Secretory Epithelia & Glands

They are in many places but The best seen of them is in stomach (Stomach synthesizes and releases materials like HCL and enzymes such as pepsinogen)

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**.

Secretory Epithelia & Glands

- Synthesize and release of substances; proteins, lipids, carbs, and proteins.
- Types based on the presence of duct system:

  A. Exocrine glands (duct)

  B. Endocrine glands (no duct)

Every gland or secretory cell could make one of each such as the mammary gland in female , they combine three of them

Types based on number of cells:

A. Unicellular — Such as Goblet cell

B. Multicellular

Most of the glands

Endocrine glands (no duct)

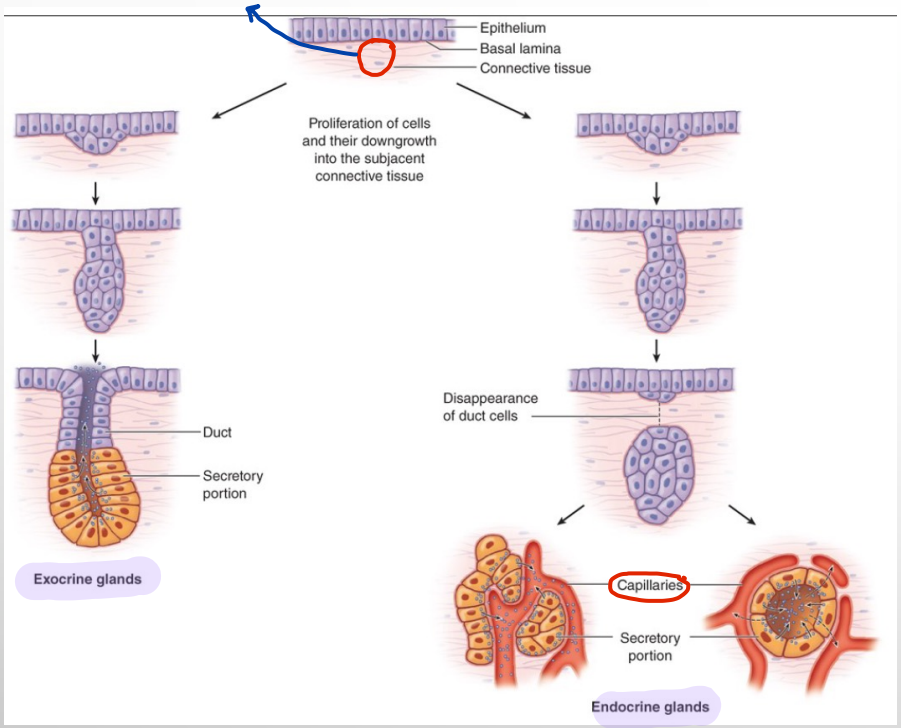
They rely on the bloodstream and the blood vessels that reach them to pick up the hormones that they produce to be redistributed to the target

Exocrine glands (duct)

They have designated ducts system that carry their secretion toward the location that they need to be taken , such as the salivary glands (they make the saliva through the duct system they deliver it to the oral cavity), another example lacrimal gland it synthesize and secretes an important part of tears then delivers it to the eye

Glands' Formation

We have specific pathway that has been unregulated in this particular region so this will signal the cells to have more downward growth



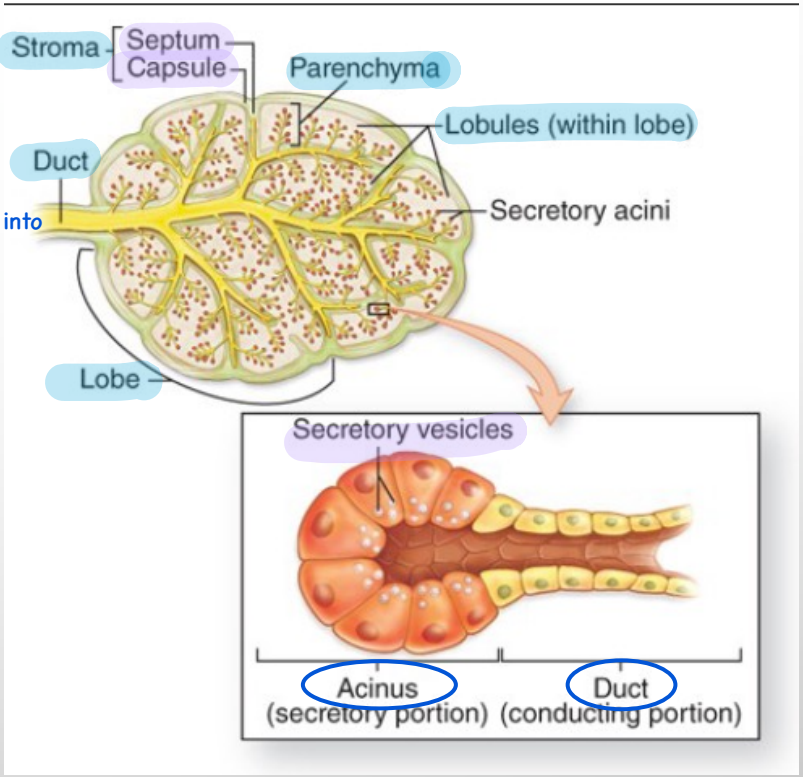
- Develop from covering epithelia in the fetus by cell proliferation (multiplying) and growth into the underlying connective tissue, followed by further differentiation. (acquiring different features ,Becoming something new different from their parents)
- Retains its connection with the surface=exocrine.
- Loses its connection with the surface=endocrine; capillaries surround them to deliver their product (hormones).

مثل ما حكينا قبل شوي أنها تعتمدعلى الاوعيه الدمويه وال bloodstream في نقل إفرازاتها

Gland Structure

- Glands are organized into secretory part and ducts.
- 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.

main duct that will open into the final destination



Exocrine glands

Classification Of Exocrine Glands

Based on the complexity of the duct

- 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).

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

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

Those secretory cell will put the composition of the saliva into granules , these granules will leave the apical surface via exocytosis , 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.

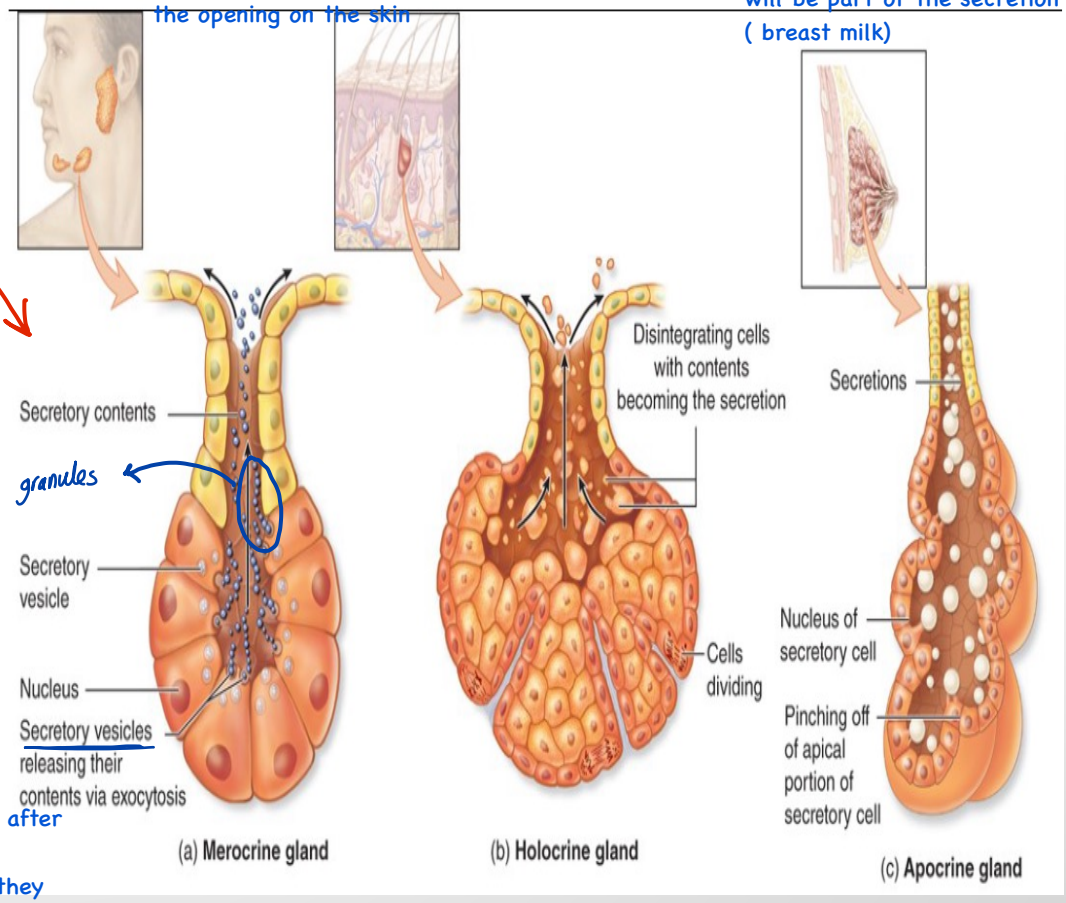
These cells synthesize the sebum and the content of the sebum , these cells become bigger till they reach their final maturation and will reach the terminal differentiation. The hole cell will be executed from the interior of this gland and leave from the duct system to the opening on the skin

Those mammary glands synthesize the required materials (nutrients) and they accumulate it into the apical end of these cell . Part of cells apically will be executed and will be part of the secretion (breast milk)

Types Of Secretion

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

Females breasts



This is 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.

those are the ones that are associated with hair follicles

- **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.

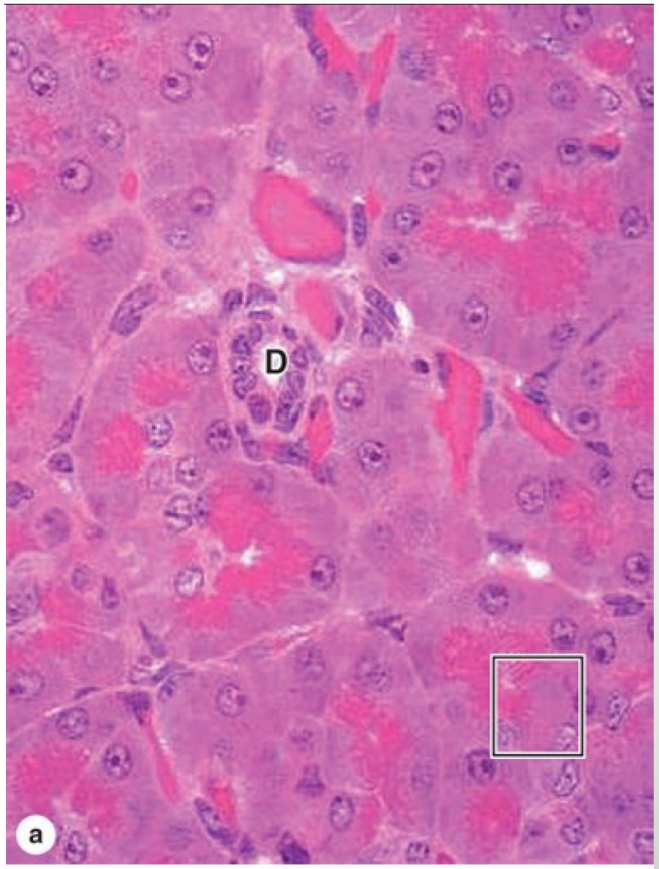
Nature Of Secretory Products.

- 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.
- **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.

Nature Of Secretory Products

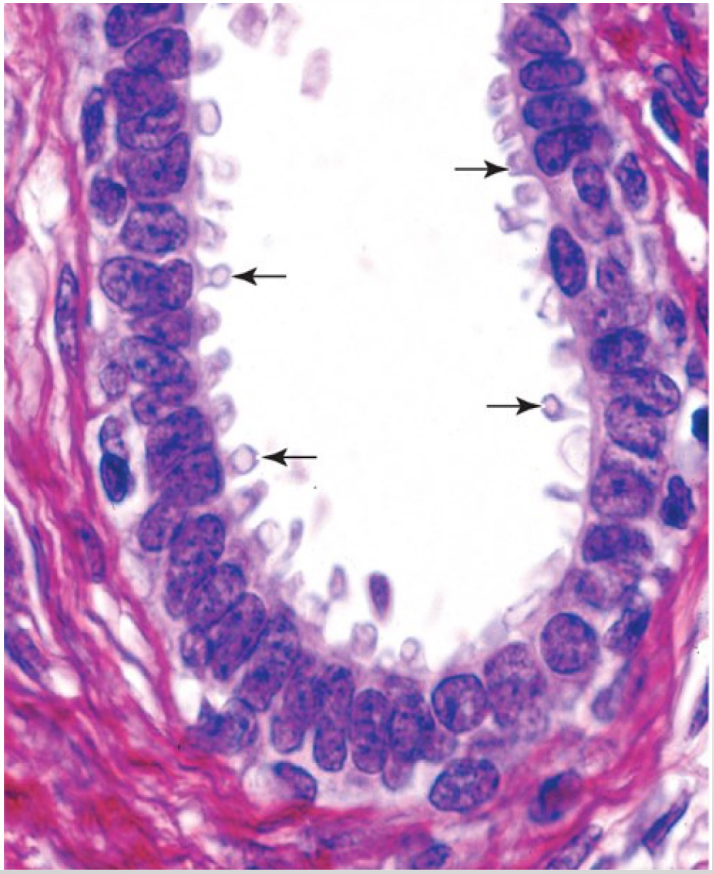
- Some salivary glands are mixed **seromucous** glands, having both serous acini and mucous tubules
- Myoepithelial cells: contractile at the basal ends of the secretory cells. Long processes of these cells embrace an acinus. Are rich in actin and myosin filament--- strong contractions serve to propel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

Merocrine



They synthesize and store their secretion into granules, then this granules will reach the apical surface then they will be exocytosis.

Apocrine

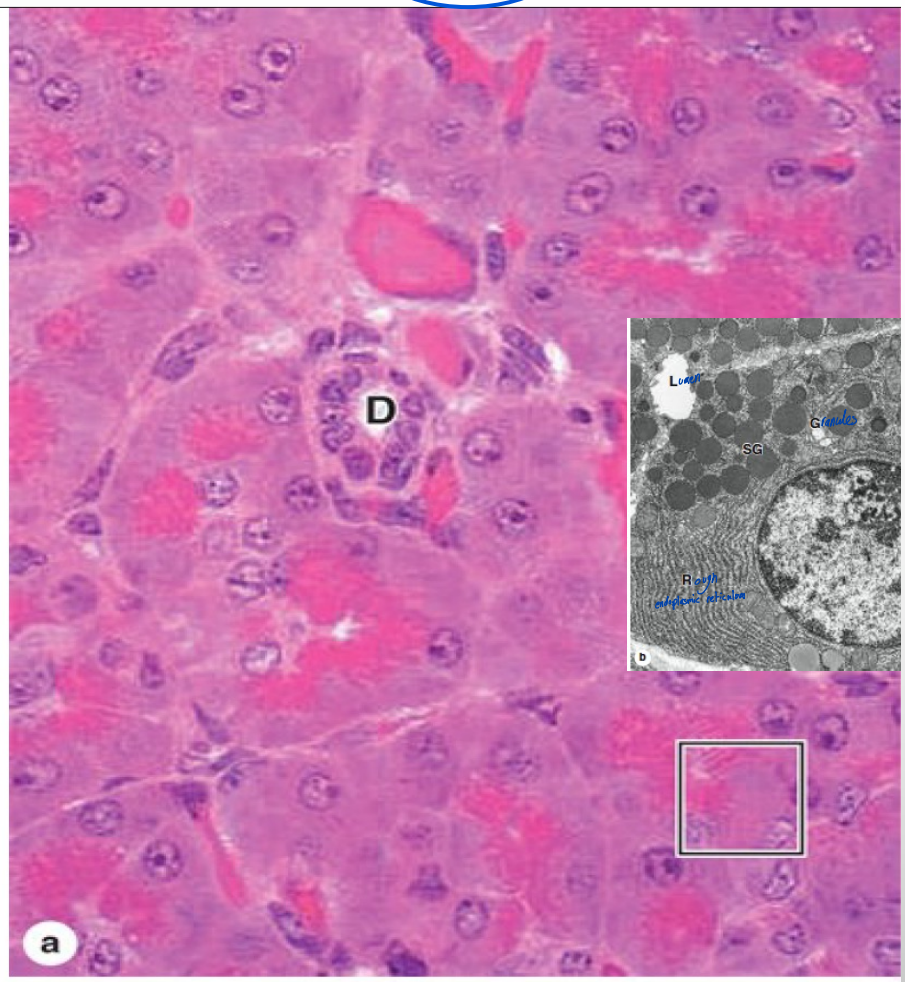


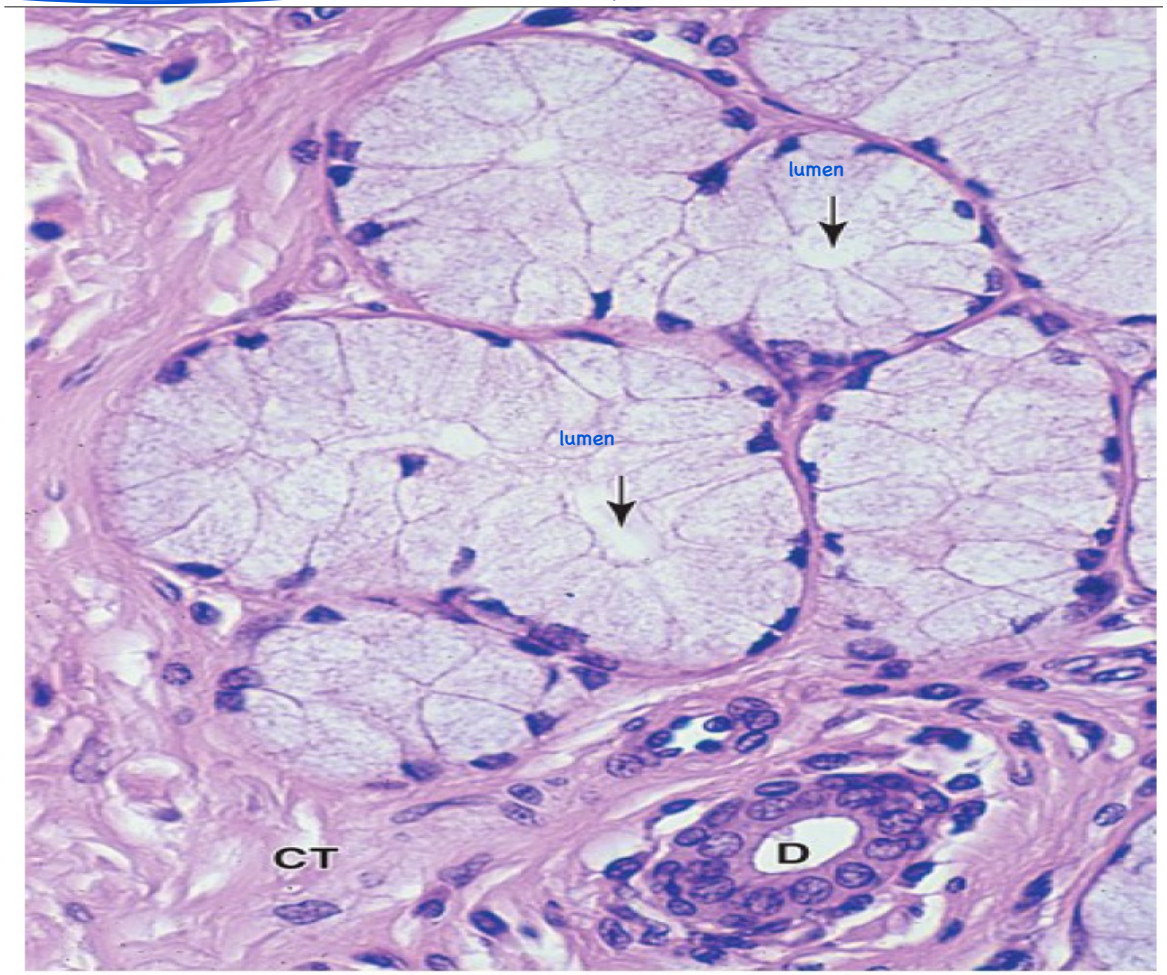
These cell will synthesize and accumulate their secretion into their apical surface, then apical part will be exocytosed and that will form the secretion of products.

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 as whole cell with its content and that eventually form what we called the sebum.

Serous and Mucous Secretory Cells



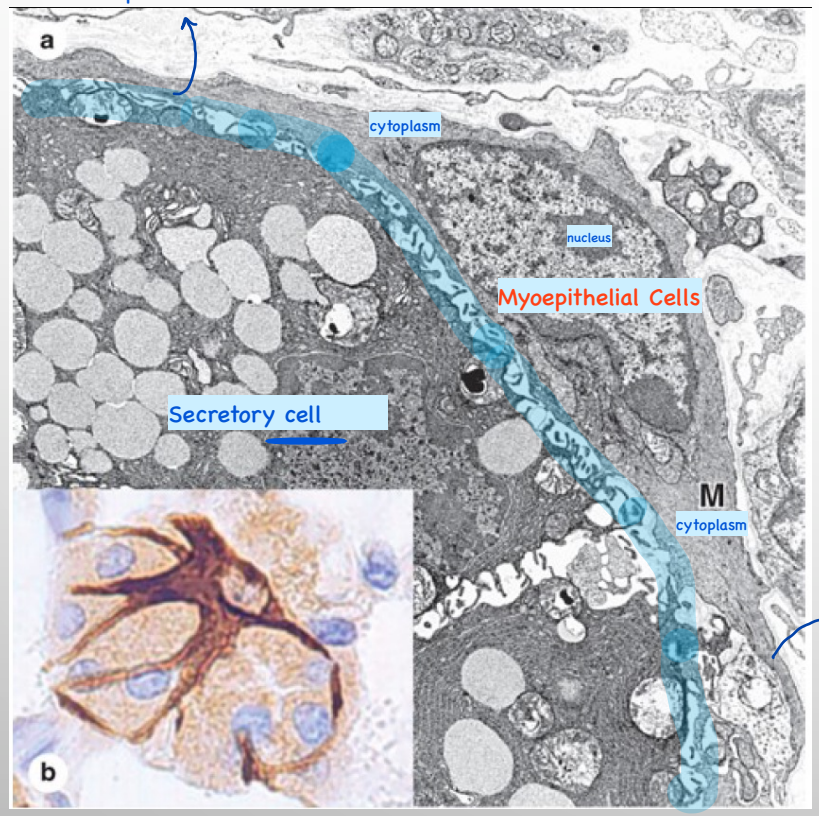


Their whitish or washed out appearance that's due to the hydrophilic nature of their glycosylated proteins.

Myoepithelial Cells

- In exocrine glands only

TEM



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

This image acquired via Immunohistochemical

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.

What is difference between the Immunohistochemistry and the immunofluorescence?
Immunohistochemistry staining we can use the Bright field microscope

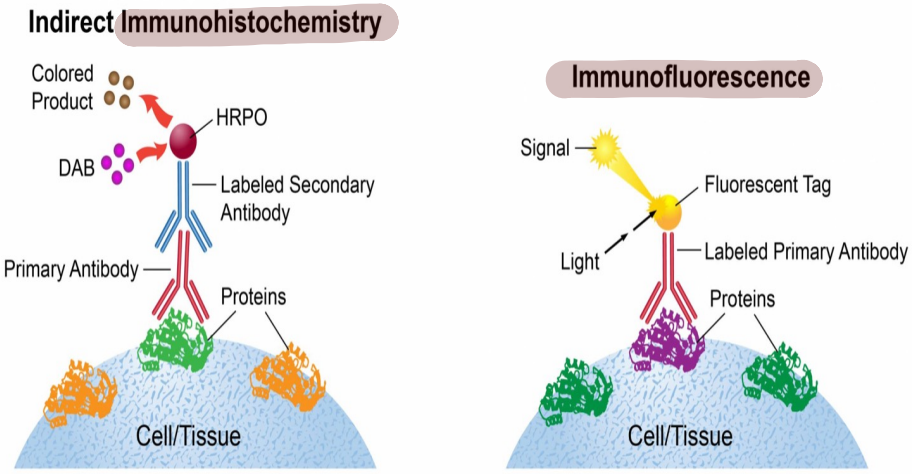


Diagram 1: *Illustration of Indirect Immunohistochemistry and Immunofluorescence methods.*

immunohistochemistry-02

The concept of antigen-antibody, I'm targeting a specific protein in these cells and I get the primary antibody that will bind to the antigen, then we always use a secondary antibody (to amplification of the signal) in immunohistochemistry it carries an enzyme whereas in immunoflouresence 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.
in immunohistochemistry staining if we have the antigen (primary and secondary)and we add the substrate the enzyme will work and then it will turn into a brownish color.