

# Secretory Epithelia & Glands

\* glands are originally from epithelial tissues

Epithelial cells that function mainly to produce and secrete various macromolecules may occur in epithelia with other major functions or comprise specialized organs called glands.

Cells among epithelial cell performs as secretory cells → secretes macromolecules and release them. Because tissues need them. → best seen in the Stomach → it synthesizes and release what it needs (HCl - enzymes (pepsogen))

# Secretory Epithelia & Glands

- Synthesize and release of substances; proteins, lipids, carbs, and proteins. → every gland could make one of each.
- Types based on the presence of duct system:

A. Exocrine glands (duct)

B. Endocrine glands (no duct)

↳ system that carries the secretion or the product that these glands have produced

- In special locations such as mammary glands they could combine all 3

Types based on number of cells:

A. Unicellular → goblet cells

B. Multicellular → most of glands

(many cells involved in their structure)

→ they rely on the **Blood stream**  
- **Blood vessels that reach them** -  
To pick up the hormones that they produced → to be redistributed to the target tissues.

- Exocrine glands have their designated duct system that carry their secretion toward the location that they need to be taken to
- Salivary glands: make saliva and through the duct system they deliver it to the oral cavity
- Lacrimal gland: Synthesize and secrete an imp part of the tears → delivers it to the eye.

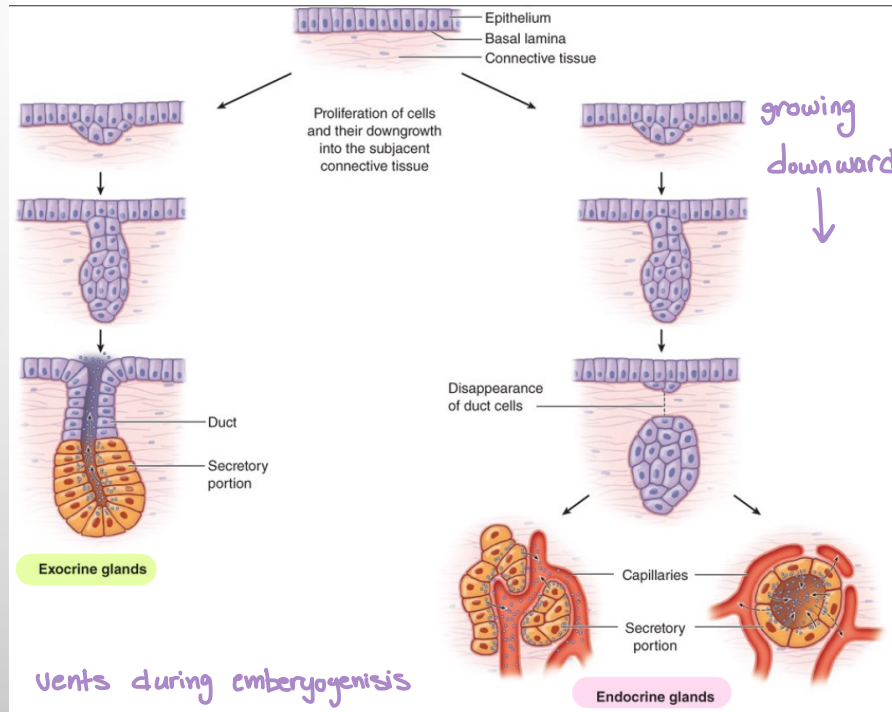
• Epithelium is running on the surface given a specific pathway that signals the cells to have more downward growth. = instead of growing linearly it will go towards the underlying connective tissue

→ So these cells are growing downward + becoming bigger

Cells are **proliferating** → they are multiplying

+ cells are **differentiating** → acquiring different types + features / Becoming sth new diff. from their parents.

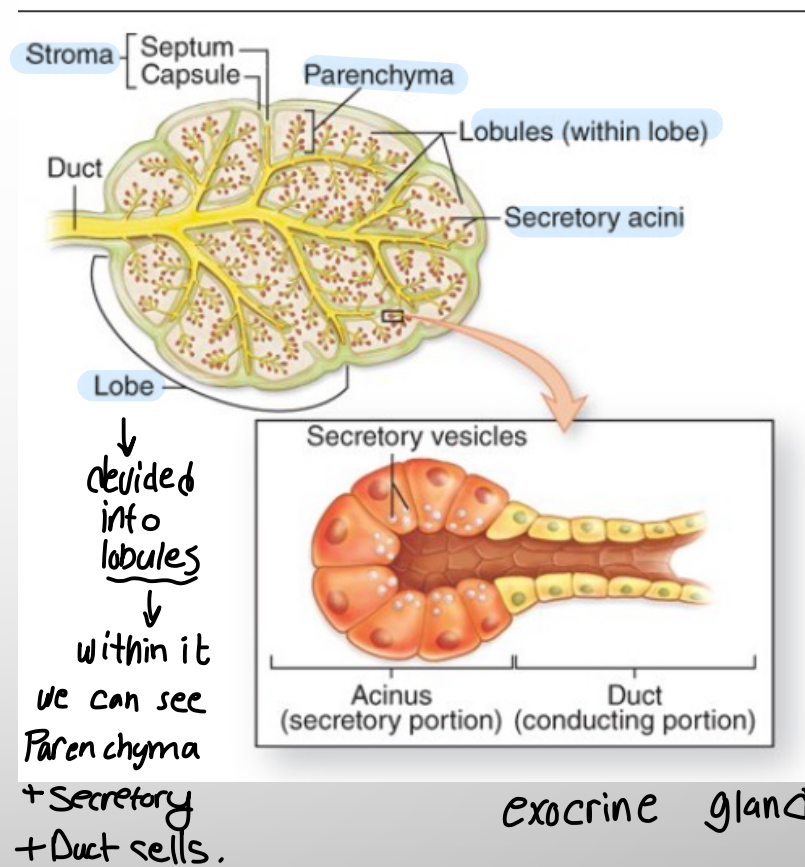
## Glands' Formation



- Develop from covering epithelia in the fetus by cell proliferation and growth into the underlying connective tissue, followed by further differentiation.
- **Retains its connection with the surface = exocrine.**
- **Loses its connection with the surface = endocrine;** capillaries surround them to deliver their product (hormones).
- glands came from epithelium.

# Gland Structure

- Glands are organized into **secretory part** and **ducts**.  
*↑ makes the product that these glands are releasing*  
*↳ starts with smaller duct that becomes bigger till we reach main excretory duct opens to final destination*
- **Parenchyma**: secretory part.
- **Stroma** connective tissue element that surround and support parenchyma.
- Glands are usually surrounded by **capsules**.
- **Capsules** sends **septa** to divided the gland into smaller compartments; **lobes** and **lobules** within it.



→ Salivary = opens to Oral cavity.

one duct only that opens to the surface. it takes secretion to the designated location, particular sites in the human body

Simple

Compound

ducts system → we have a smaller ducts when unite they become bigger ducts when they are combined they form bigger ducts till we reach the final bigger duct called "excretory duct" that carries final form of secretion to it's location.

## Classification Of Exocrine Glands

↳ Based on Complexity of the ducts.

- Simple glands: glands with unbranched duct.
- Compound glands: the ducts have two or more branches.
- The secretory portions can be tubular or acinar (different in the nature of the secretory material).

SIMPLE Glands (Ducts Do Not Branch)					
Class	Simple Tubular	Branched Tubular	Coiled Tubular	Acinar (or Alveolar)	Branched Acinar
Features	Elongated secretory portion; duct usually short or absent	Several long secretory parts joining to drain into 1 duct	Secretory portion is very long and coiled	Rounded, saclike secretory portion	Multiple saclike secretory parts entering the same duct
Examples	Mucous glands of colon; intestinal glands or crypts (of Lieberkühn)	Glands in the uterus and stomach	Sweat glands	Small mucous glands along the urethra	Sebaceous glands of the skin
COMPOUND Glands (Ducts from Several Secretory Units Converge Into Larger Ducts)					
Class	Tubular		Acinar (Alveolar)		Tubuloacinar
Features	Several elongated coiled secretory units and their ducts converge to form larger ducts		Several saclike secretory units with small ducts converge at a larger duct		Ducts of both tubular and acinar secretory units converge at larger ducts
Examples	Submucosal mucous glands (of Brunner) in the duodenum		Exocrine pancreas		Salivary glands

How does it release its secretory molecules / How it get out from secretory cells to the ducts then to exterior?

## Types Of Secretion

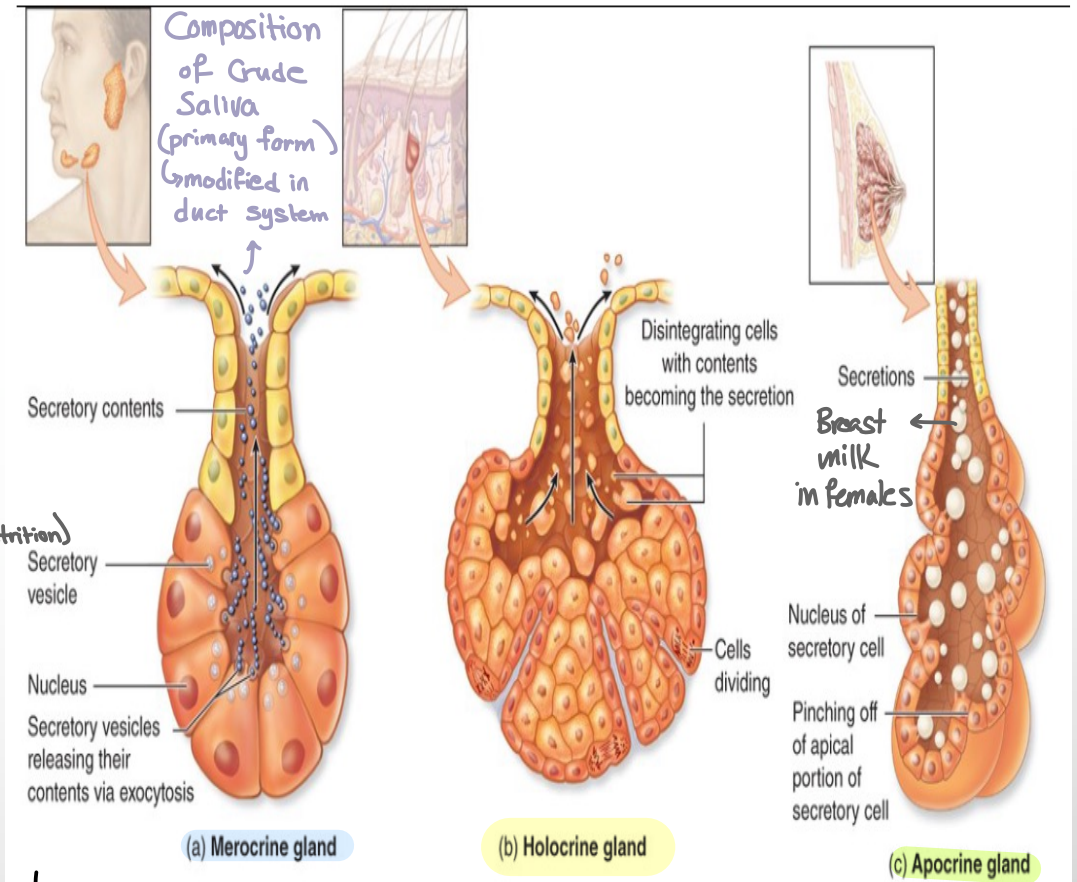
- **Merocrine** (salivary): most common method of protein or glycoprotein secretion---exocytosis from membrane-bound vesicles or secretory granules.

↳ Synthesize the required material (All we need as nutrition)

- **Apocrine** (mammary): product accumulates at the cells' apical ends, portions of which are then extruded to release the product together with small amounts of cytoplasm and cell membrane

↳ Associated with hair follicles at the base

- **Holocrine** (sebaceous): cells accumulate product continuously as they enlarge and undergo terminal differentiation, culminating in complete cell disruption which releases the product and cell debris into the gland's lumen.



usually seen in pregnant ladies → After they have a baby or way before that there's a proliferation of the glands + they acquire a secretory function

Sebaceous cells synthesize the sebum and the content of the sebum → it becomes bigger and bigger till they reach their final maturation → Terminal differentiation

## Nature Of Secretory Products.

- Exocrine glands secretion is categorized based on the nature of their secretory products into serous or mucous.
- **Serous** cells synthesize proteins (mostly not glycosylated; digestive enzymes)--- well-developed RER and Golgi complexes and are filled apically with secretory granules in different stages of maturation---stain intensely with basophilic or acidophilic stains. → more watery nature
- **Mucous** cells filled apically with secretory granules contain heavily glycosylated proteins called mucins (when released from the cell---become hydrated and form a layer of mucus)--  
-hydrophilic mucins are usually washed from cells during routine histological preparations, causing the secretory granules to stain poorly. → thicker nature (mucous rich).

# Nature Of Secretory Products

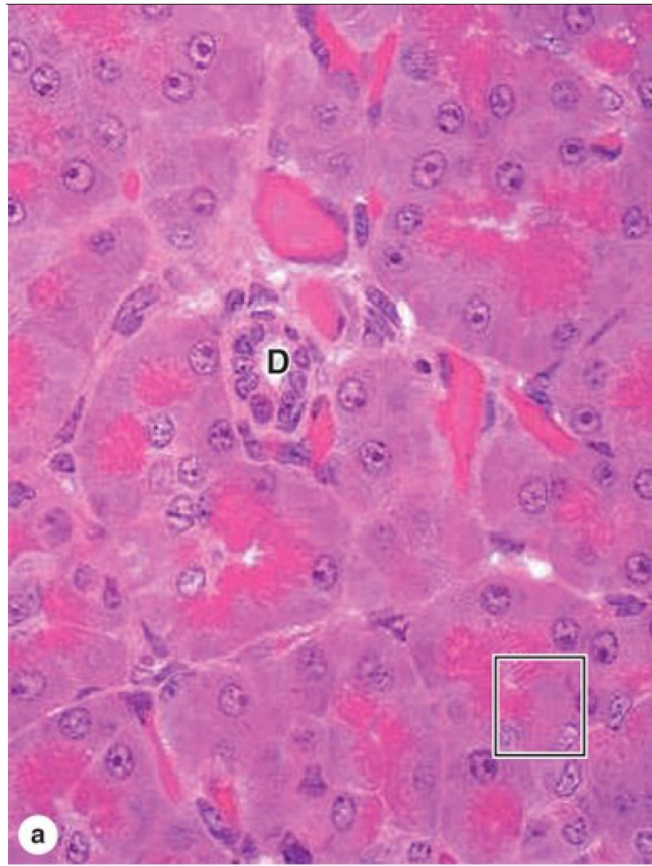
- Some salivary glands are mixed **seromucous** glands, having both **serous acini** and **mucous tubules** → They produce the watery and mucus (thick) secretion
- **Myoepithelial cells**: **contractile** at the **basal ends** of the secretory cells. Long processes of these cells **embrace an acinus**. Are rich in **actin** and **myosin filament**--- **strong contractions** serve to **propel secretory products** from acini into the duct system.

→ from the name = they have a muscle element in them = Actin + myosin filaments.

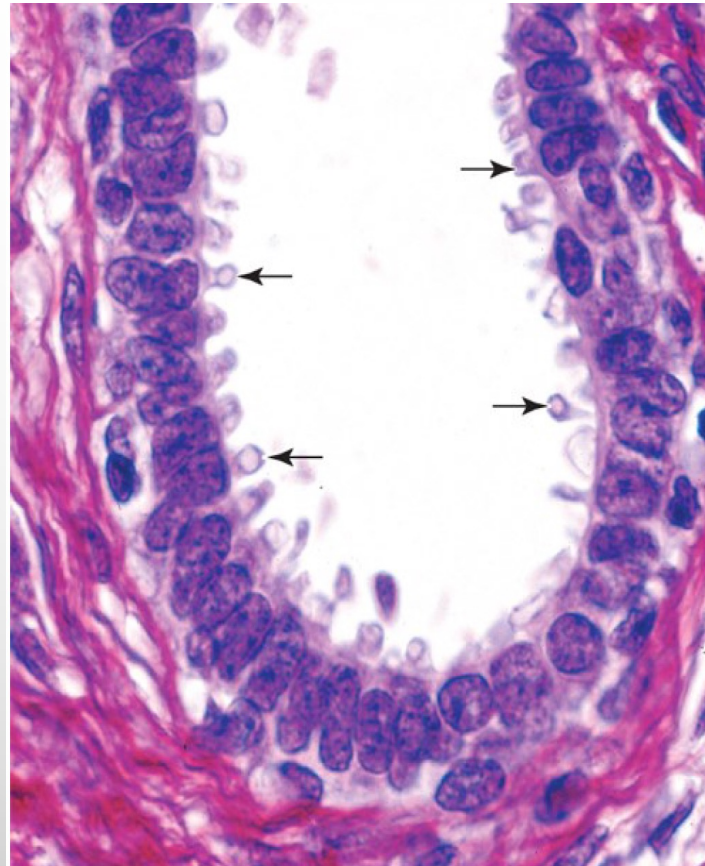
Another element exocrine glands



## Merocrine



## Apocrine



## Holocrine

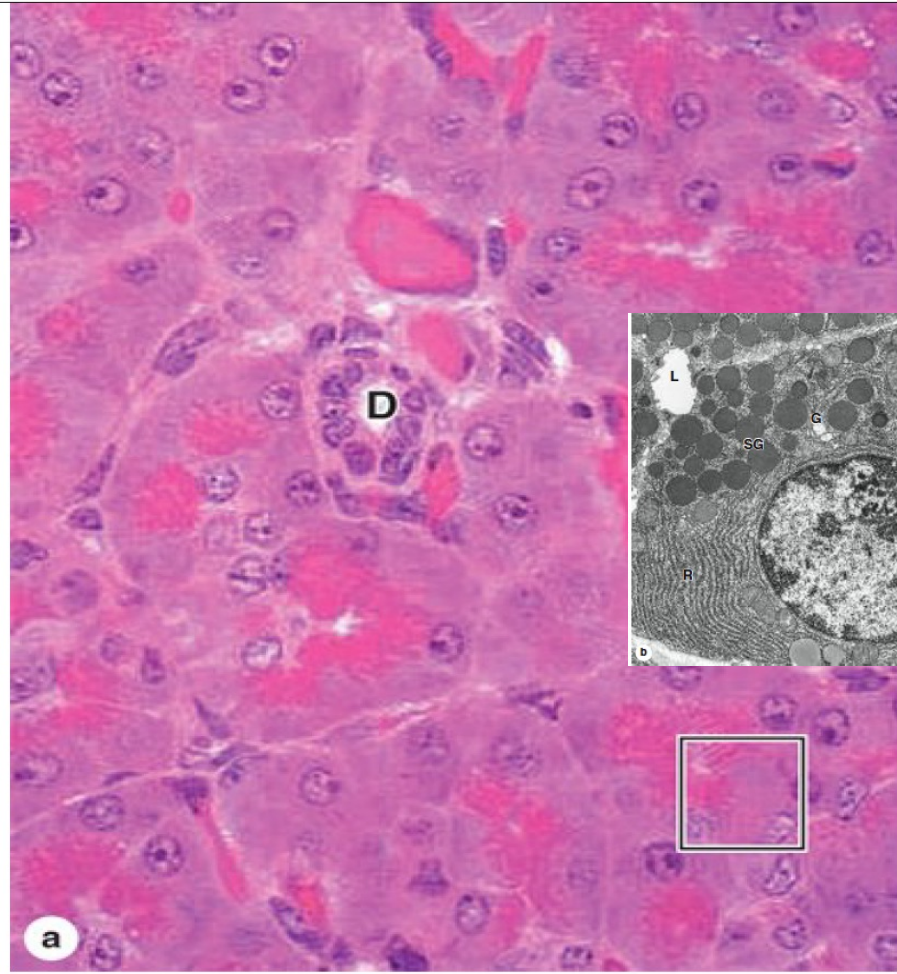


watery ←

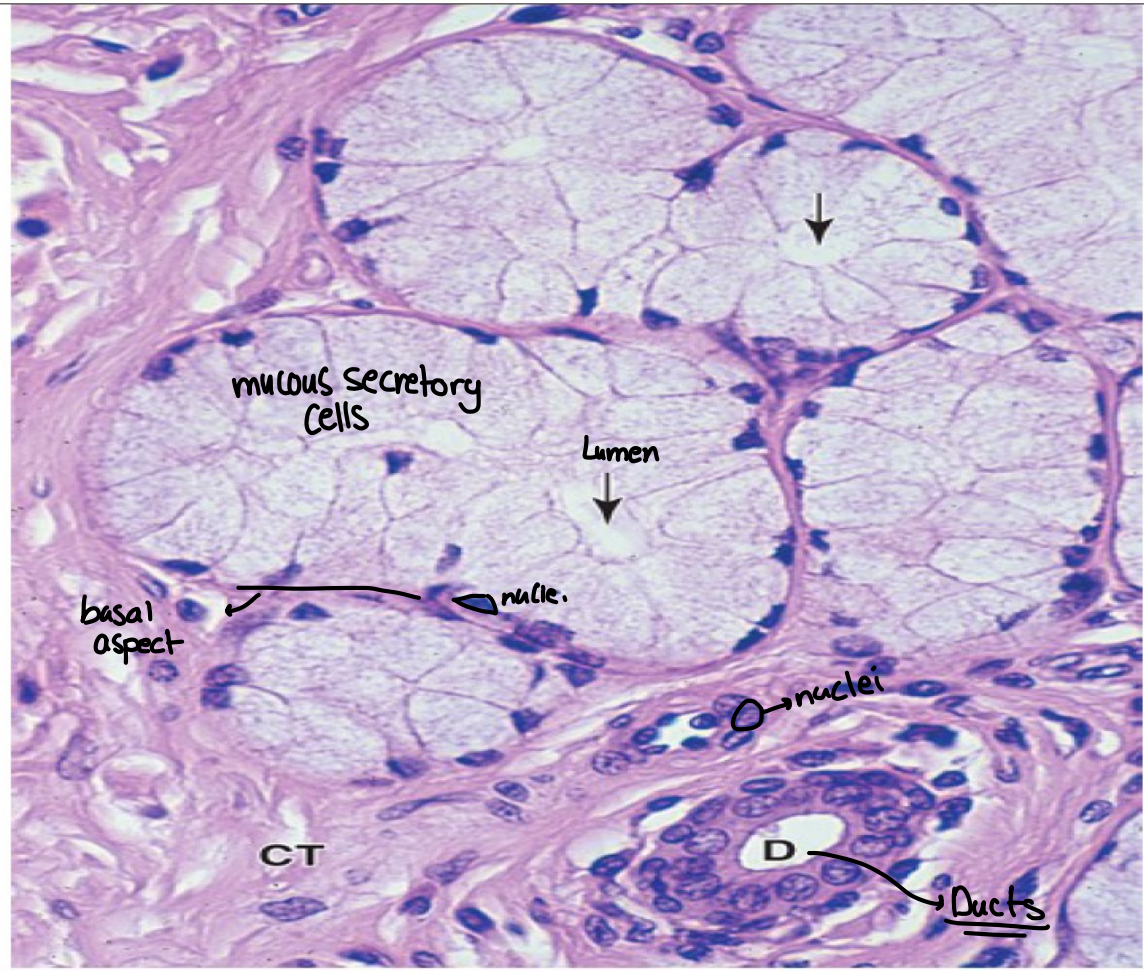
# Serous and Mucous Secretory Cells

↳ thick

Mucous Cell

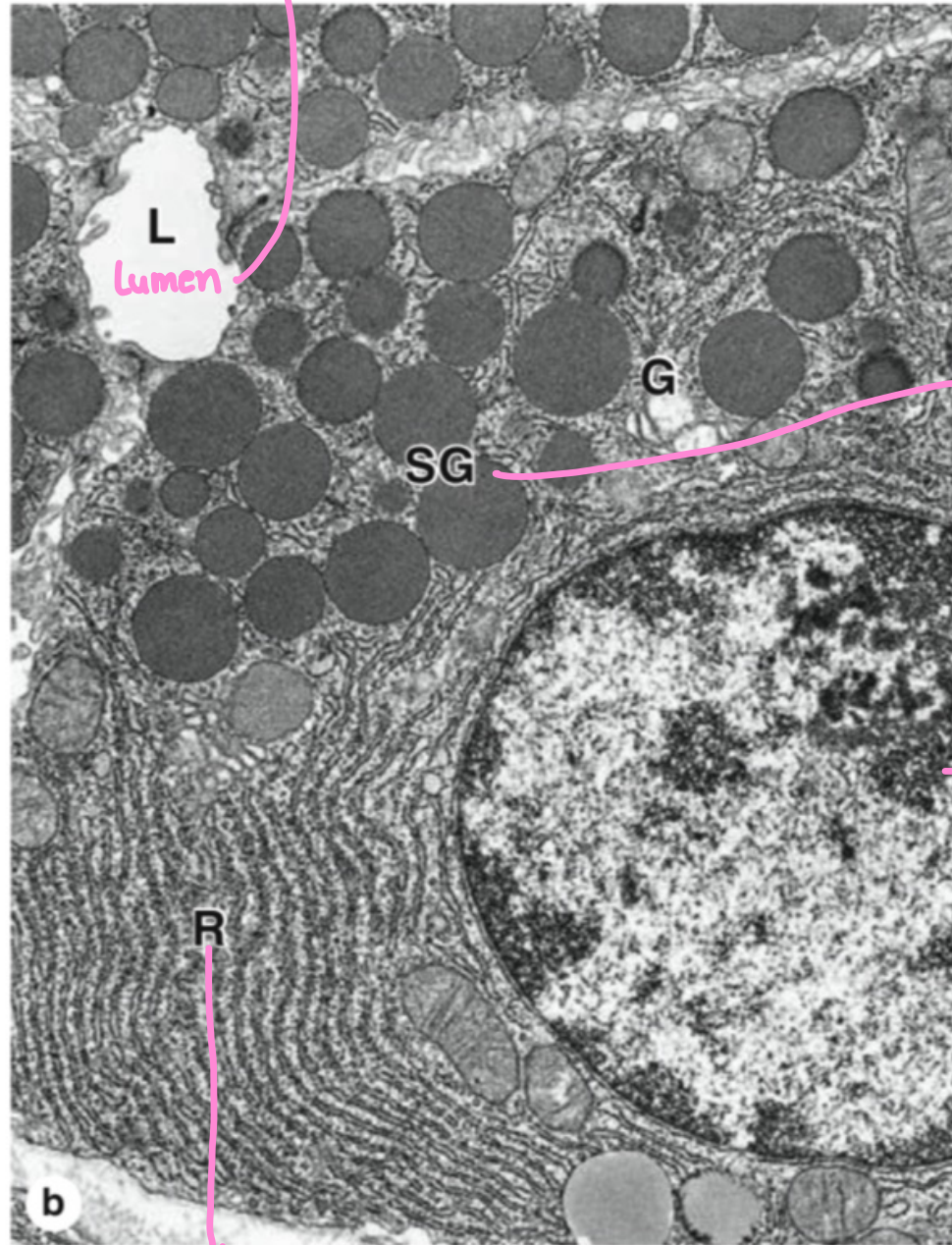


↳ enlarged → by using diff. microscope to see finer details.



→ the whitish or washed out appearance is due to the hydrophilic nature of the glycosylated protein.

Lumen → of secretory portion where granules will open and let go of their content inside the lumen that will be carried away.



## Serous Cell

granules

that cells have stored their secretion in

nucleus

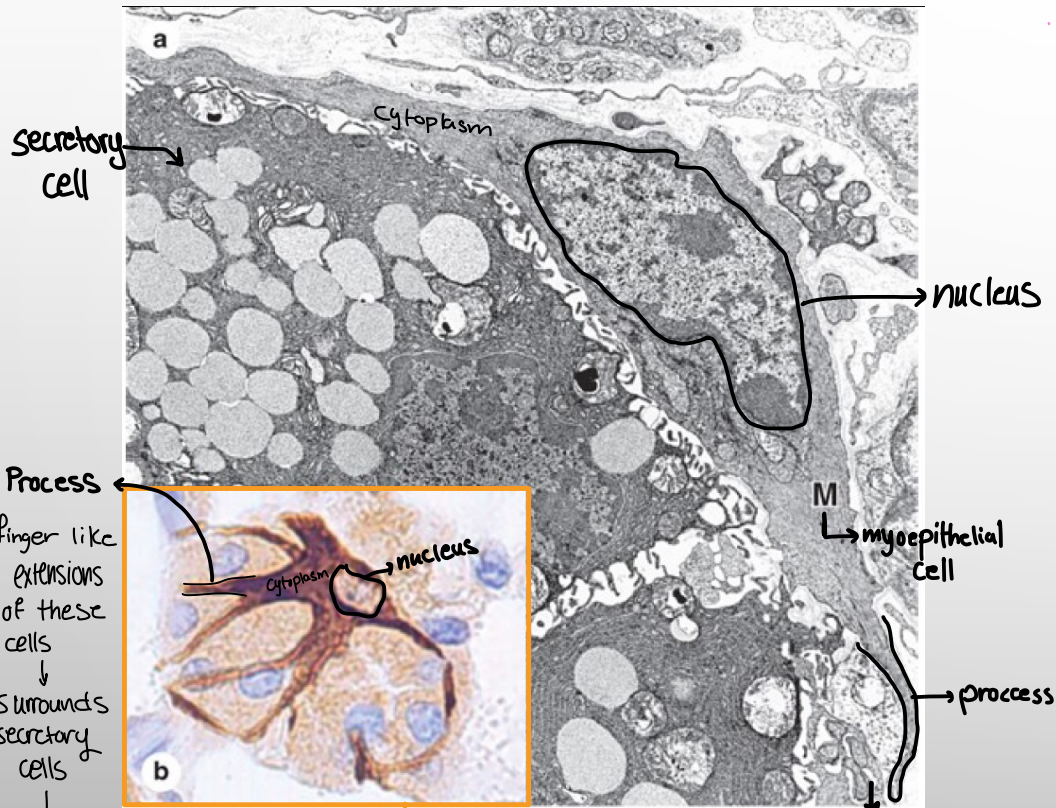
RER → looks like threads running throughout this region

# Myoepithelial Cells

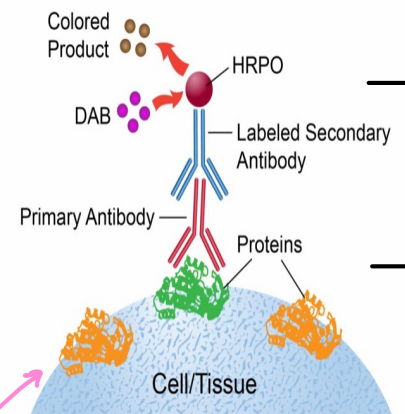
- In exocrine glands only

**Recall ↴**

- **Antigen-Antibody Concept:**  
 → Targeting a specific protein in the cells →  
 the primary anti-body will bind to the antigen  
 and we always use a secondary anti-body  
 for the amplification of the signal.



## Indirect Immunohistochemistry



## Immunofluorescence

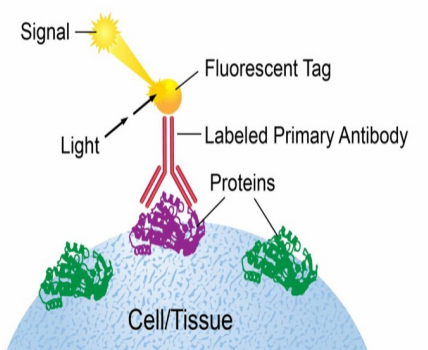


Diagram 1: Illustration of Indirect Immunohistochemistry and Immunofluorescence methods.

immunohistochemistry-02

We can use BF light microscope  
 (The Background is light)

Acquired by immunohistochemistry

How do we know? →

We do see the outline of the cell rather than the neighboring cells which we recognize by their nuclei

• the difference between ● & ●

## Secondary Anti-Body Carries an enzyme

if you add a substrate,  
enzyme will produce a diff color

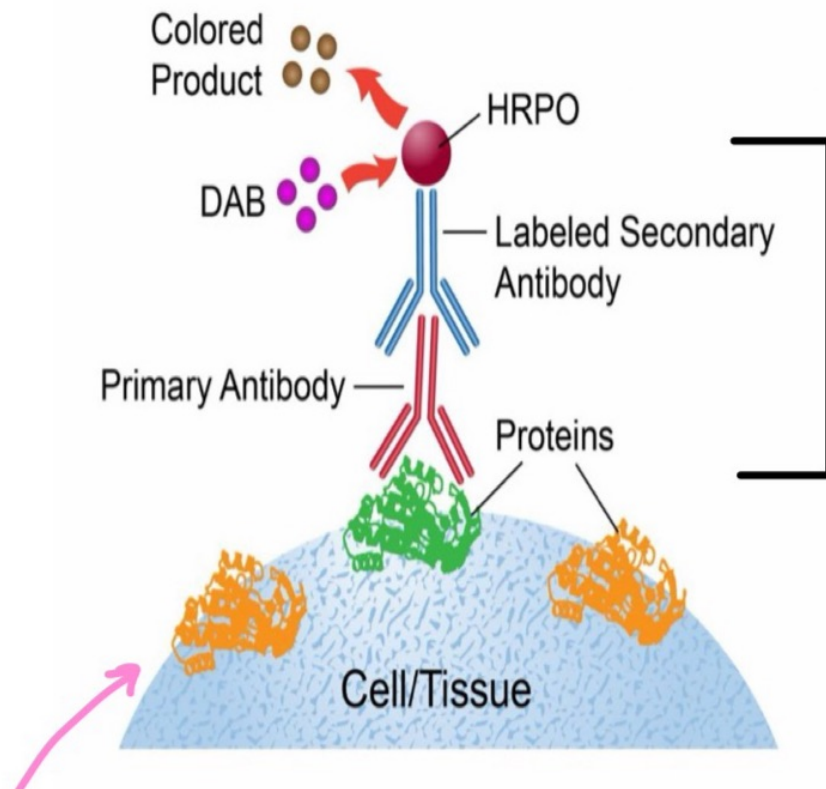
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## Secondary Anti - body Carries flourophore

excited by a specific wave length  
then it emits longer wave length the  
we see it as a signal in any color

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### Indirect Immunohistochemistry



### Immunofluorescence

