

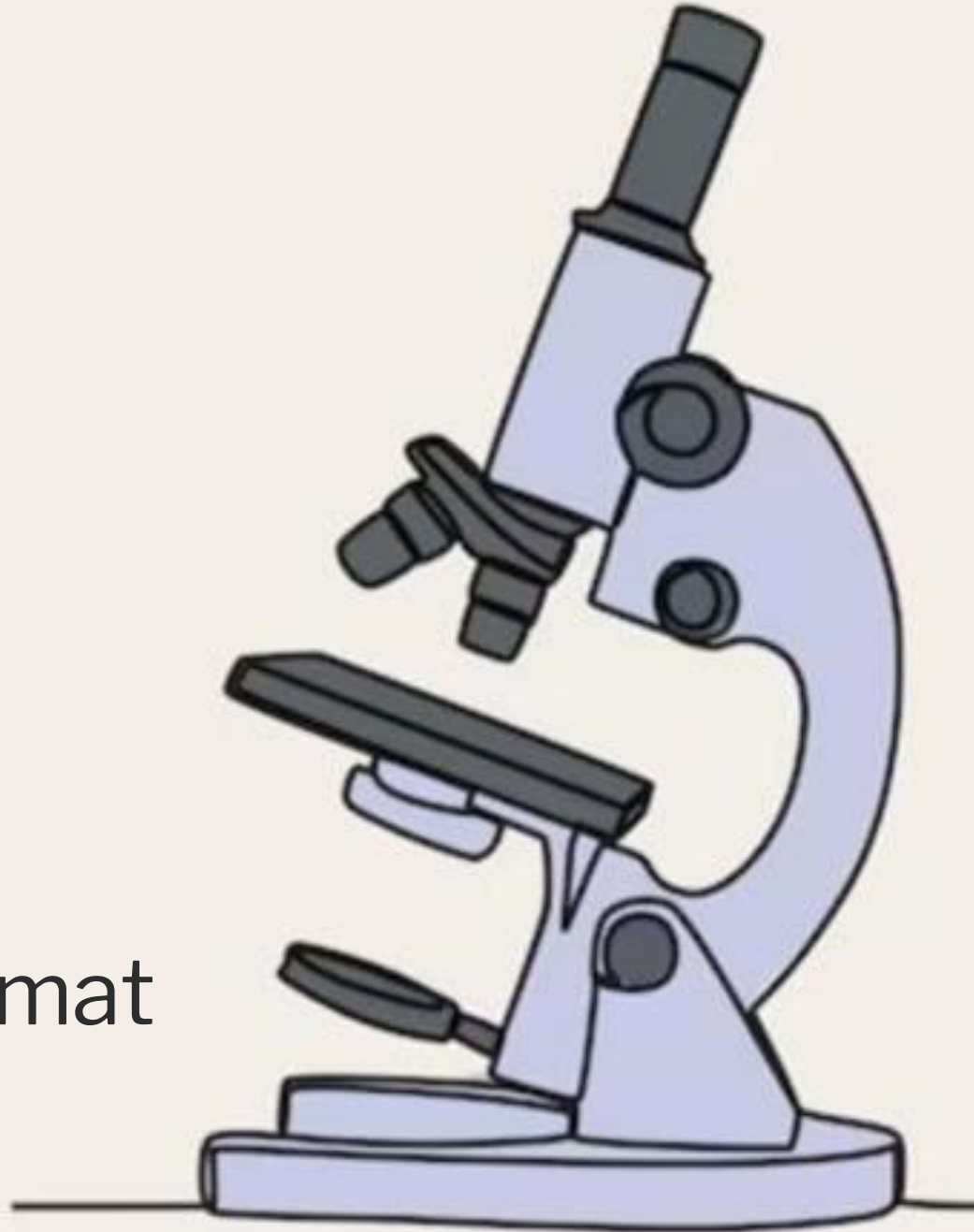
Histology

Modified n.8



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Secretory Epithelia & Glands

- 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**.

Can see it in many places, but best seen actually in the stomach.

Stomach synthesizes and releases materials like HCL and enzymes such as pepsinogen.

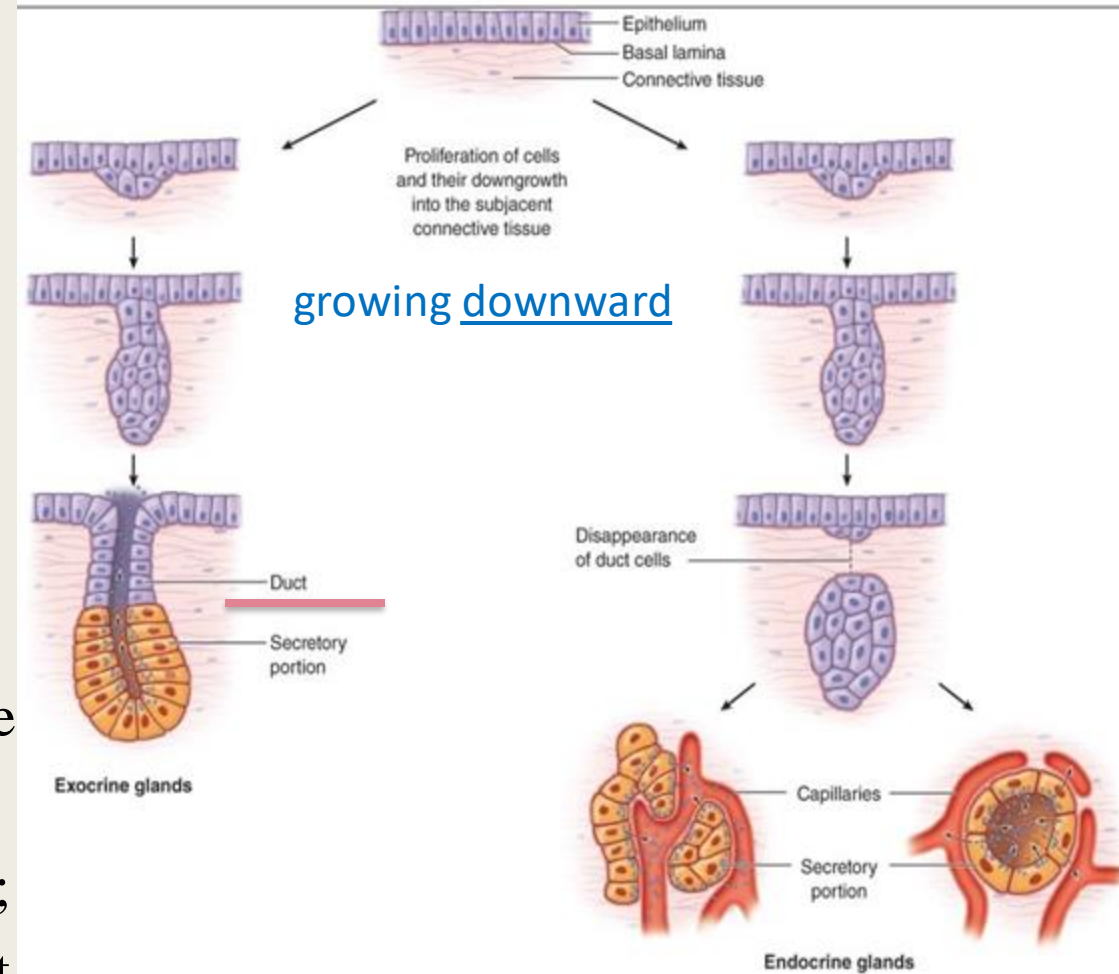
Glands originally are from epithelium tissues and this started early in the embryo life.

Secretory Epithelia & Glands

- Synthesize and release of substances: lipids, carbs, and proteins.
every gland or secretory cell could make one of each, in special location such as the **mammary glands** in females they combine all three of them.
- Types based on the presence of duct system:
 - A. Exocrine glands (duct) such as **salivary glands**, they make the saliva and through the duct system they deliver it to the oral cavity. Also, **lacrimal gland** (الغدة الدمعية) synthesizes and secretes an important part of the tears and then deliver it to the eye .
 - B. Endocrine glands (no duct) rely on the bloodstream and the blood vessels that reach them to pick up the hormones that they produced to be redistributed to the target tissues.
- Types based on number of cells:
 - A. Unicellular such as Goblet Cells.
 - B. Multicellular most of glands are multicellular.

Glands' Formation

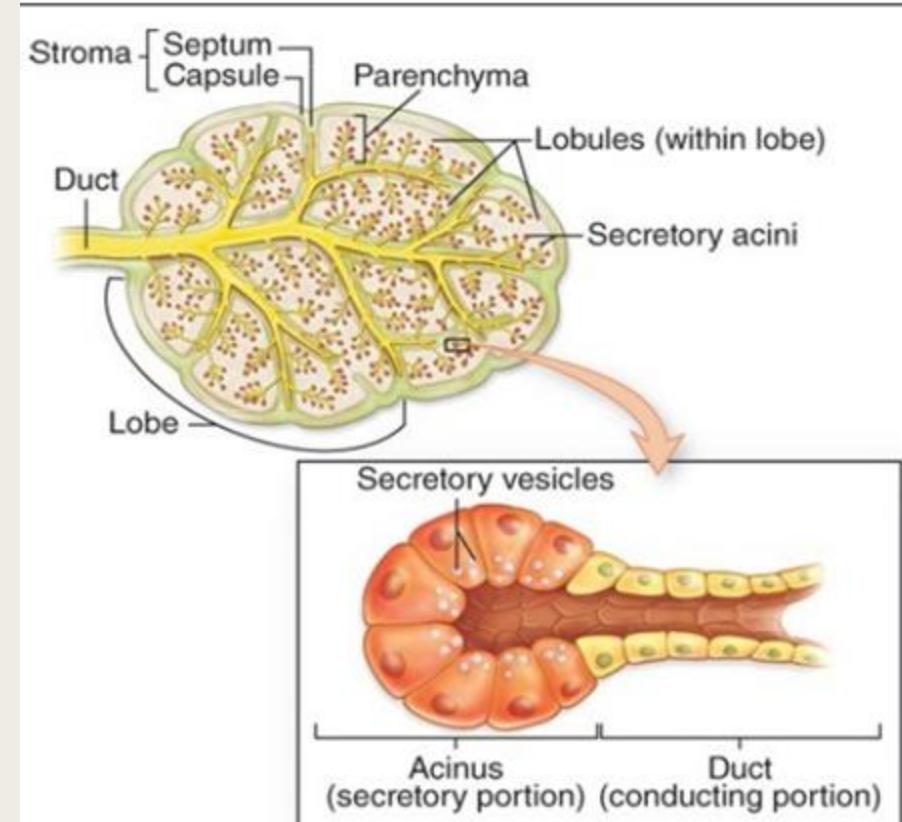
- Develop from covering epithelia in the fetus by cell **proliferation**(means multiplying) and growth into the underlying connective tissue, followed by further **differentiation**(means acquiring different features).
- Epithelium cells are proliferating and differentiating which means they are becoming something new different from their parents.
- If cells retains its connection with the surface=**exocrine**.
- Lose their connection with the surface=**endocrine**; capillaries surround them to deliver their product (hormones).



Gland Structure

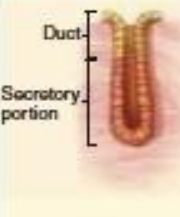




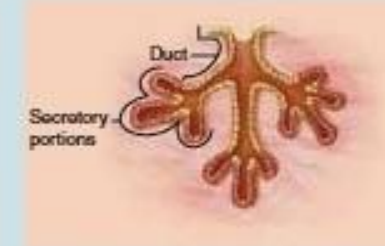


Exocrine gland

- Glands are organized into secretory part and ducts parts.
- secretory cells attached to duct systems.
- **Parenchyma**: secretory part and ducts.
- **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.



Classification Of Exocrine Glands

- Simple glands: glands with unbranched duct.
- Compound glands: the ducts have two or more branches. which means we have smaller ducts, when they unite they become bigger ducts, and those bigger ducts when they are combined they form a bigger and bigger till we reach the final biggest ducts that we call it the **excretory duct** the one will eventually carry the final form of the secretion to its designated location
- 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

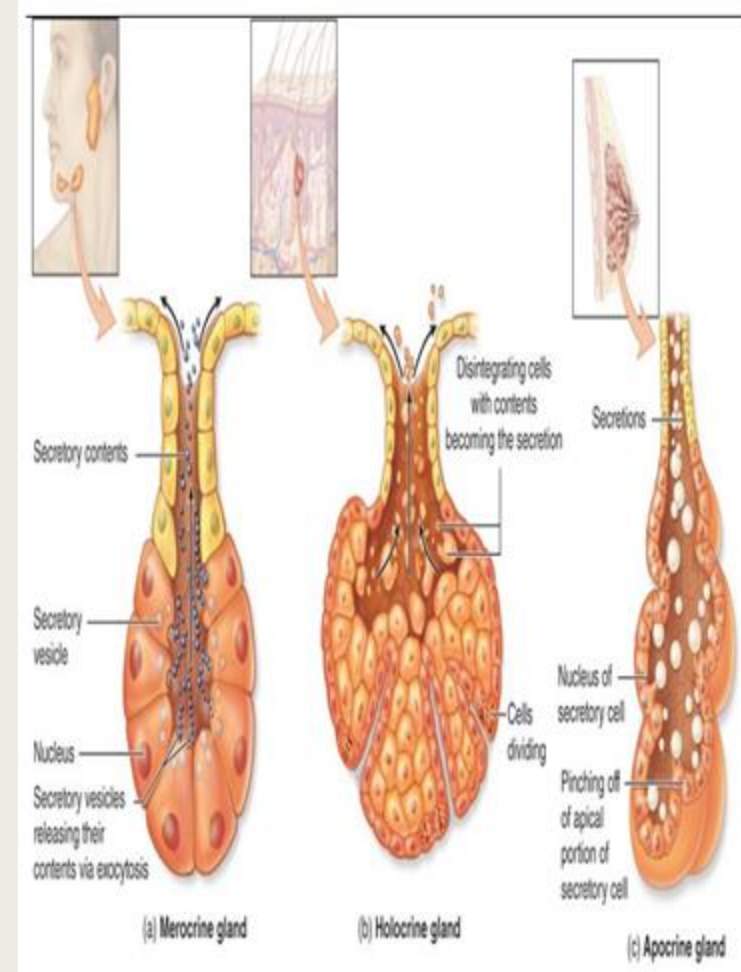
Types Of Secretion

• **Merocrine** (salivary): most common method of protein or glycoprotein secretion--- exocytosis from **membrane-bound vesicles** or **secretory granules**. Those combined granules are simply the composition of the crude saliva which means the saliva in its primary form because eventually it will be modified in the duct system.

• **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. **usually seen in pregnant ladies, so after they have the baby and way before that there's a proliferation of the glands and they acquire a secretory function more profoundly.**

mammary glands synthesize the required materials and usually combination of all the materials that we need as a nutrition.

• **Holocrine** (sebaceous **الغدد الدهنية**— those are the ones that are associated with hair follicles): 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. **These cells synthesize the sebum and the content of the sebum.**



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 (**Rough Endoplasmic Reticulum**) and Golgi complexes and are filled apically with secretory granules in different stages of maturation---stain intensely with basophilic or acidophilic stains. **Their secretory product will be more watery.**
- **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. **Their secretory product is thicker because it is mucus rich.**

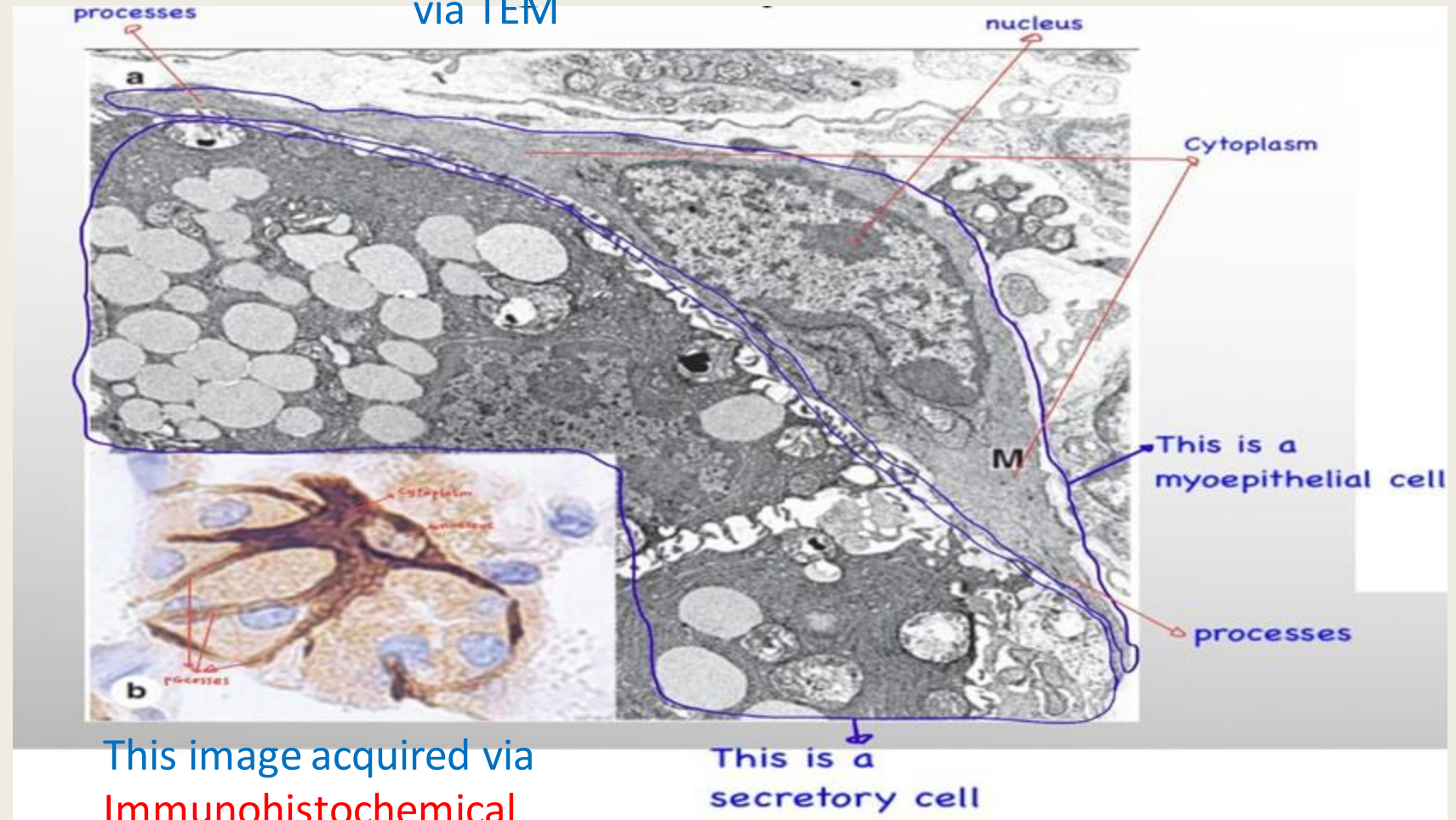
Nature Of Secretory Products

- Some salivary glands are mixed **seromucous** glands, having both serous acini and mucous tubules
- **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.

Myoepithelial Cells

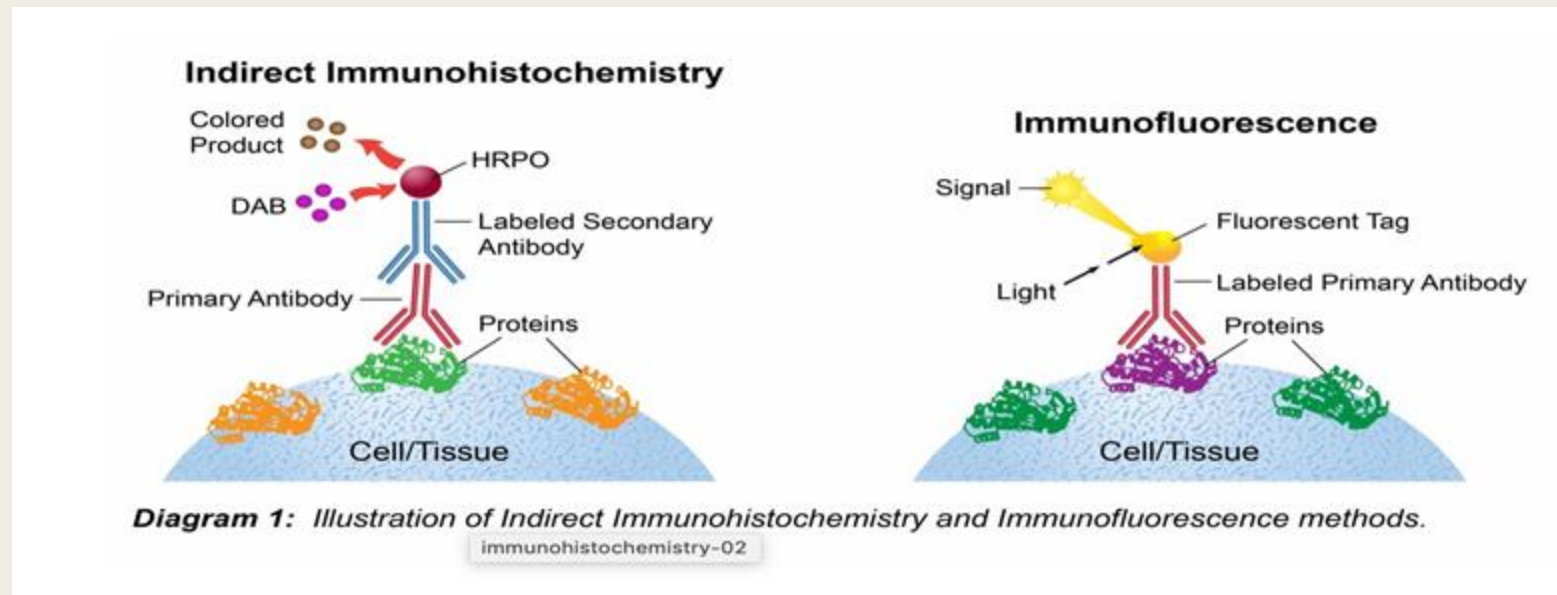
- In exocrine glands only

This image acquired via TEM



How did I know immunohistochemistry staining? I do see the outline of the cell rather than the neighboring cell, the neighboring cell I recognize them by their nuclei.

when myoepithelial cell contracted helps to squeeze out the product that secretory cells have made to enter the duct and then continue its way to the bigger and bigger duct

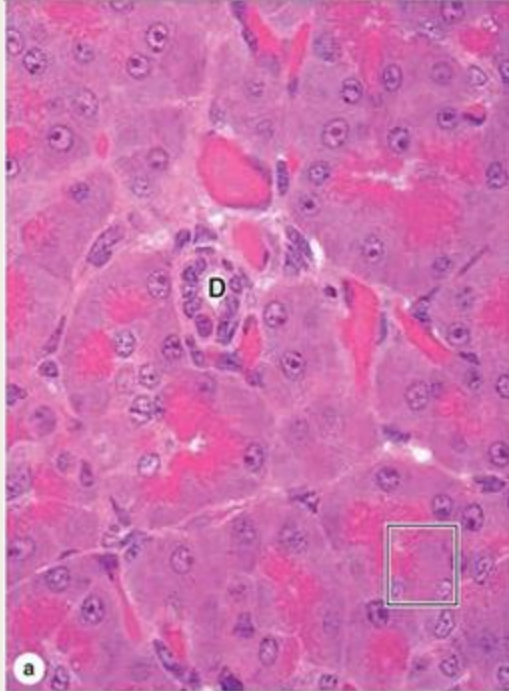


What is difference between the Immunohistochemistry and the immunofluorescence?
Immunohistochemistry staining we can use the Bright field microscope (background is white).

The concept of **antigen-antibody**, I'm targeting a specific protein in the cells and I get the primary antibody that will bind to the antigen. then secondary antibody (to amplification of the signal) in immunohistochemistry it carries an enzyme whereas in immunofluorescence it carries a fluorophore, and this fluorophore we could excited with the specific wavelength then it will emit a longer wavelength then we see this longer wavelength as a signal could be in any color, versus the enzyme if you add the substrate it will produce a different color.

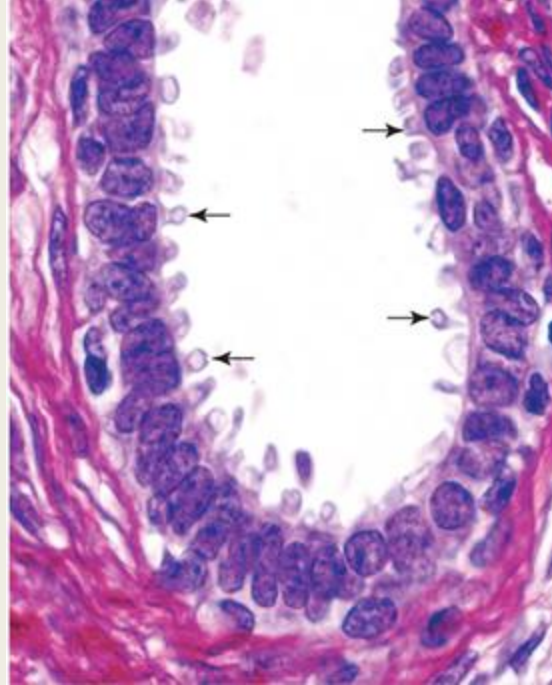
So in immunohistochemistry staining if we have the antigen and we add the substrate the enzyme will work and then it will turn into a **brownish color**.

Merocrine



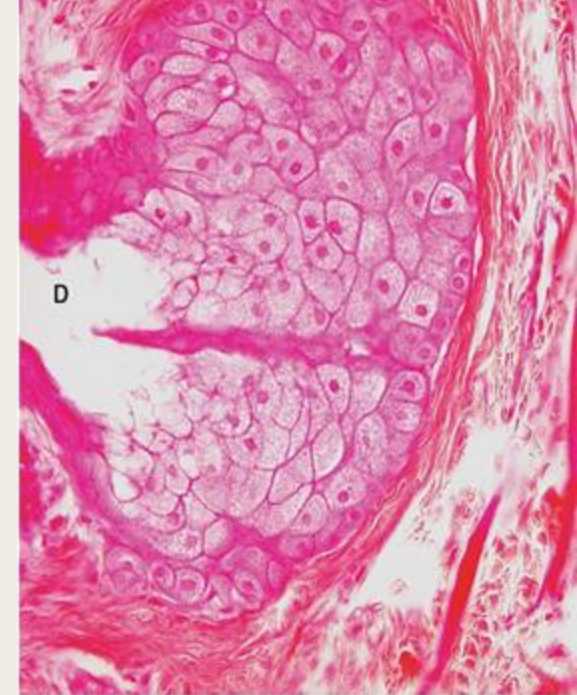
Store their product into granules, then this granules will reach the apical surface then they will be exocytosis.

Apocrine



Accumulate their secretion into apical surface, then apical part will be exocytosed and that will form the secretion of products.

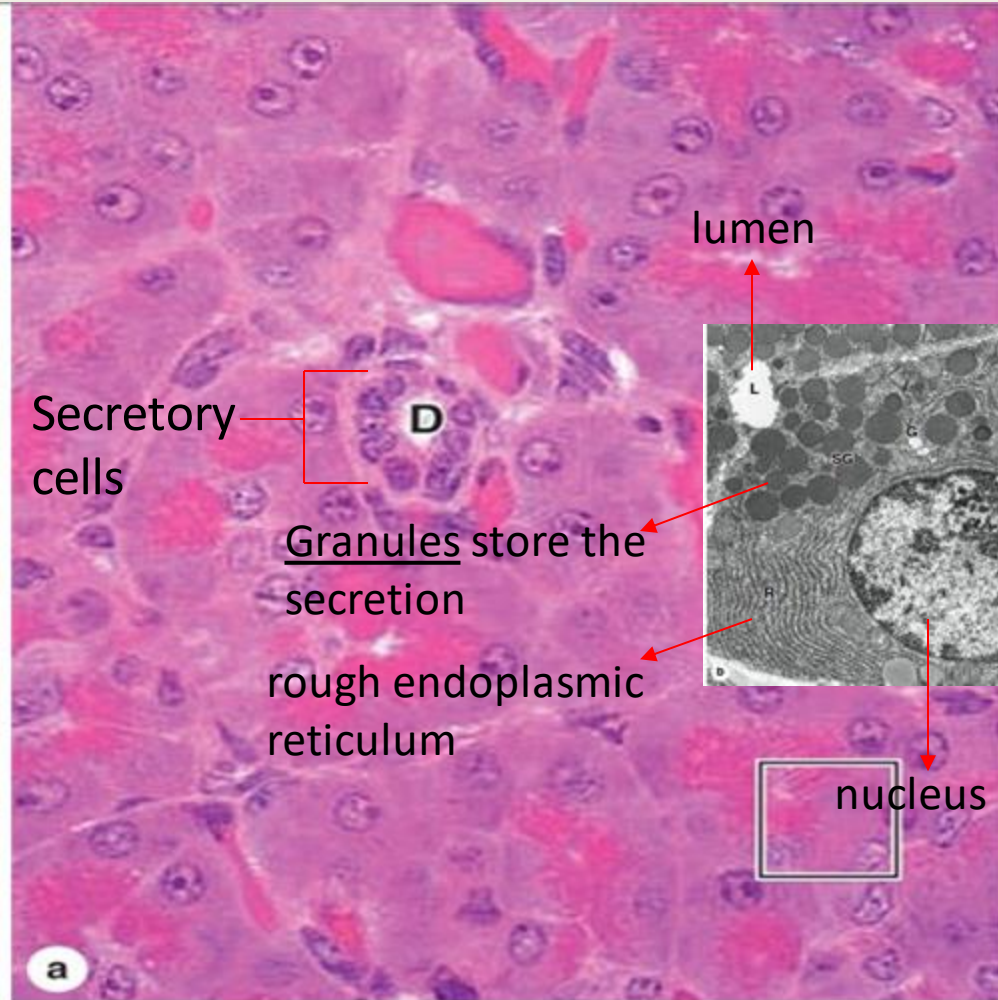
Holocrine



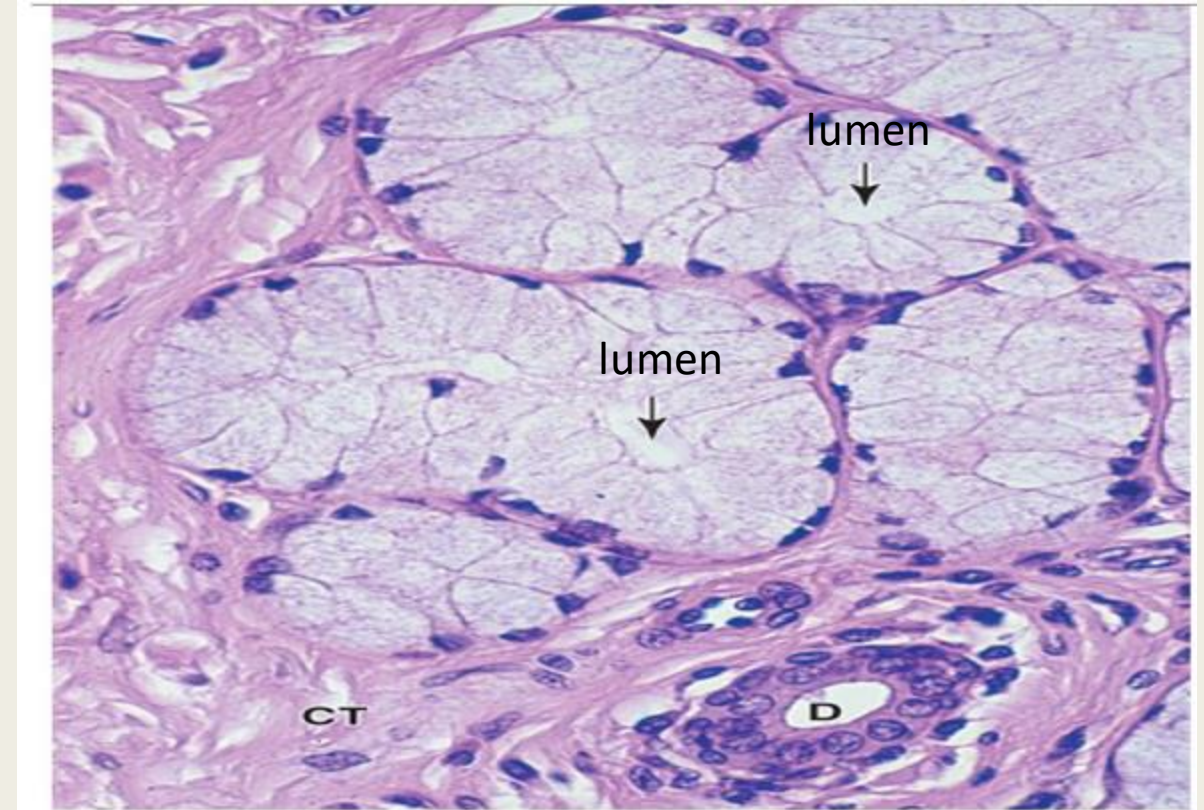
younger cells will find their way to the surface, finding their way means that they are differentiating their synthesizing and accumulating the lipids that will finally be the whole content of the cells, and eventually those fully differentiated cells will be exocytosed (whole cell with its content) and that eventually form what we called the **sebum**.

Serous and Mucous Secretory Cells

Serous secretory cells



Mucous secretory cells



The whitish or washed out appearance that's due to the **hydrophilic nature** of their glycosylated proteins.

أدركت، أن ترك الذنوب الذي اعتدناها، سبب
في الفتح، في الفهم والعلم، وراحة النفس
وهدوء الضمير، كما لو أنك خففت ثقلًا،
ورثيت قلبًا، وتركته لله!

فهمت، أن الإنسان بقدر معاناته في
ترتيب نفسه وضبط خطاه، بقدر
الراحة النفسية التي ينالها جزاء هذا
الجهد والثعب! "جاهد لشاهد"

لذلك؛ كان لزامًا أن تتدرب على
«الإلزام» أن تُلزم نفسك الثعب، وتُلزم
جسدك العمل، وتُلزم قلبك الاستقامة،
وتُلزم وقتك الدقة، وتُلزم روحك
التسليم، وتُلزم حياتك أنك لله.

هنا فقط، تعلم أن الذنب الواحد،
يبعدك خطوة عن الغاية، فاترك تصل.