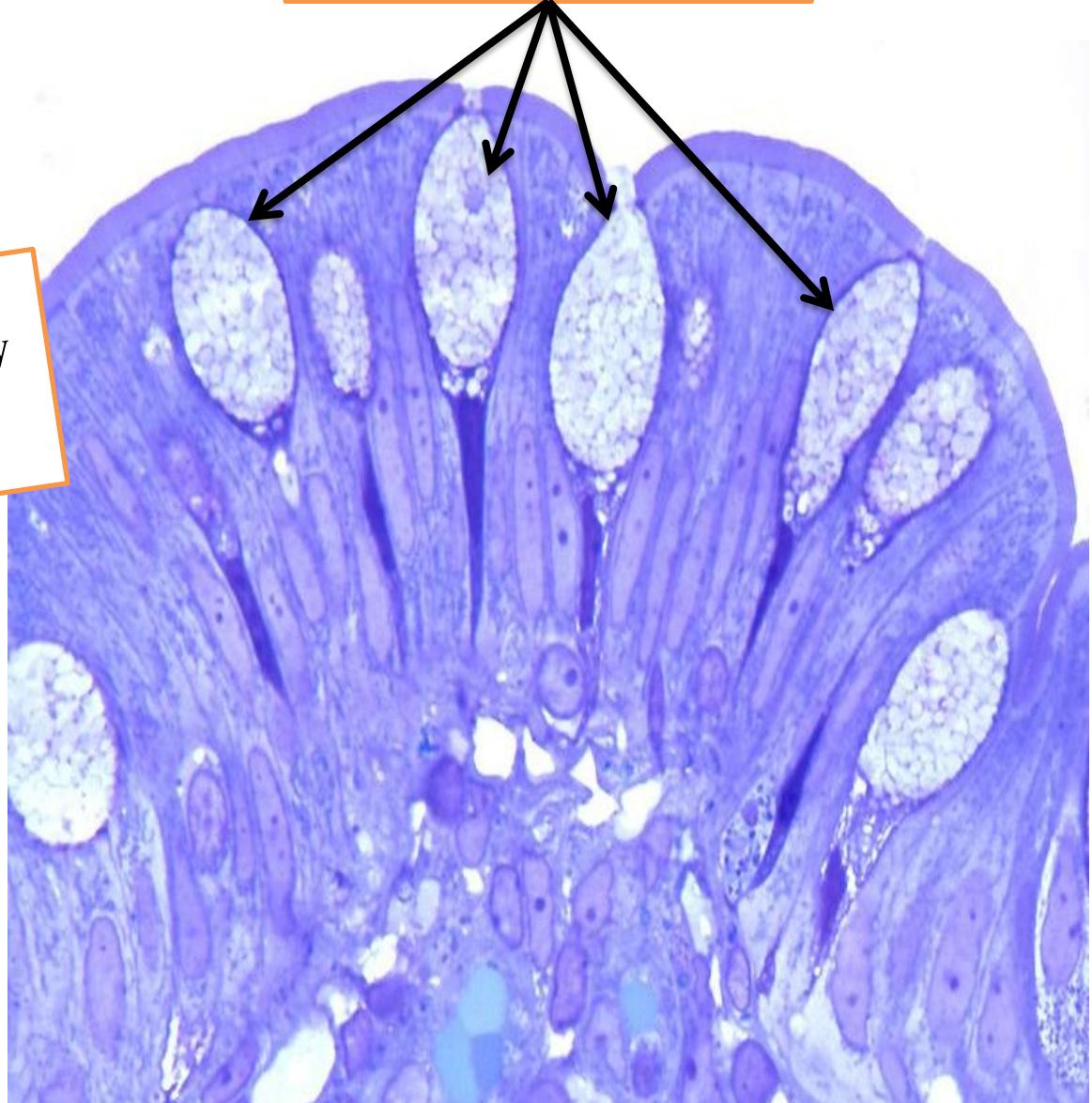
The apical part of the cell's cytoplasm is occupied by membrane-bound secretory granules containing mucin



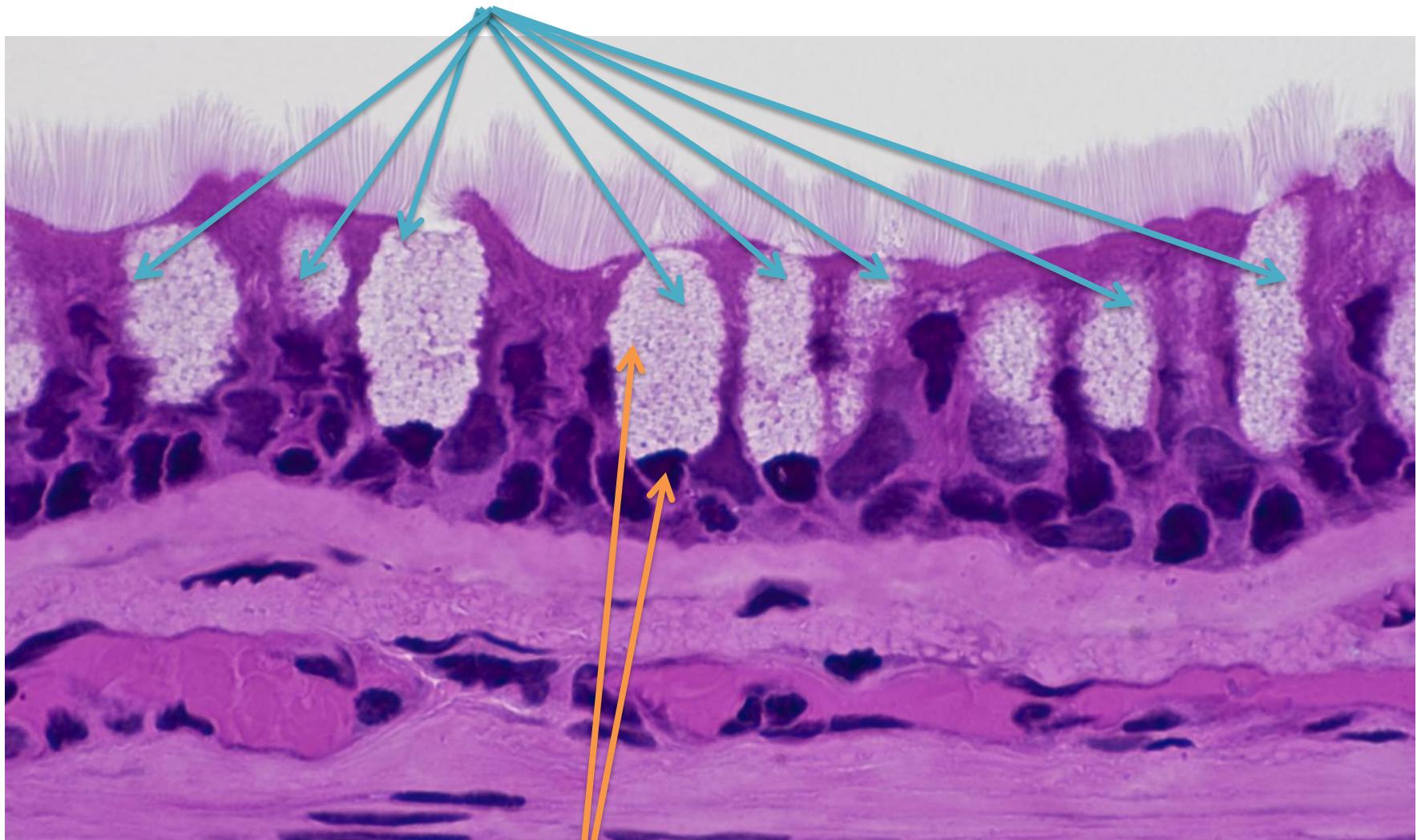
# Goblet cell

Functions of goblet cells

- 1-produce mucus (Mucin)
- 2-Protects and lubricates many internal body surfaces.



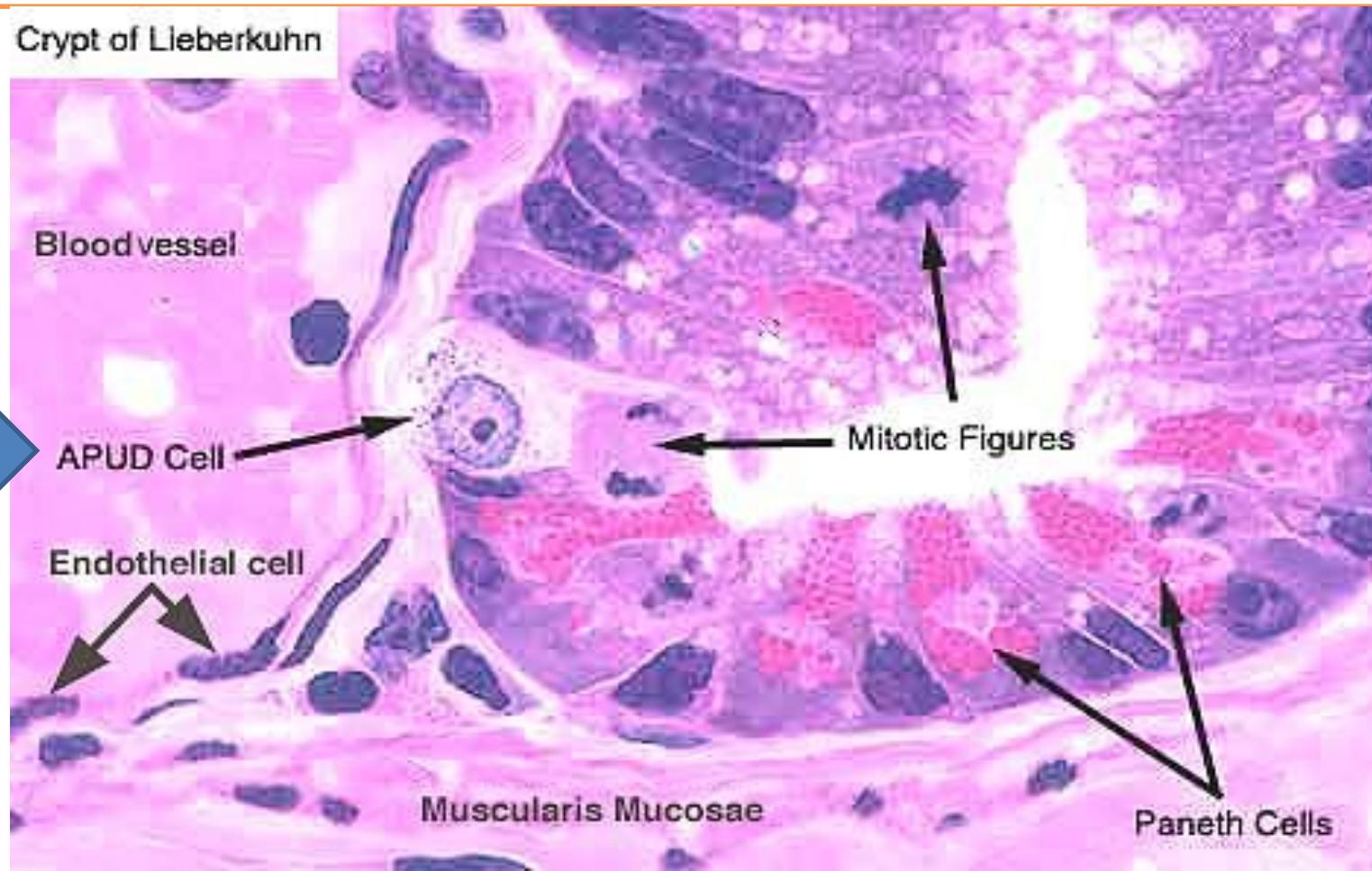
# Goblet cells in the respiratory tract



You should appreciate polarity

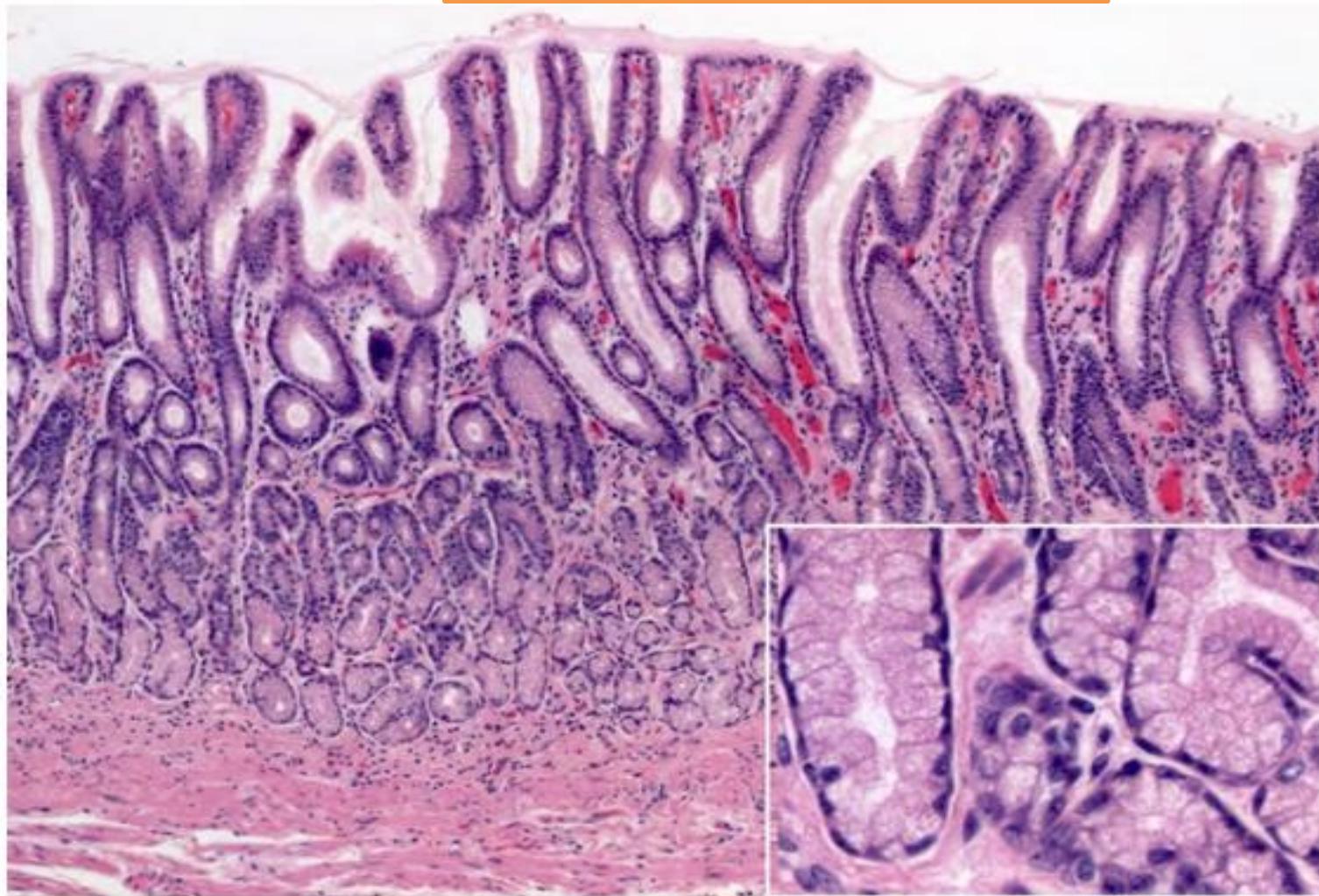
What do think about their function?

# Unicellular gland



**DNES (Diffuse Neuro-Endocrine Systems), or APUD**

## Multicellular glands



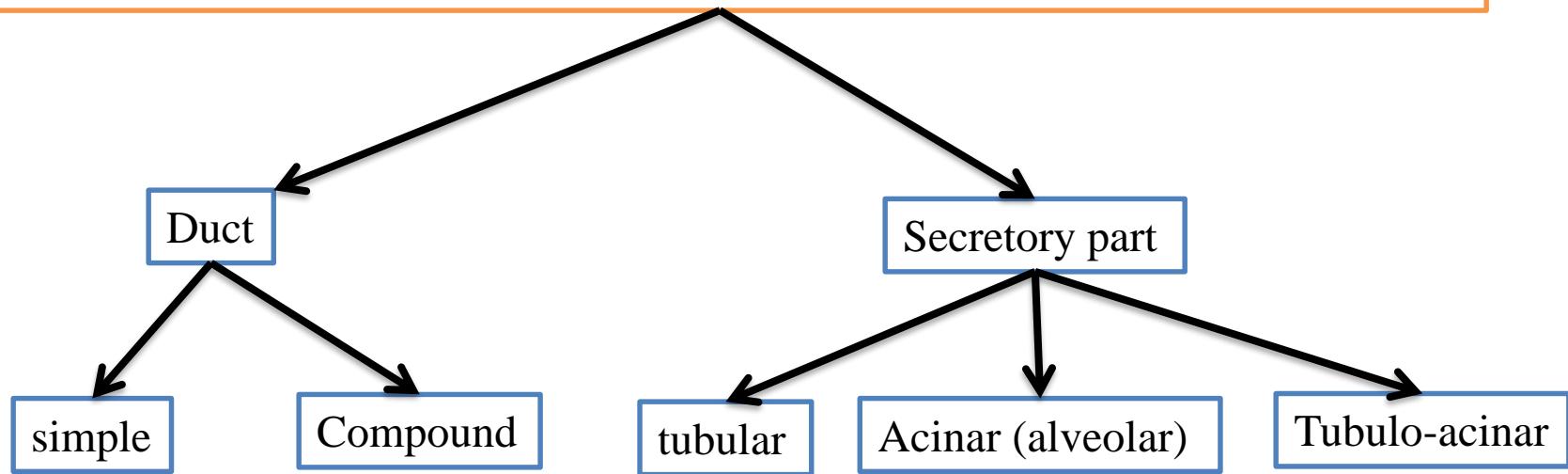
For example, Stomach glands

# Exocrine glands

These can also be classified on the basis of:

- ❖ Morphology of ducts and secreting portions.
- ❖ Nature of secretory product.
- ❖ Mode of secretion.

Classified according to the duct system and the secretory part



# Morphology of ducts and secreting portions

## ■ Classified by structure of duct:

- Simple : “if a gland consists of a single secretory passage”.
- Compound: “ if a gland containing a branched duct system”.

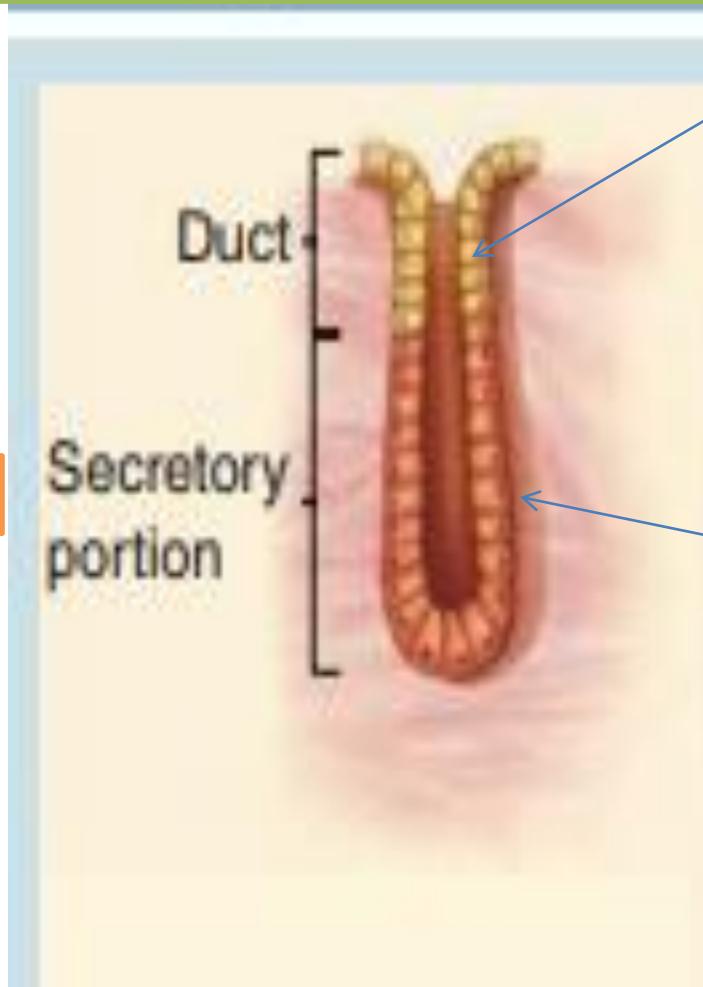
## ■ Categorized by secretory unit:

- Tubular
- Acinar
- Tubulo- acinar

# Simple Tubular

Example

Mucous glands of colon



One duct

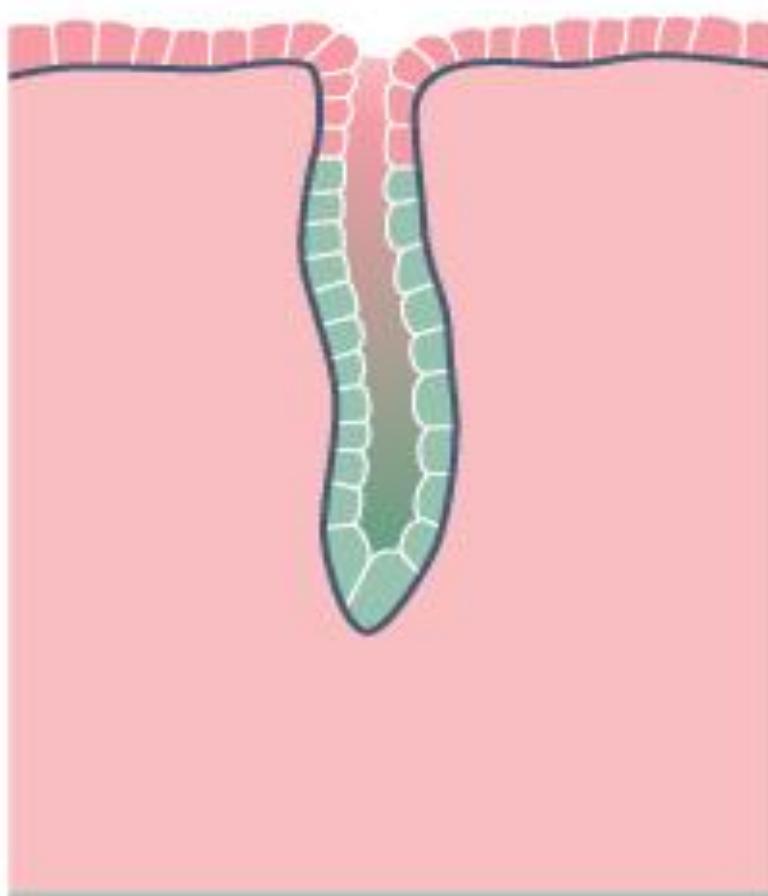
This means **simple**

+

Secretory portion  
Tube like

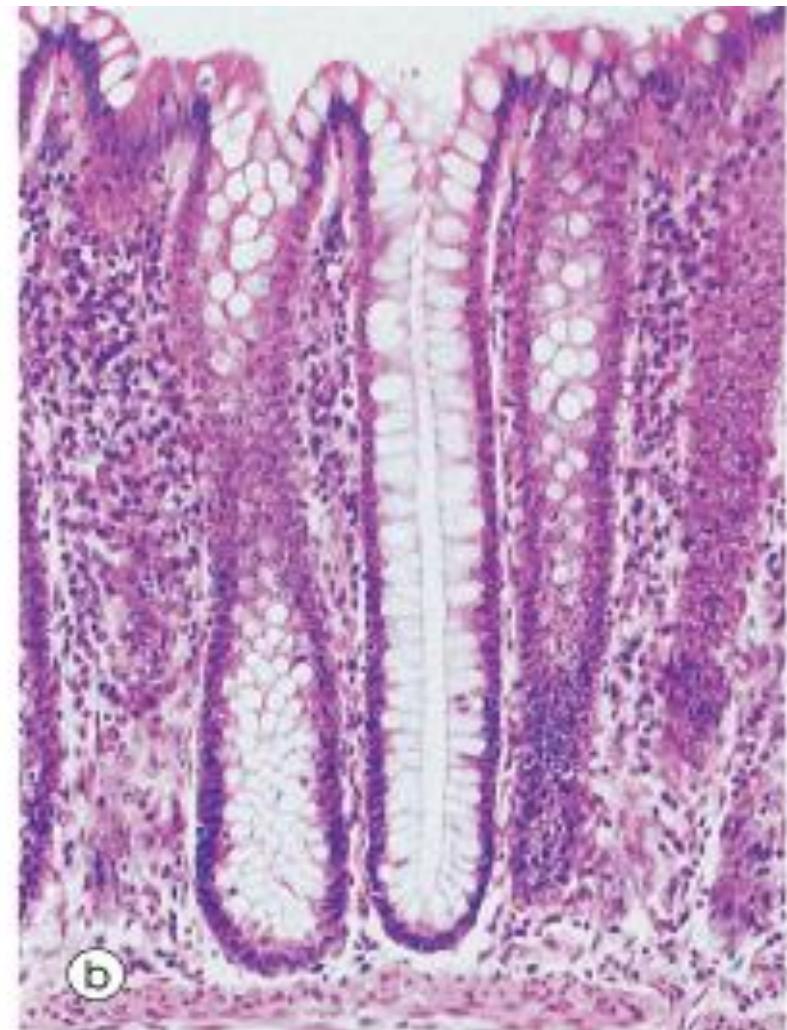
Simple Tubular

# Simple tubular



a

Simple tubular

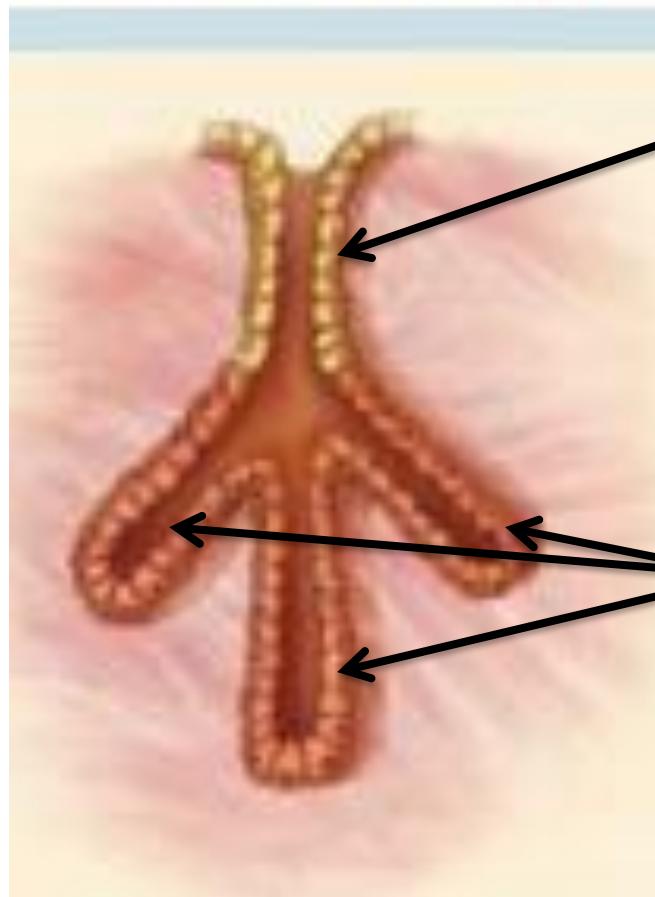


b

# Simple Branched Tubular

Example

Glands in the uterus  
and stomach



One duct

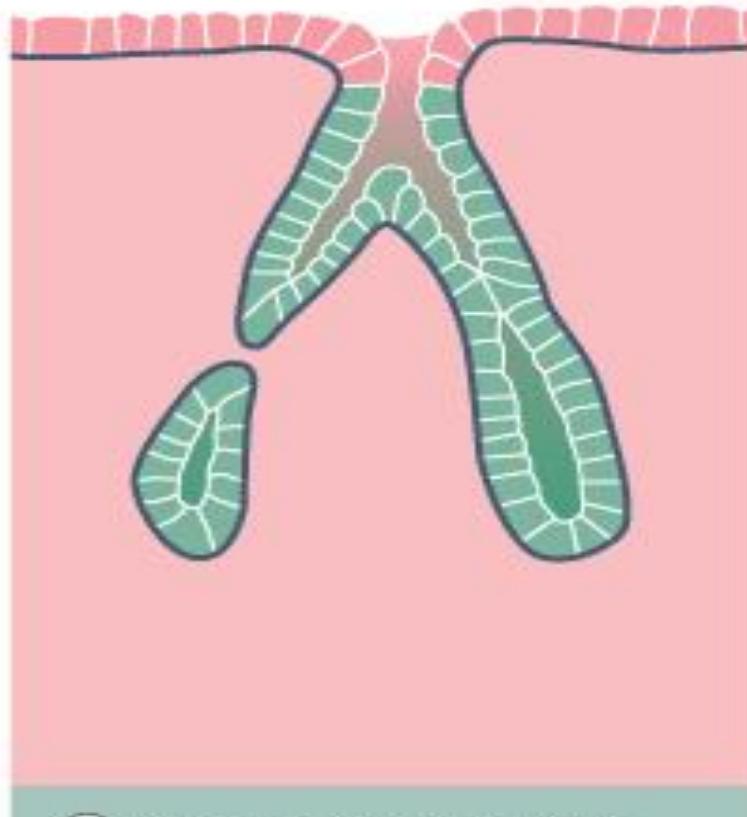
This means **simple**

+

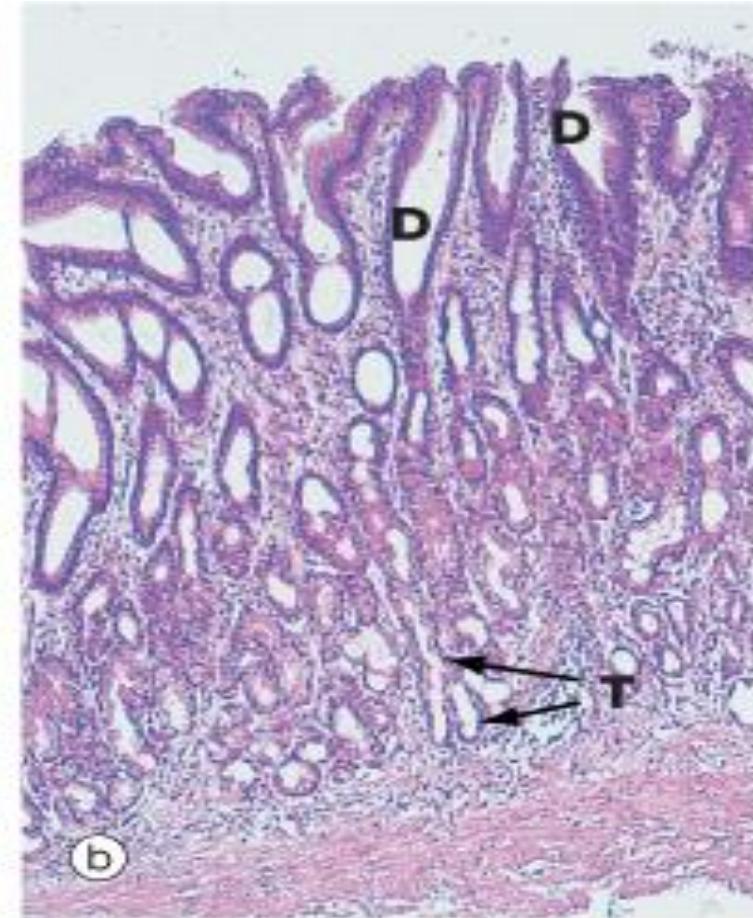
Several long secretory  
parts joining to drain into  
1 duct

Simple Branched Tubular

# Simple branched tubular



a Simple branched tubular

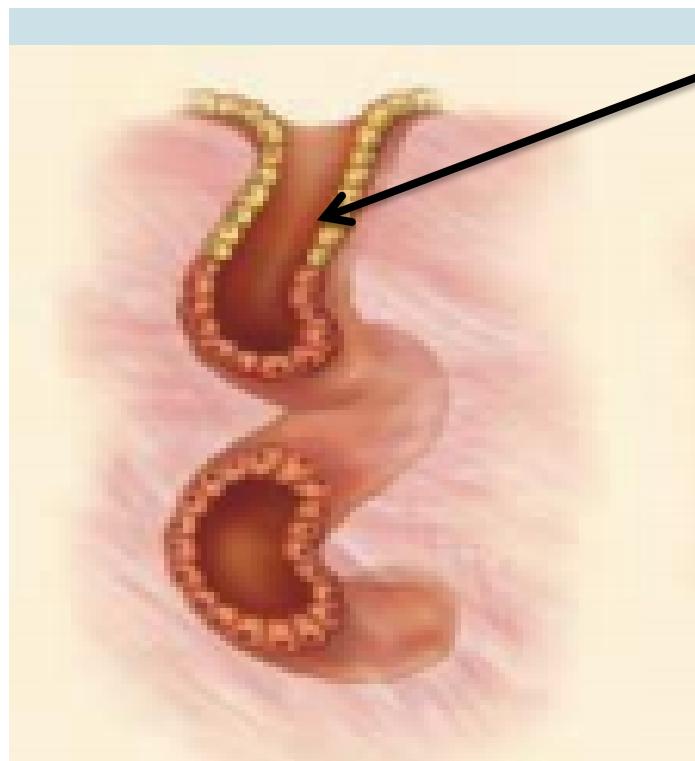


Several long secretory parts joining to drain into 1 duct

# Simple Coiled Tubular

Example

Sweat glands



One duct

This means **simple**

+

Secretory portion  
is very long and  
coiled

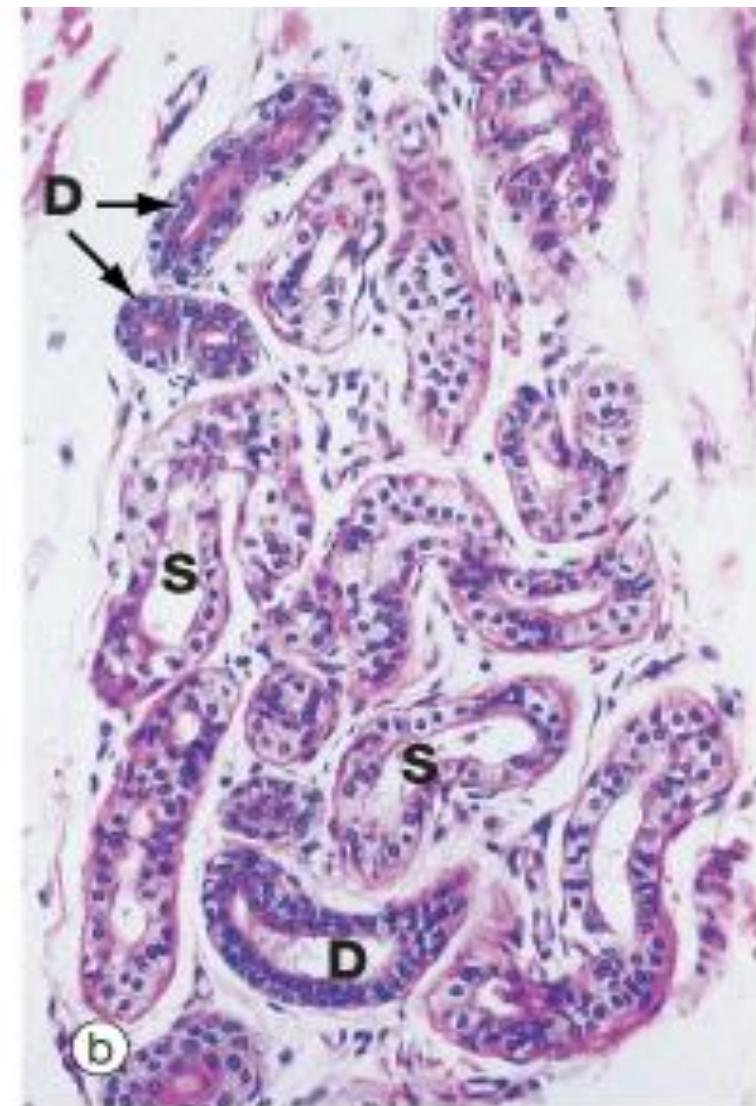
**Simple Coiled Tubular**

# Simple coiled tubular



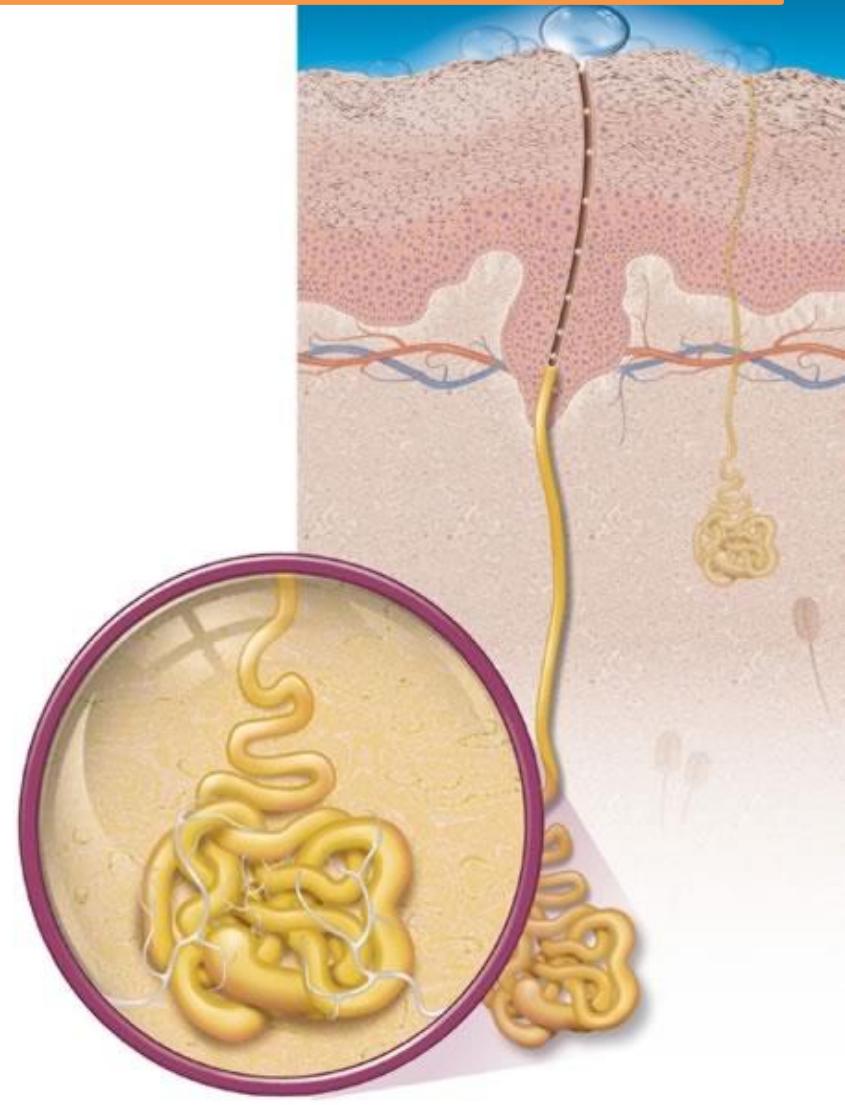
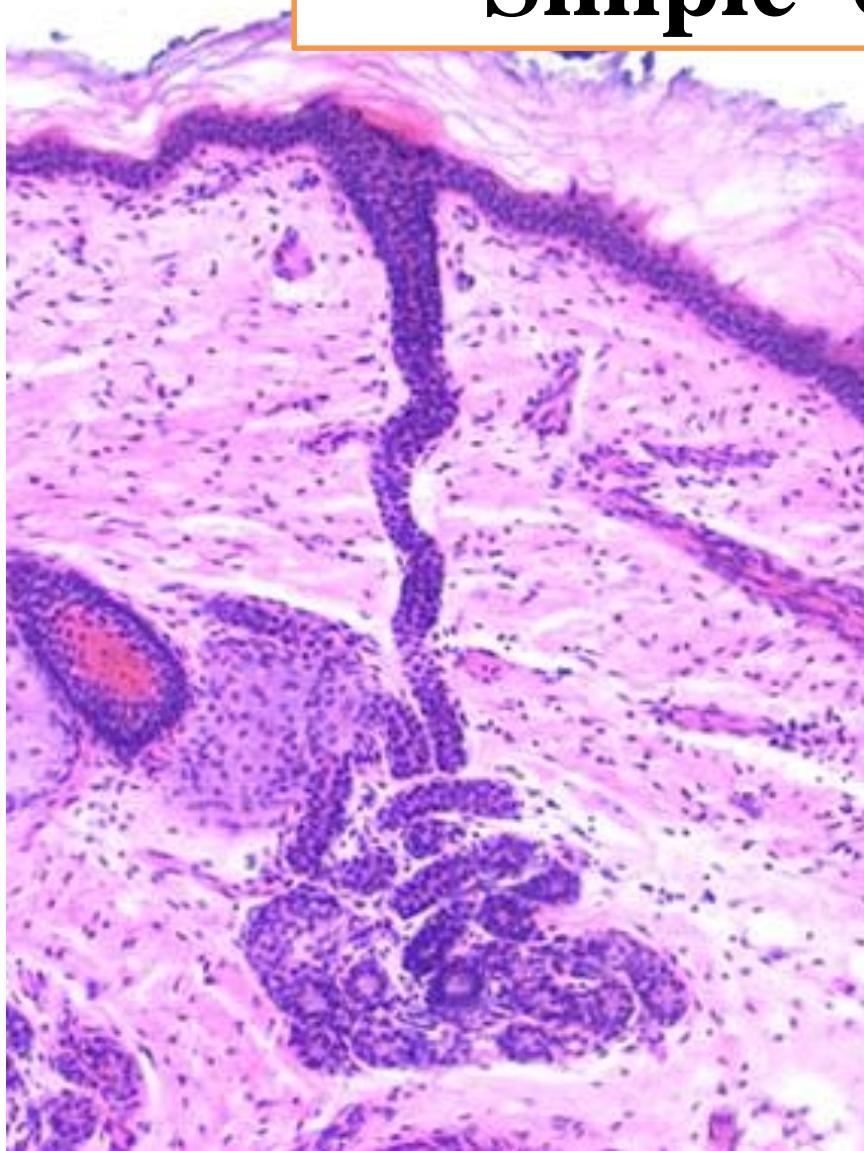
a

Simple coiled tubular



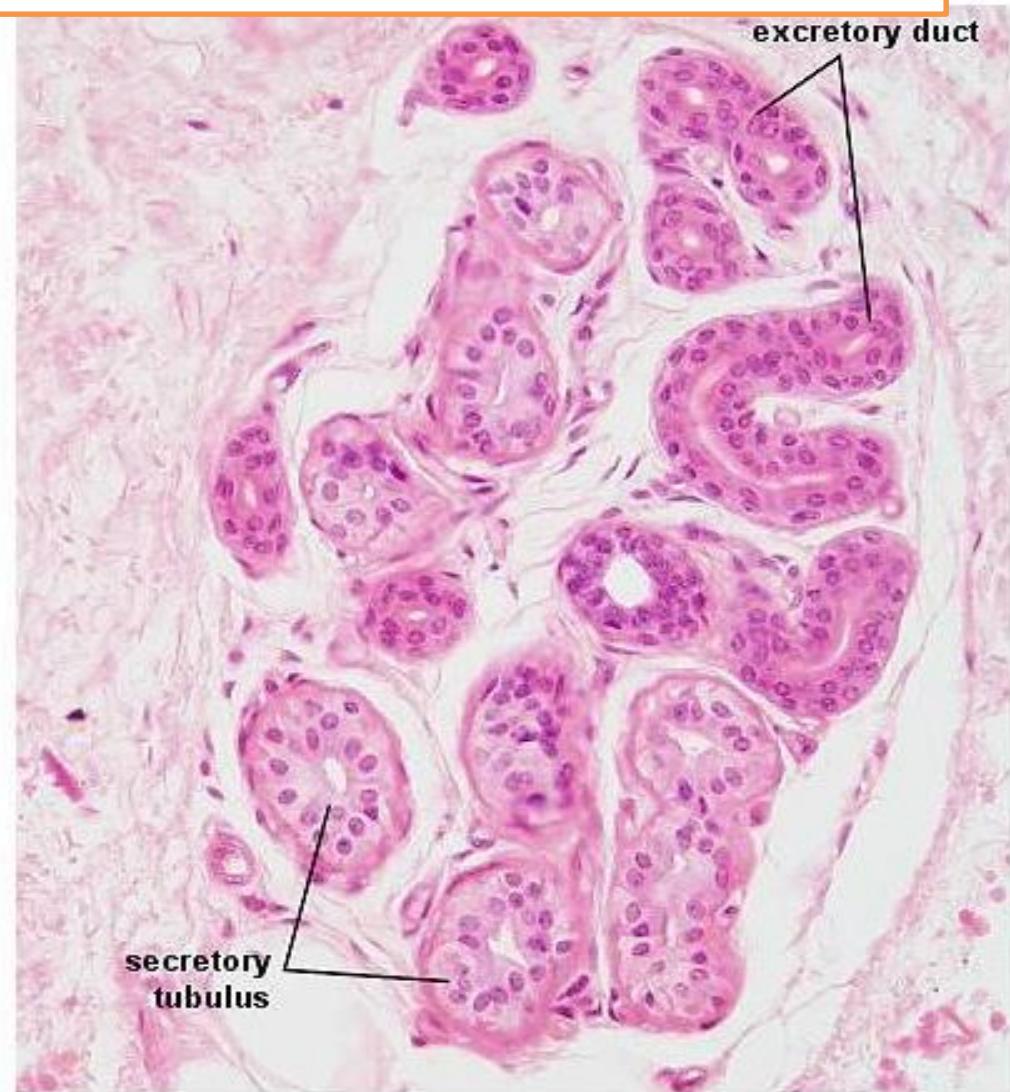
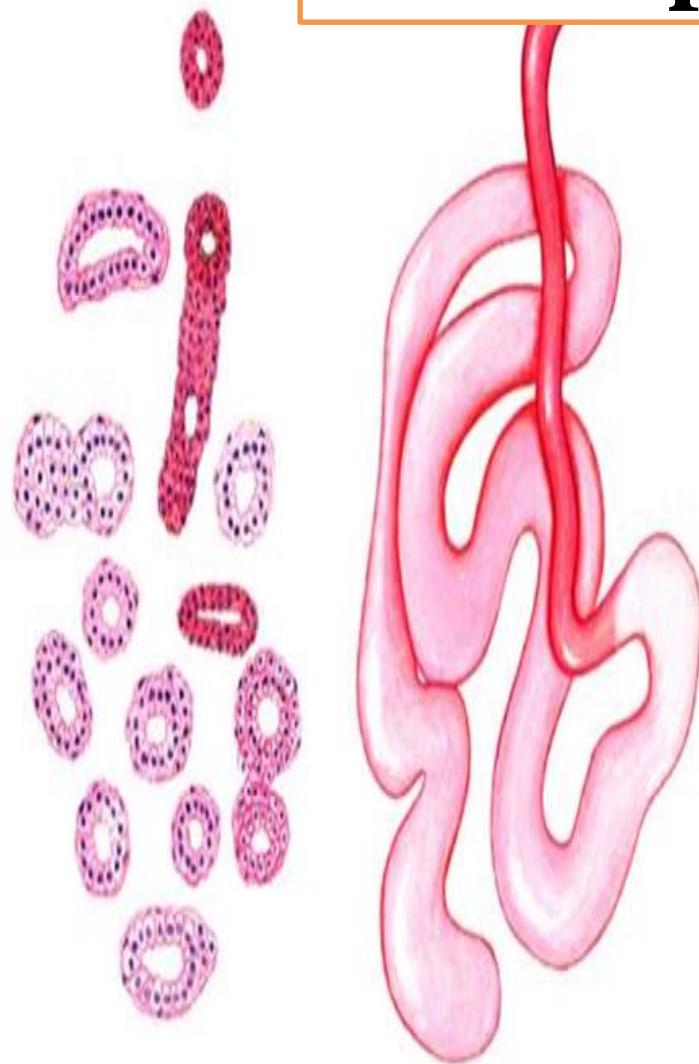
b

# Simple coiled tubular



A single tube, tightly coiled in 3 dimensions eg. Sweat glands

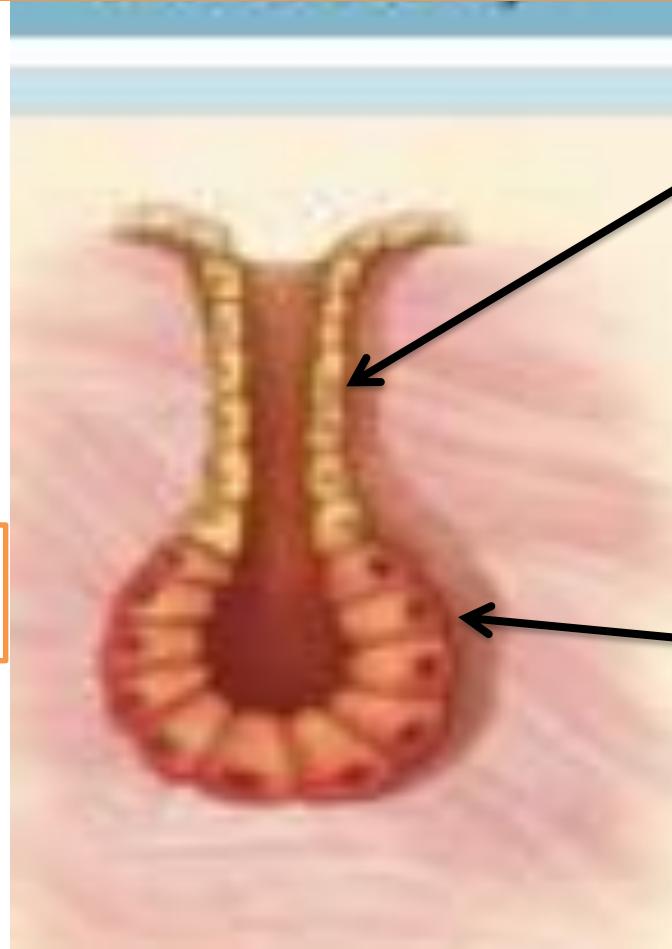
# Simple coiled tubular



# Simple Acinar (or Alveolar)

Example

Small mucous glands  
along the urethra



One duct

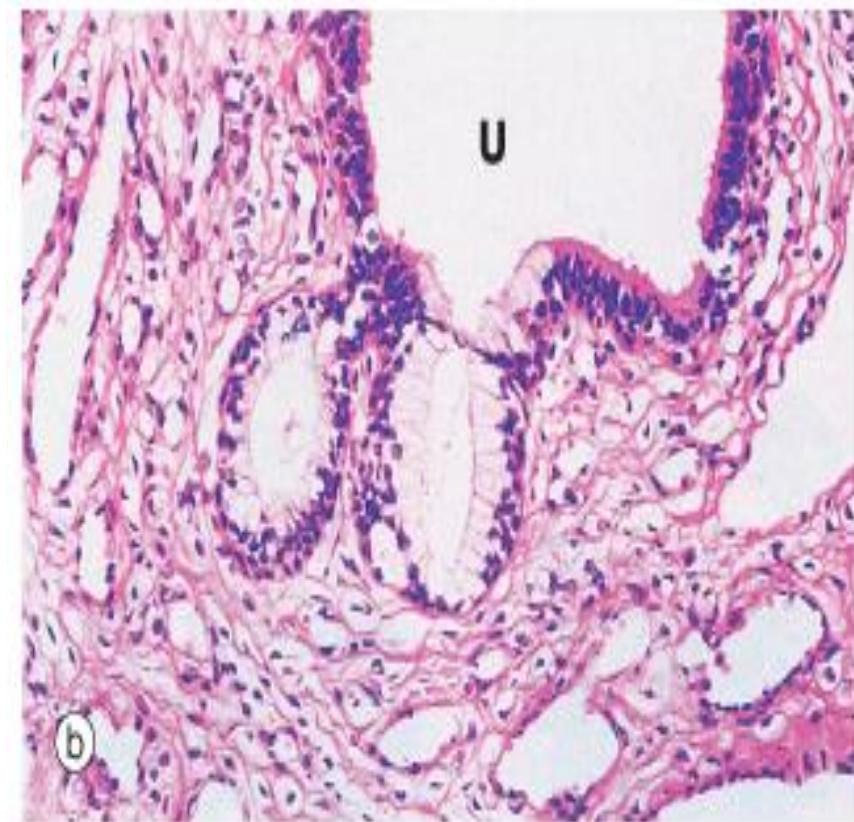
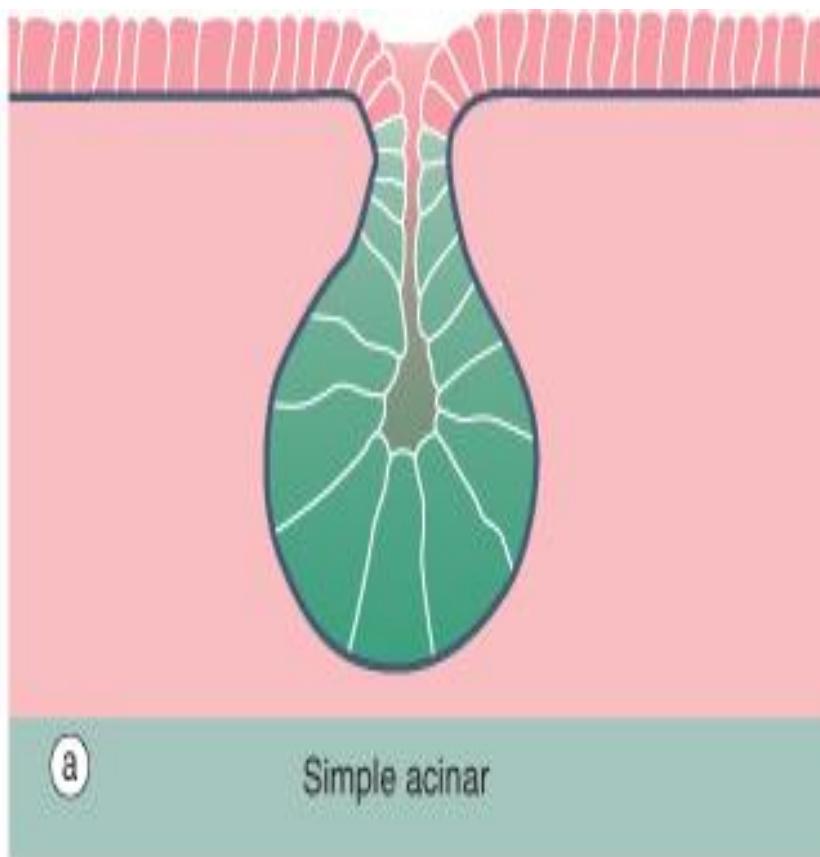
This means **simple**

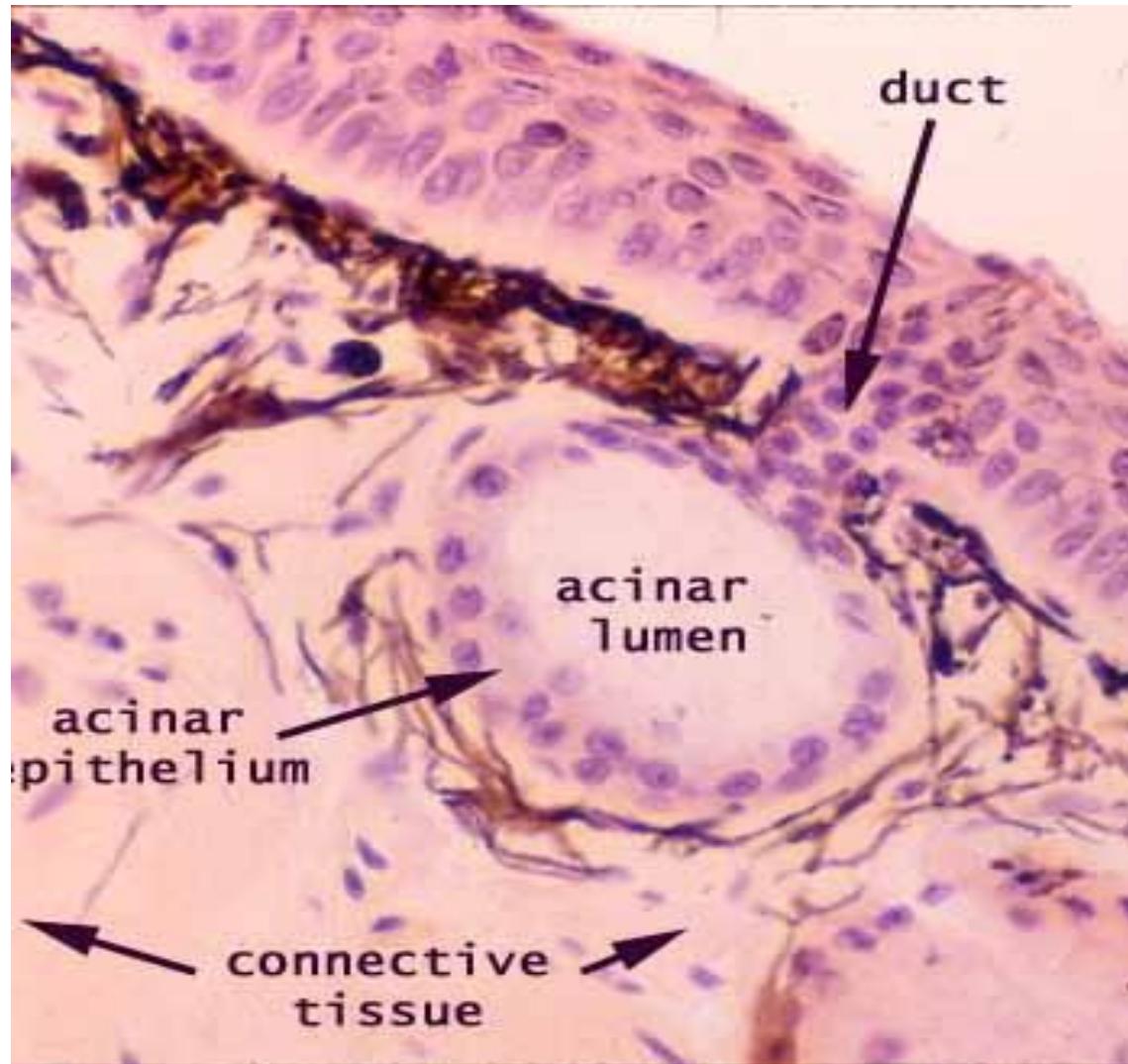
+

Rounded, saclike  
secretory portion

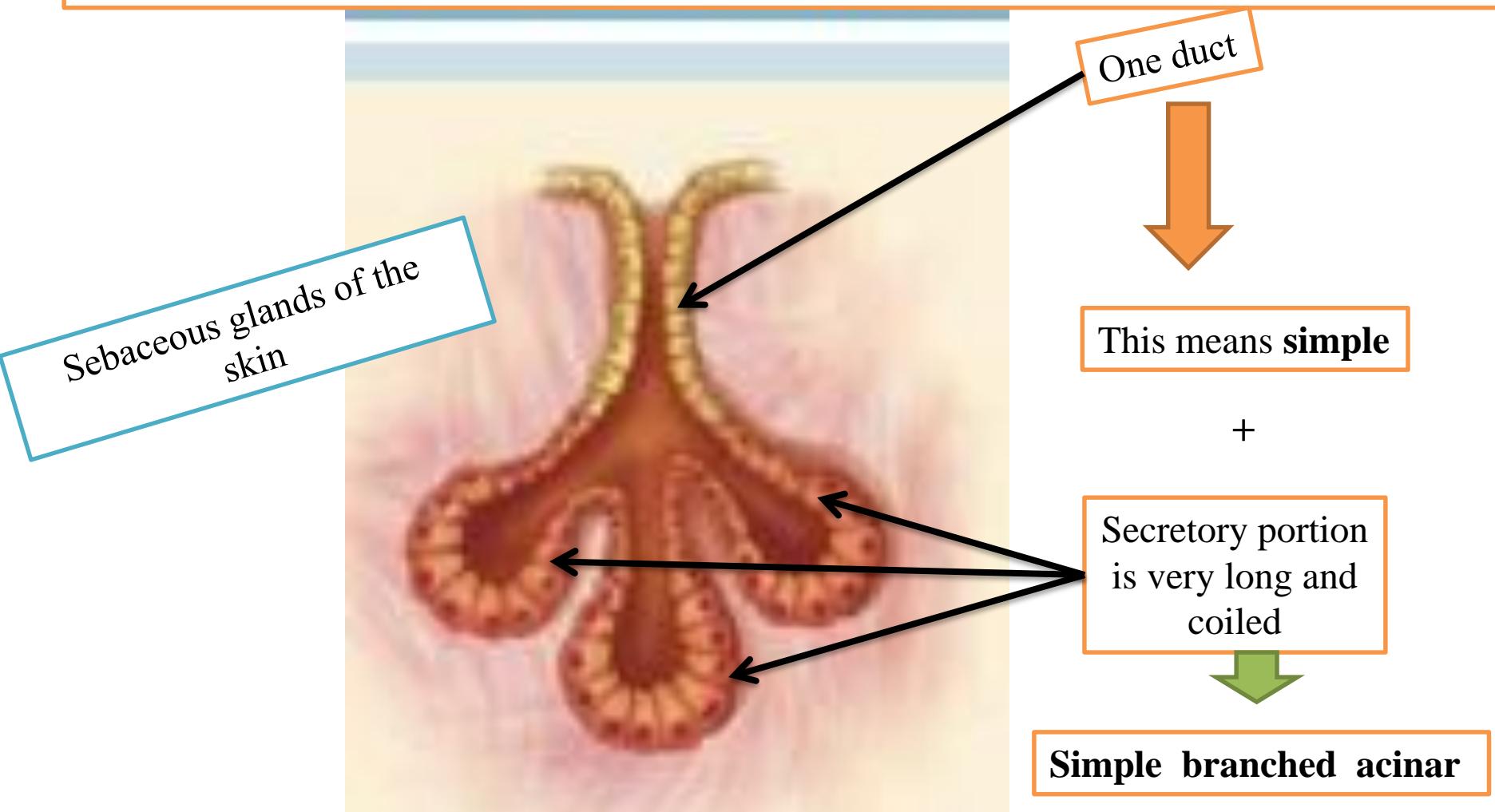
Simple Acinar (or Alveolar)

# Simple acinar

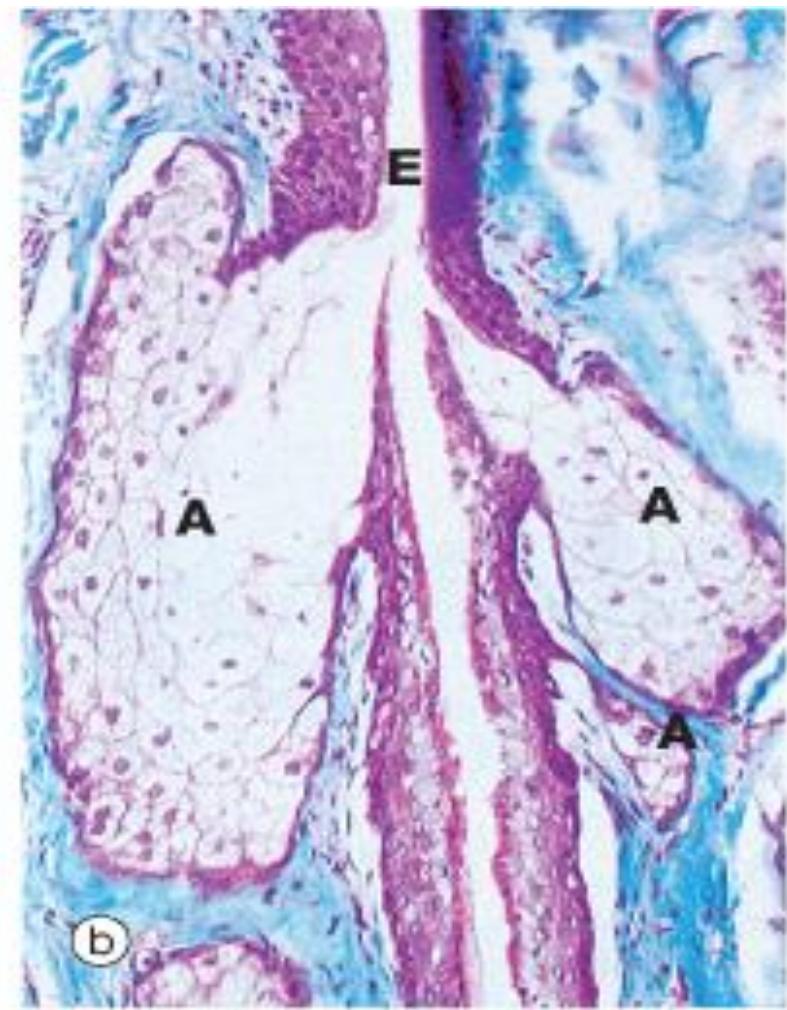
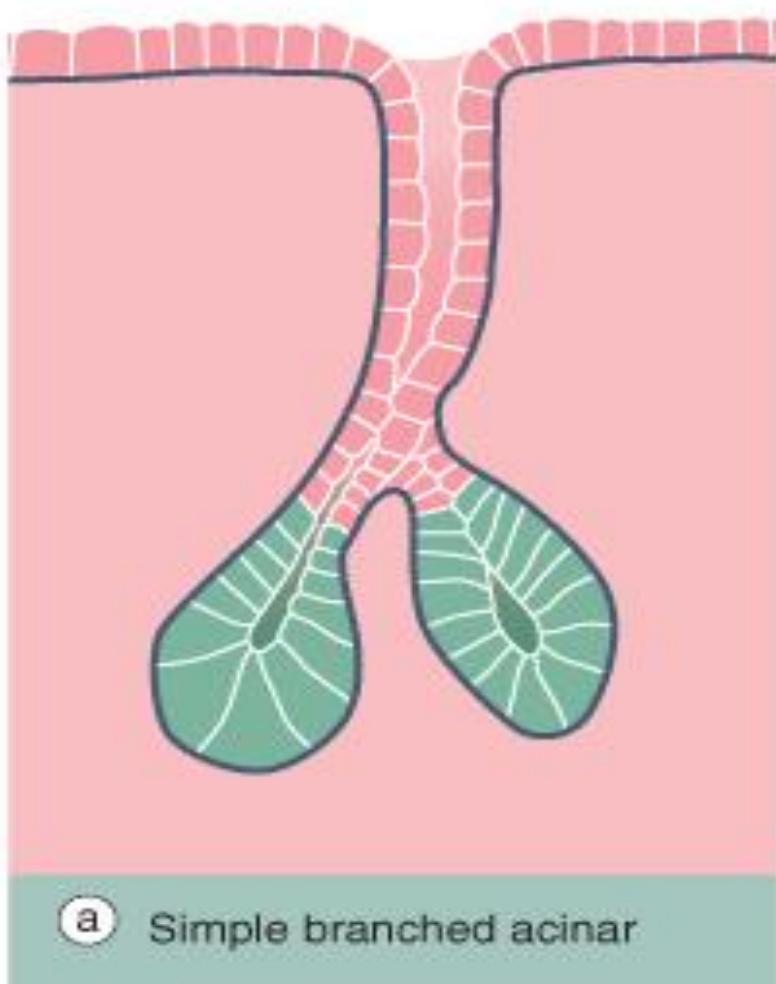




# Simple branched acinar



# Simple branched acinar



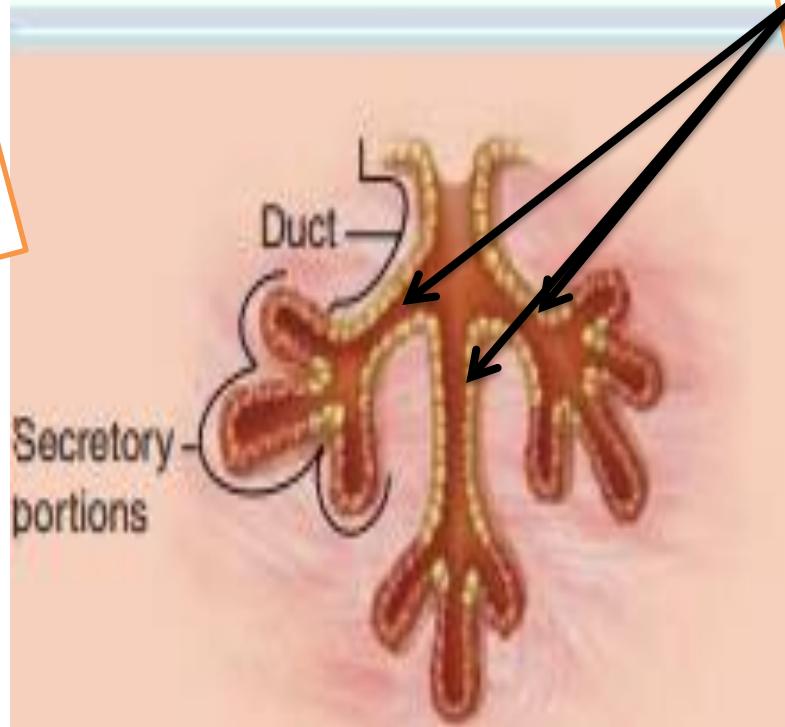
# Compound exocrine glands

COMPOUND Glands (Ducts from Several Secretory Units Converge into Larger Ducts)

# Compound Tubular

Example

Submucosal mucous glands (of Brunner) in the duodenum



More than One duct

This means Compound

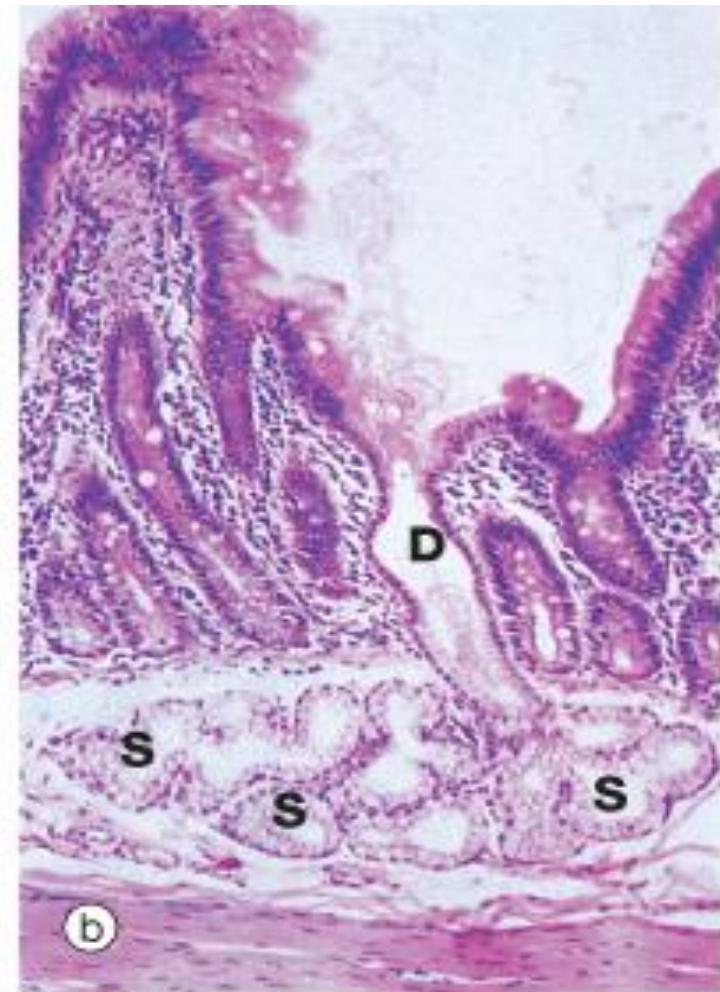
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Several elongated coiled secretory units and their ducts converge to form larger duct



**Compound Tubular**

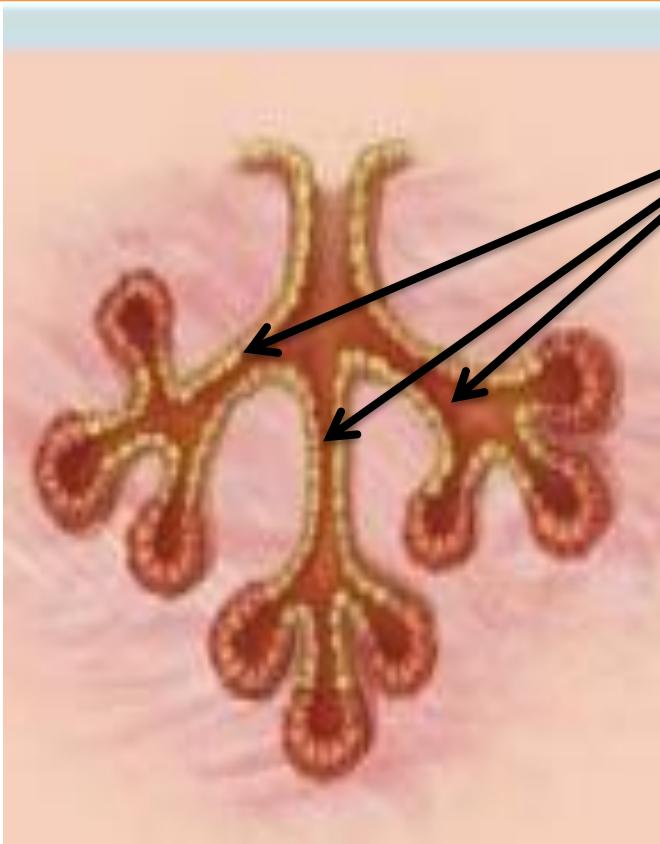
# Compound tubular



# Compound acinar

Example

Exocrine pancreas



More than One duct

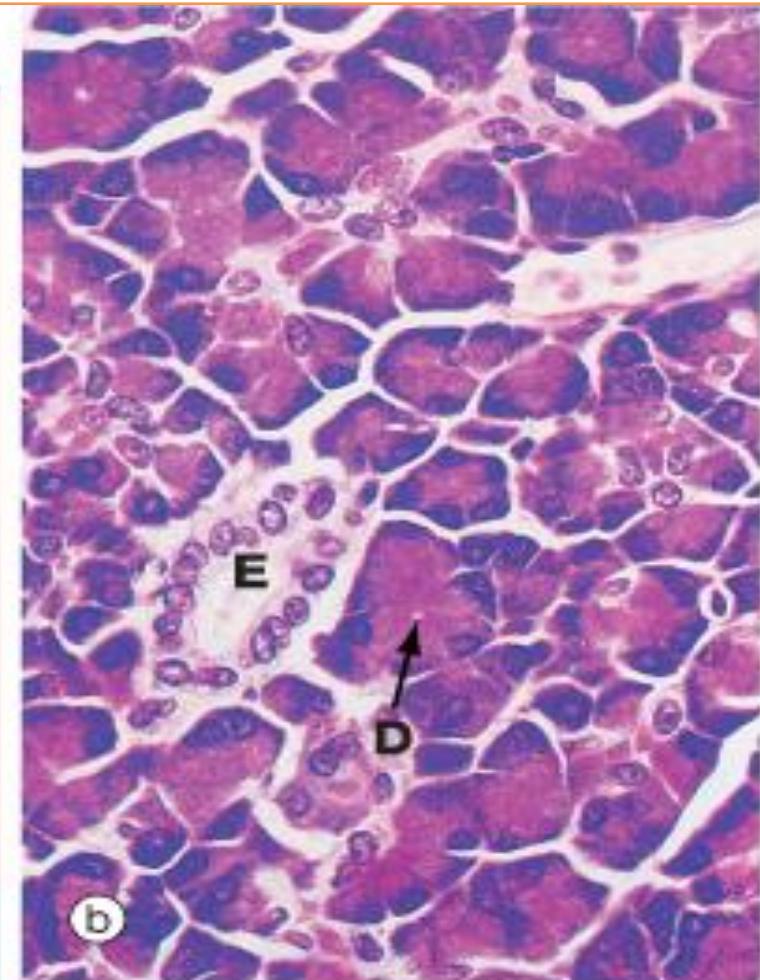
This means **Compound**

+

Several saclike secretory units with small ducts converge at a larger duct

**Compound acinar**

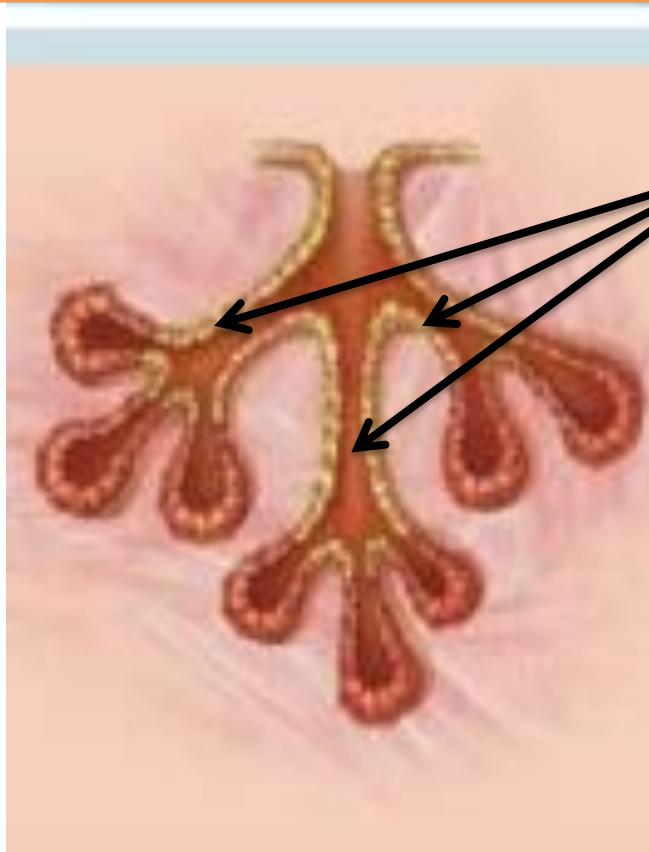
# Compound acinar



# Compound tubulo - acinar

example

Salivary glands



More than One duct



This means **Compound**

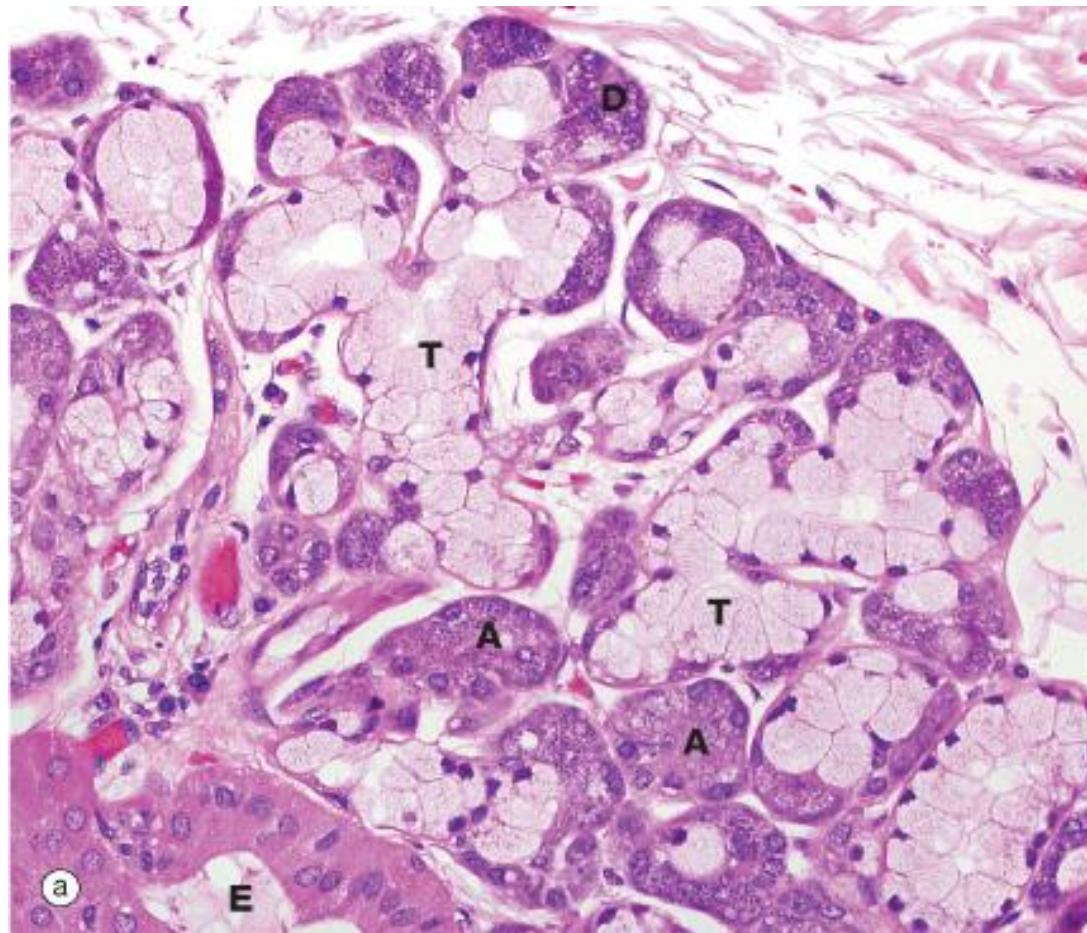
+

Ducts of both tubular  
and acinar secretory units  
converge at larger ducts



**Compound tubulo - acinar**

# Compound tubulo - acinar



b Compound tubulo-acinar

# Exocrine Glands

Classified according to  
nature of secretion:

- Serous:
- Mucous:
- Mixed:

# Classification on the basis of nature of secretory product

1. **Mucous glands:** produce carbohydrate-rich secretion which is called mucus,

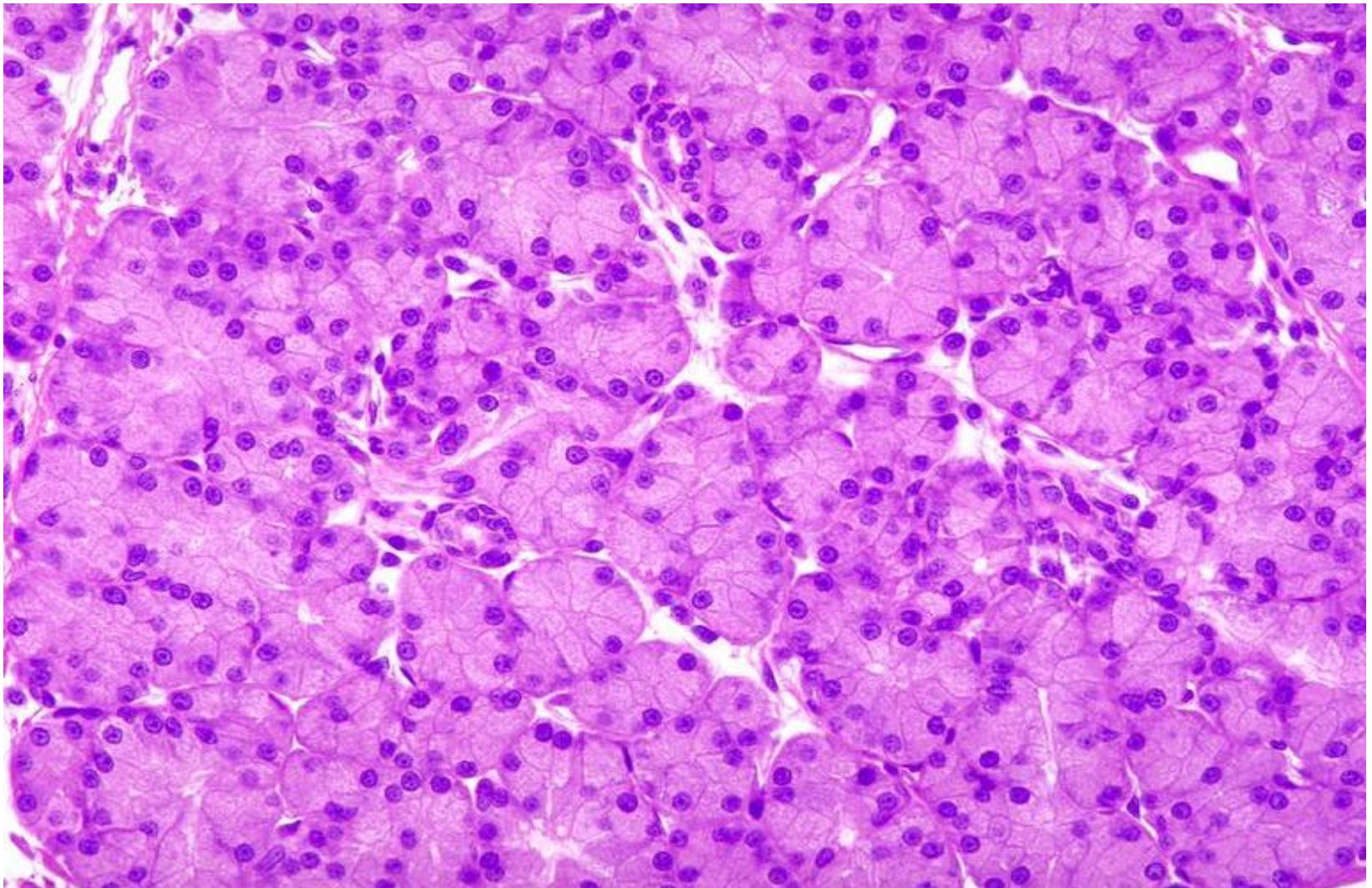
e.g; Pyloric glands of stomach

2. **Serous glands:** these glands produce watery, protein-rich secretions, often high in enzymatic activity e.g;

Exocrine pancreas, the parotid salivary gland.

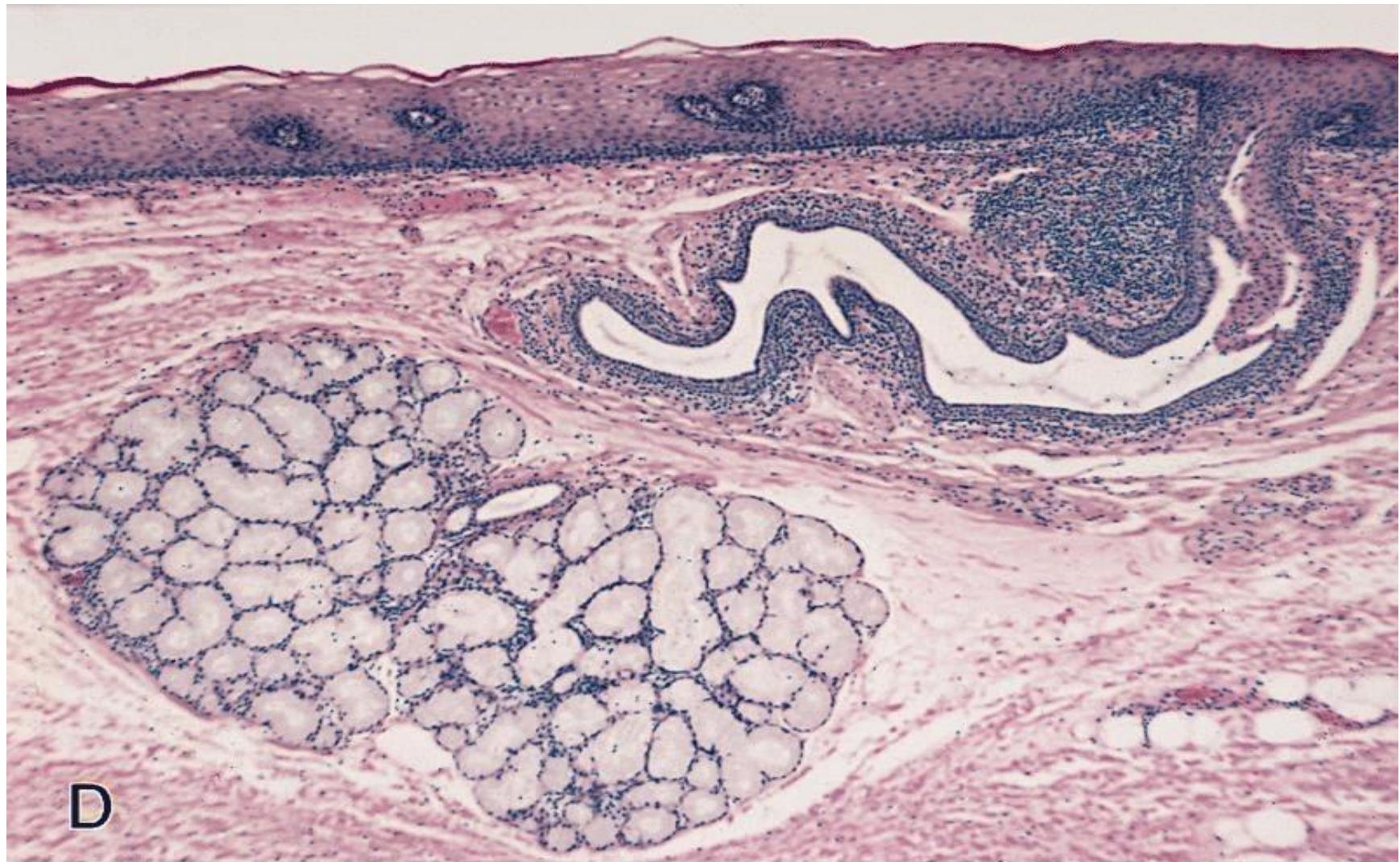
3. **Mixed glands:** these glands produce both mucous and serous secretions e.g; the sublingual and submandibular salivary glands.

# Serous gland



Parotid gland

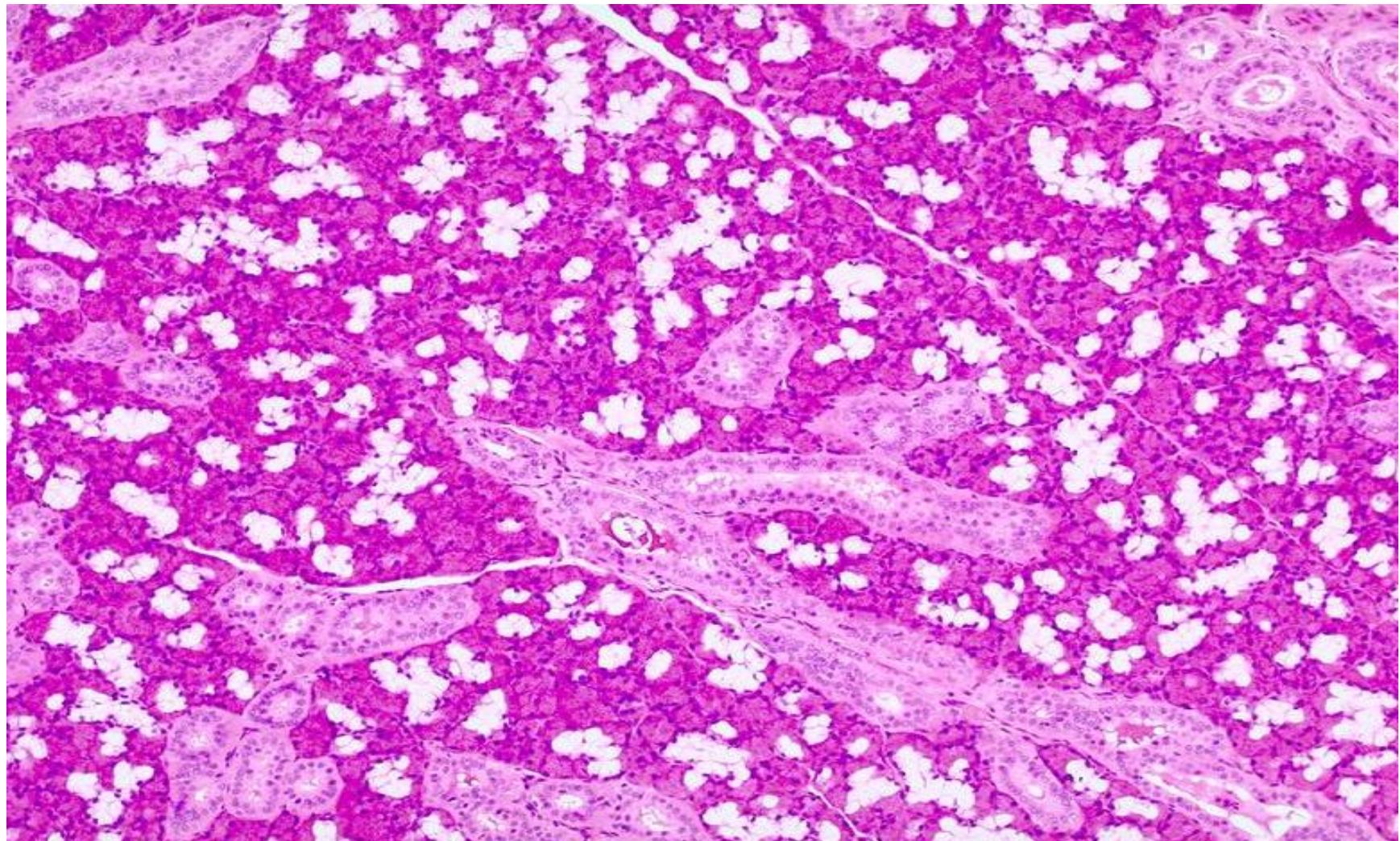
# Mucous gland



D

Esophagus gland

# Mixed gland : Seromucous gland



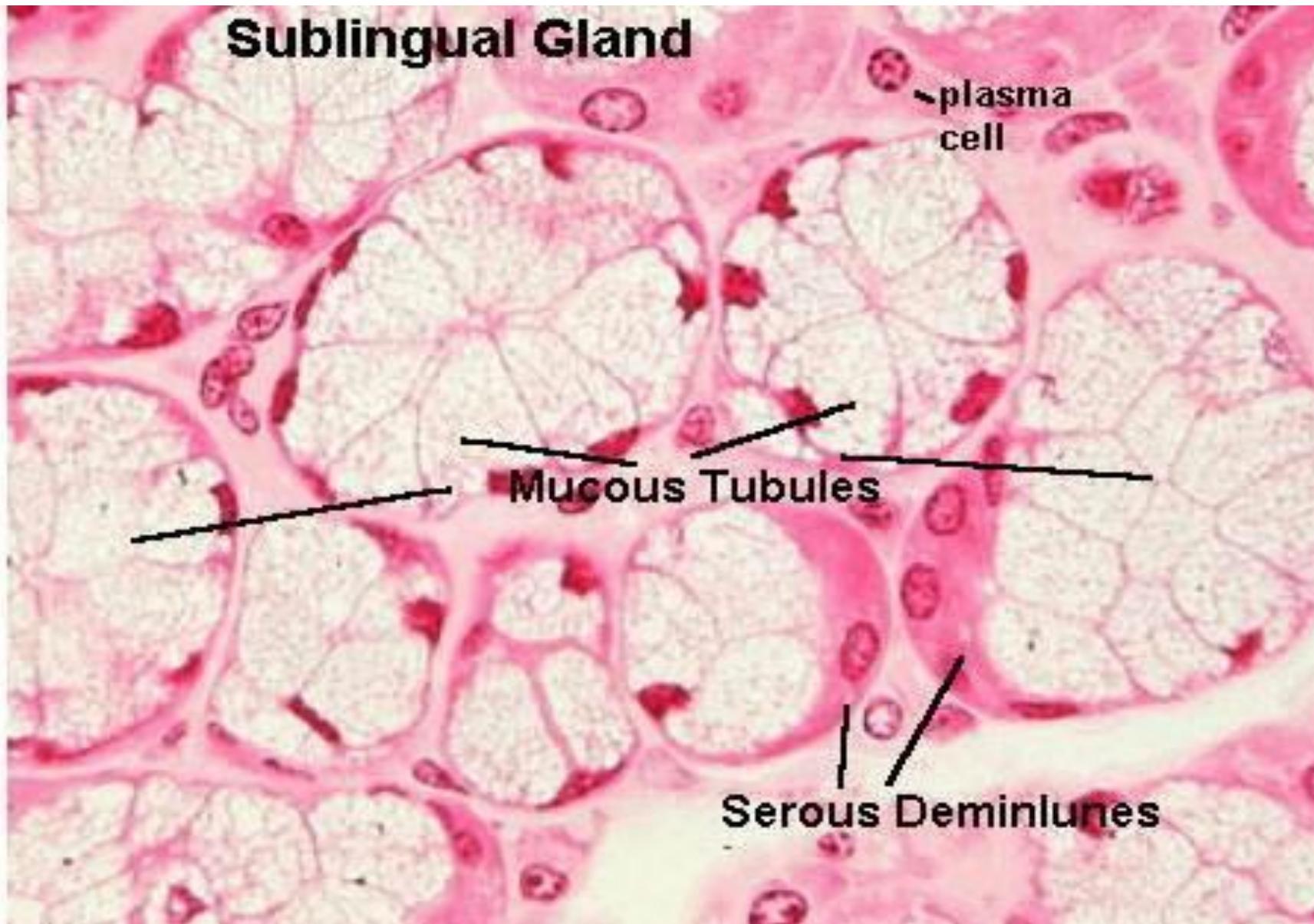
Submandibular gland

# **Sublingual Gland**

plasma  
cell

Mucous Tubules

Serous Deminlunes

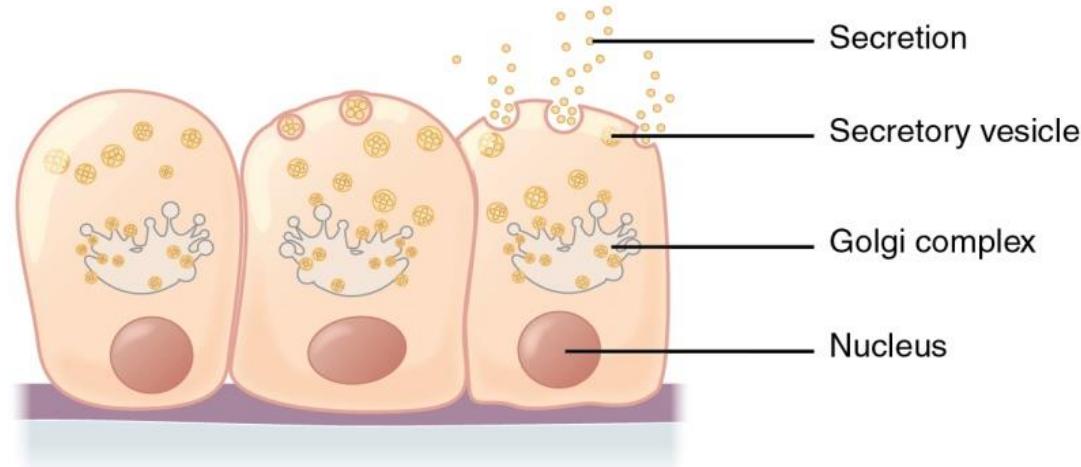


# **Classification on the basis of the mode of secretion**

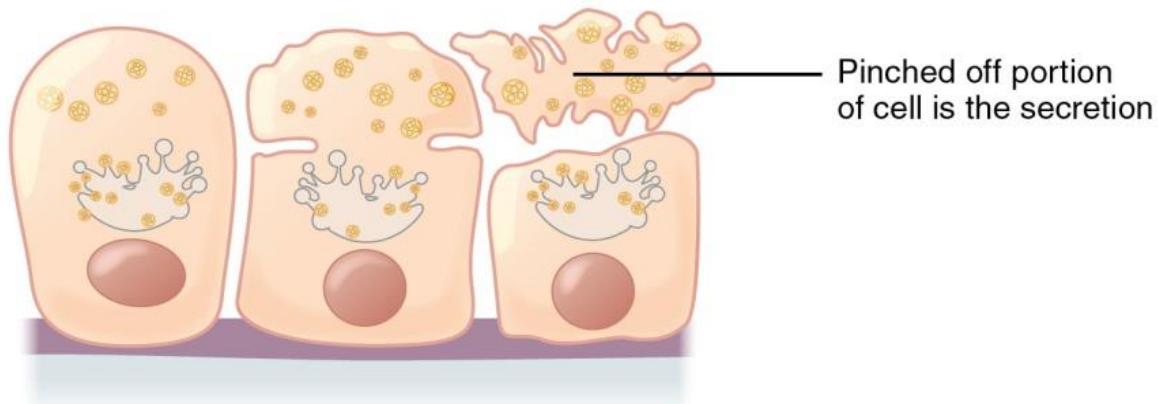
# **Classification on the basis of the mode of secretion:**

- Depending on their **mode of secretion** i.e; the manner in which the secretory product is elaborated.
- The exocrine glands are classified into the following:
  1. **Merocrine (eccrine) glands**
  2. **Apocrine glands**
  3. **Holocrine glands**

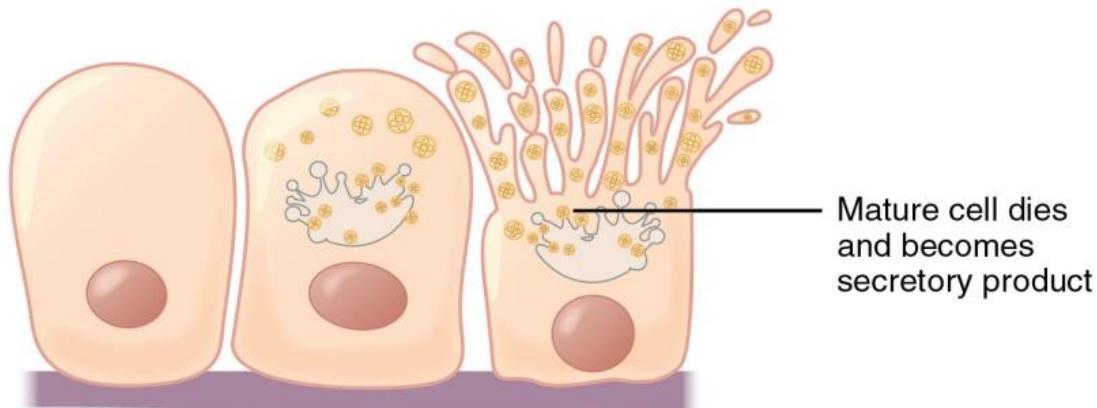
**(a) Merocrine secretion**



**(b) Apocrine secretion**



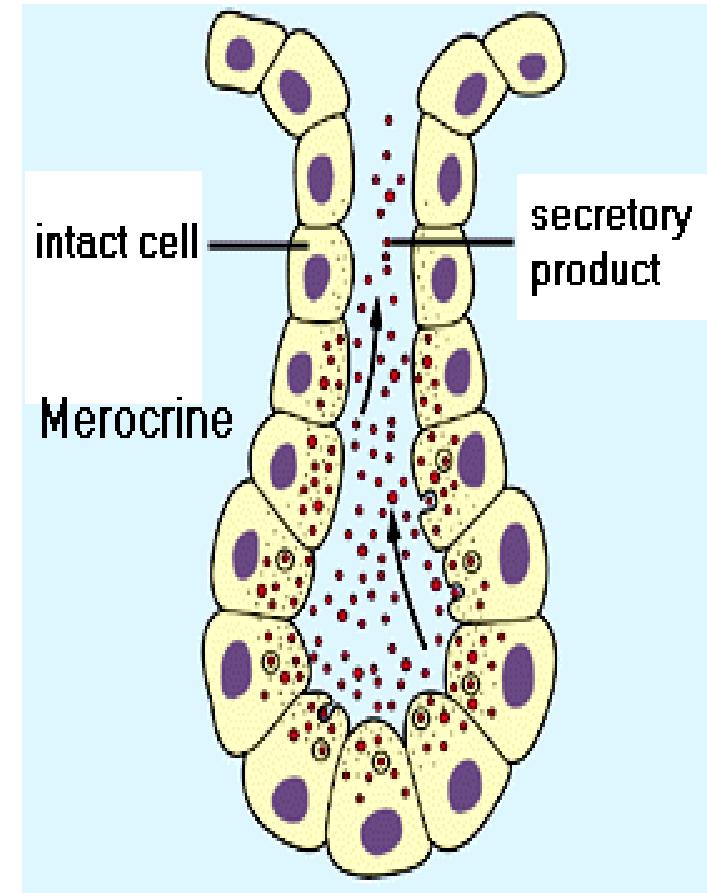
**(c) Holocrine secretion**



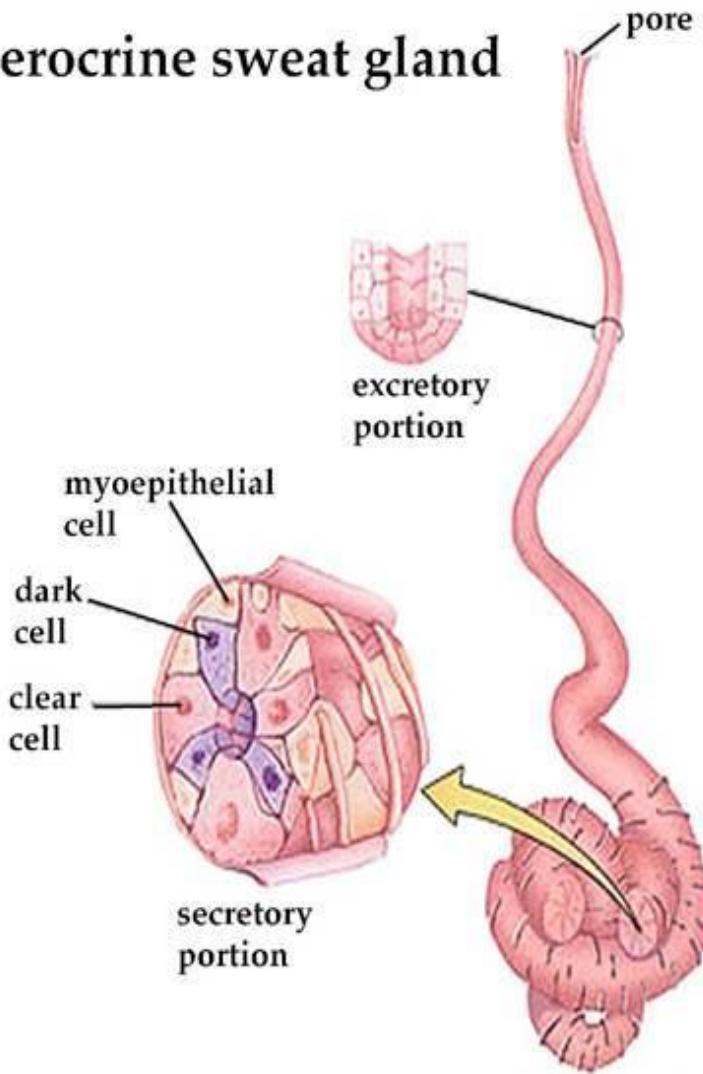
# Merocrine glands

## Merocrine glands :

The secretory product is delivered in membrane-bounded vesicles to the apical surface of the cell. Here, vesicles fuse with the plasma membrane and extrude their contents by **exocytosis**.



## merocrine sweat gland



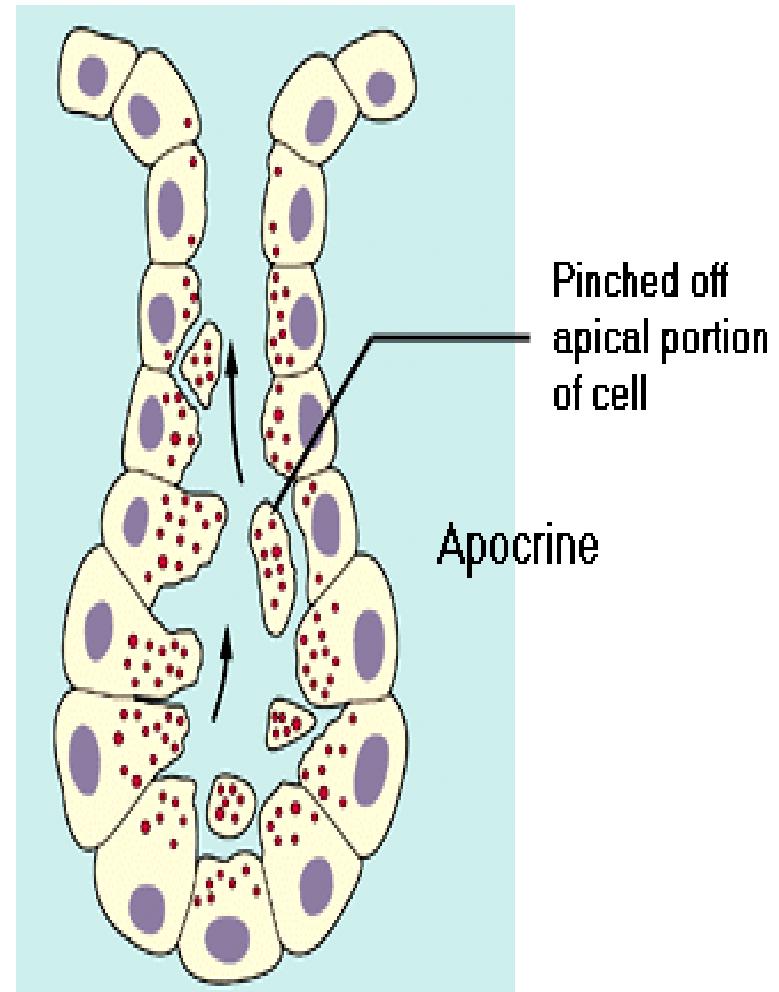
**Example: Sweat gland, Pancreas and salivary glands.**

# Apocrine glands

## Apocrine glands :

In these glands part of the apical cytoplasm is lost along with the secretory material.

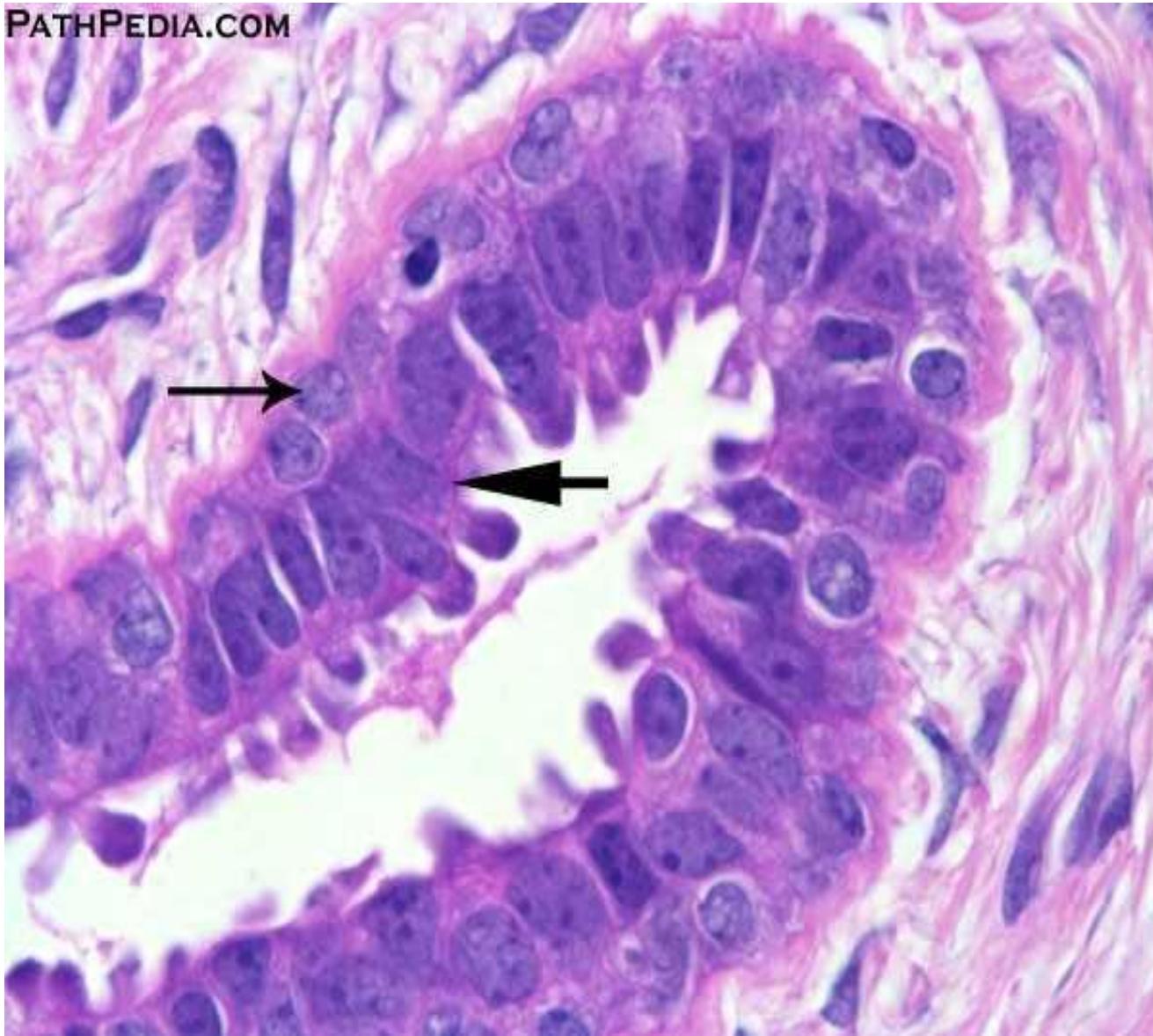
1. Lactating mammary glands,
2. Special sweat glands located in axilla , perianal area & areola of nipples.
3. Ceruminous glands of the external auditory meatus (ear)



Example for apocrine glands

## Mammary glands





# Holocrine glands

## Holocrine glands:

In these glands entire cells laden with secretory material disintegrate and all of the cellular contents are discharged from the gland as secretions.

e.g; the sebaceous glands of skin

