

# Epithelial tissue

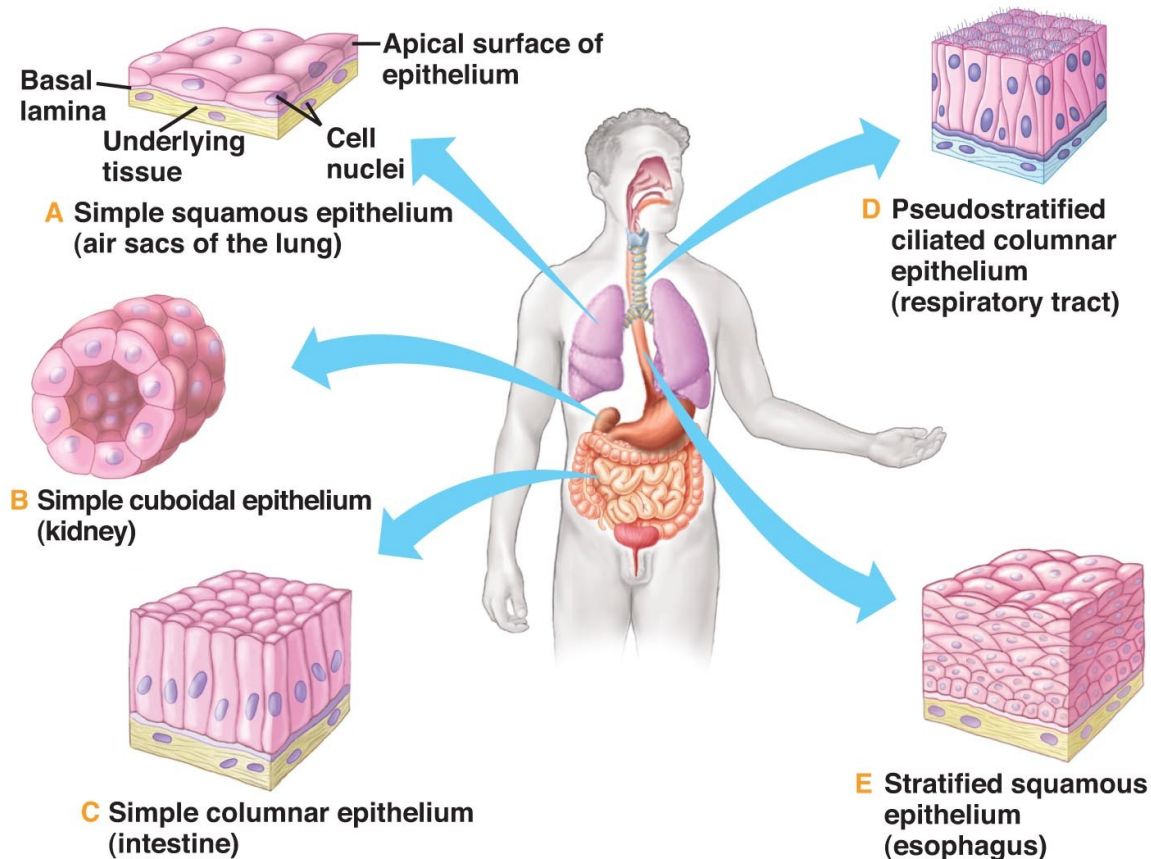
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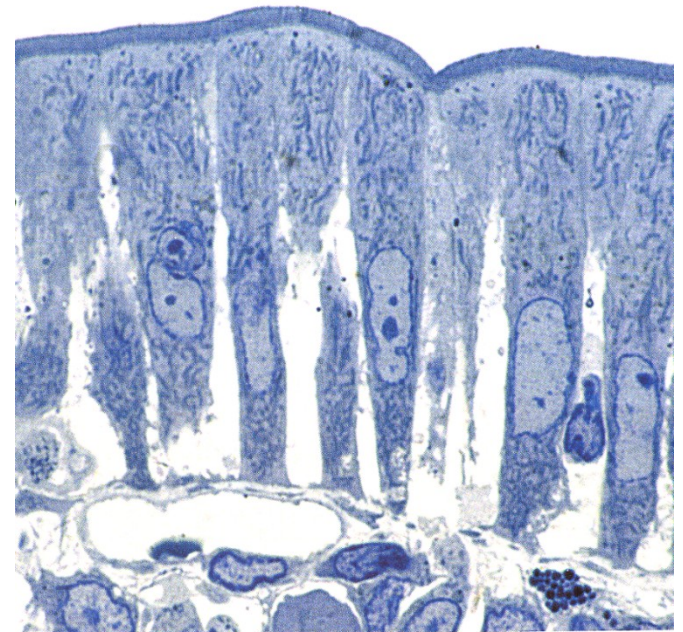
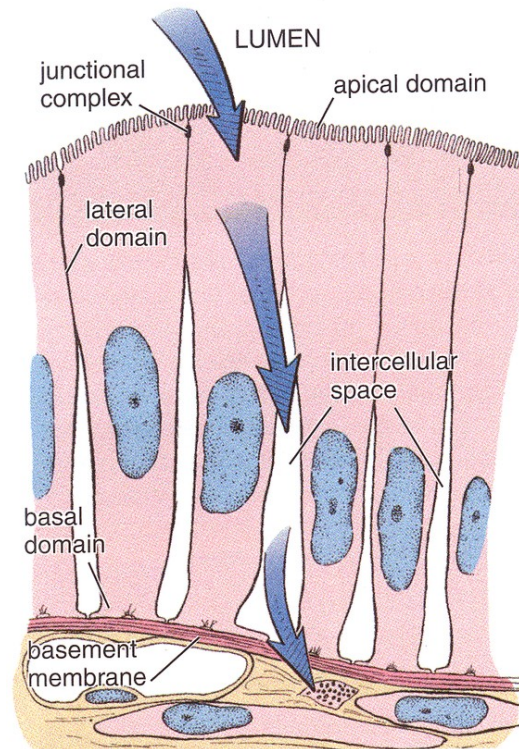
# General characteristics of epithelium

- Lining of cavities or interfaces of open space
- Inner linings of vessels – endothelia
- Visceral and parietal mesothelium – lining of pleura, peritoneum, pericardium
- Clusters or cords of cells with secreting function
- Resorptive, sensory or simply protective functions



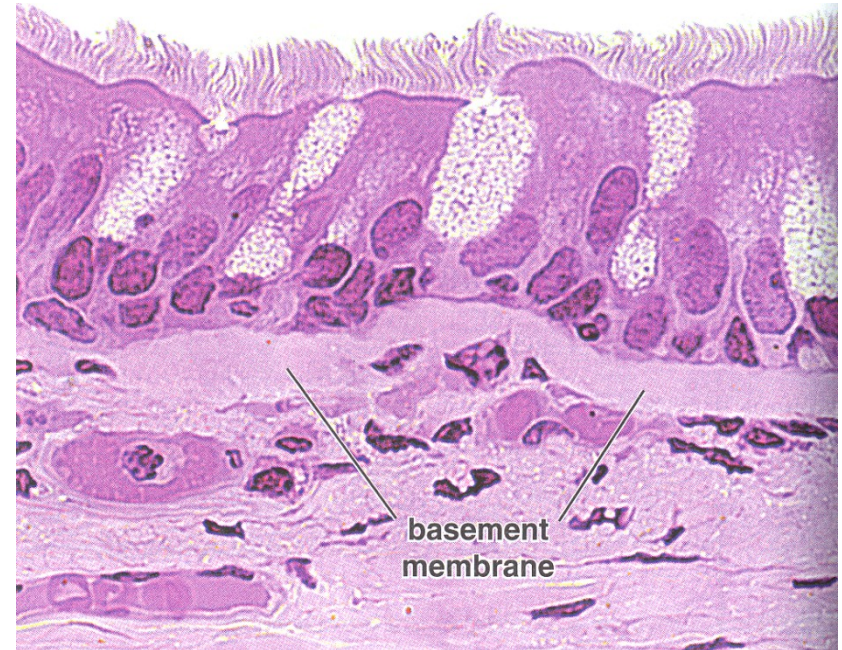
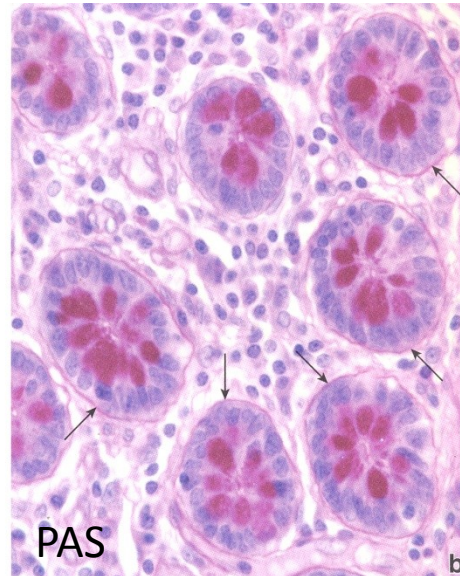
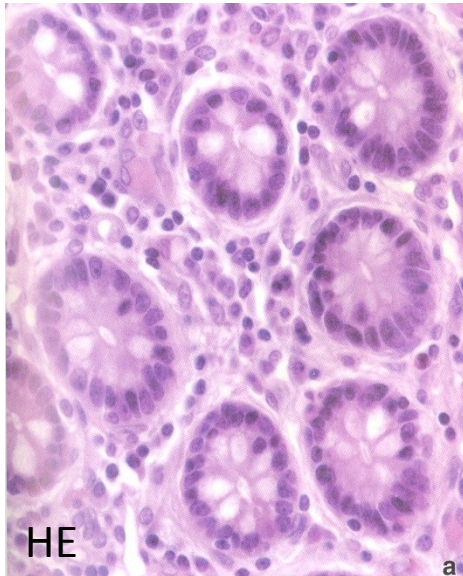
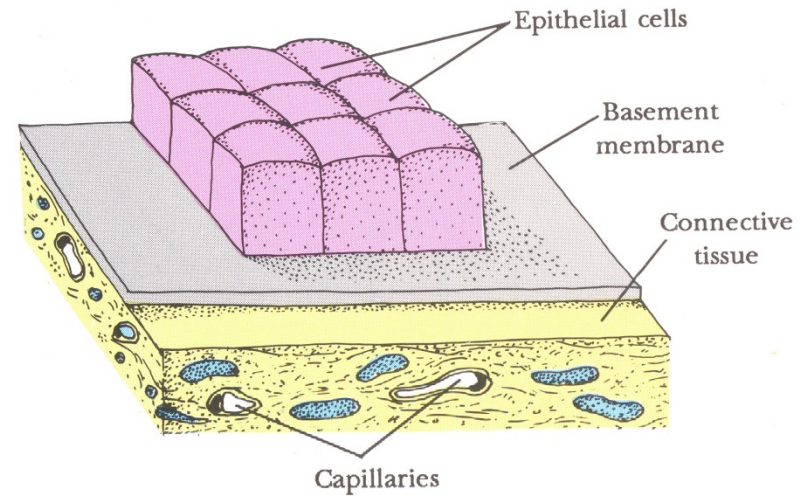
# General characteristics of epithelium

- Avascular (without blood supply) – nutrition by diffusion from a highly vascular and innervated area of loose connective tissue (*lamina propria*) just below the basement membrane
- Highly cellular – cohesive sheet or groups of cells with no or little extracellular matrix
- Typical morphology and cell connections

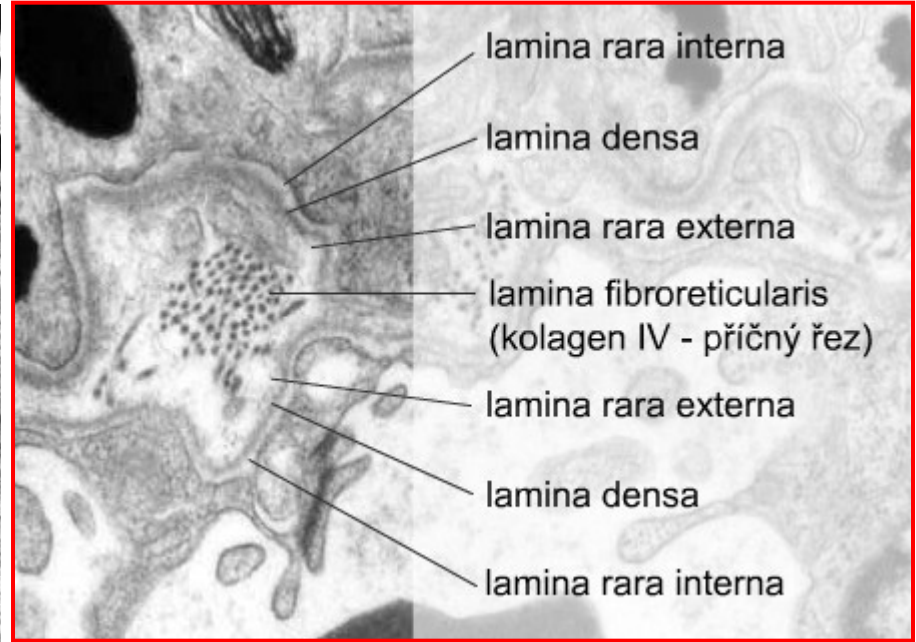
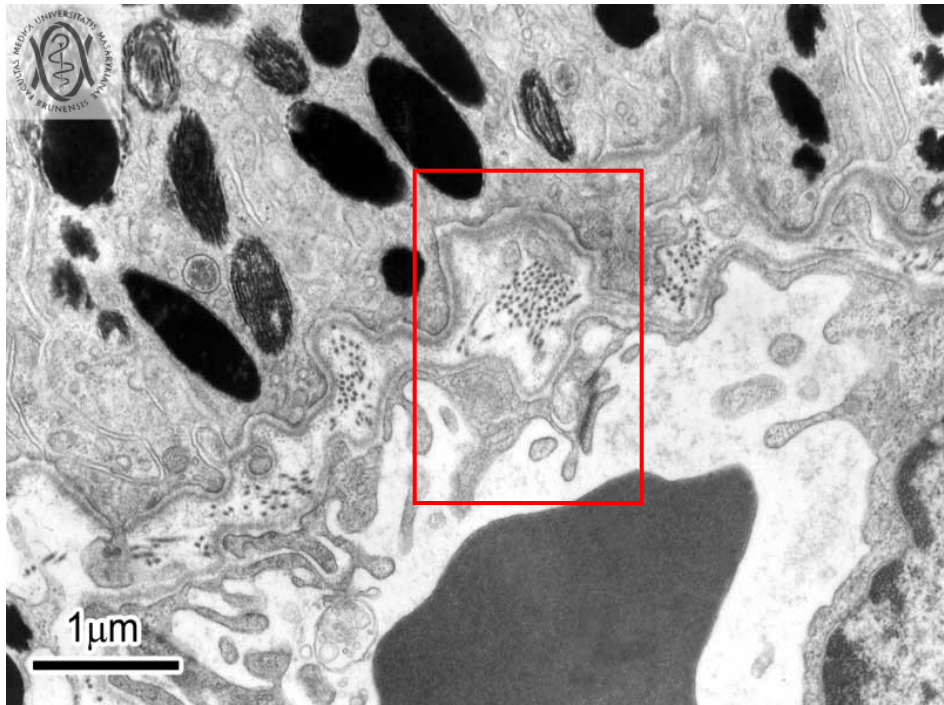


# Basement membrane

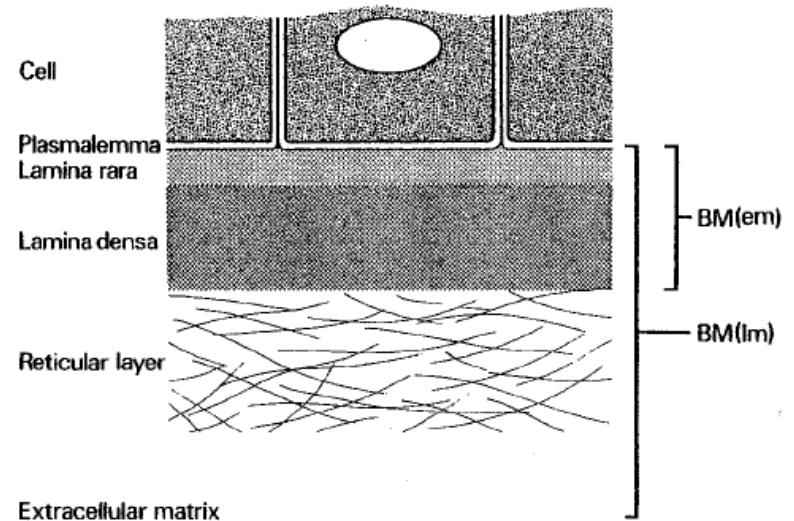
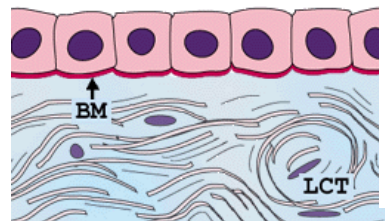
- Attachment of epithelium to underlying tissues
- Selective filter barrier between epithelial and connective tissue
- Communication, differentiation



# Basement membrane

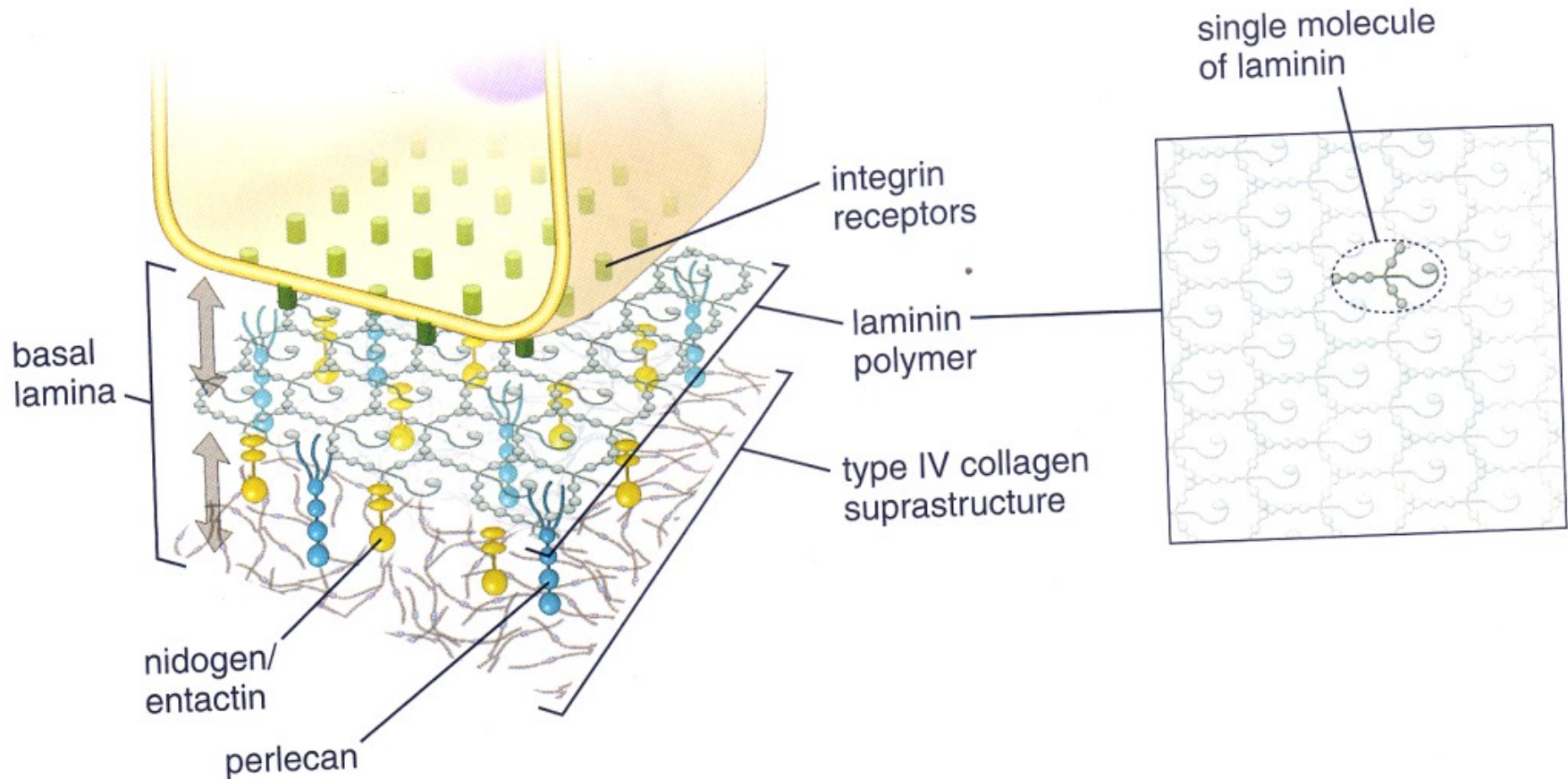


- Two basic layers
  - lamina basalis
    - lamina densa,
    - lamina rara ext. et int.
  - lamina fibroreticularis



# Basement membrane

- Glycosaminoglycans – heparansulphate
- Laminin, collagen III, IV, VI



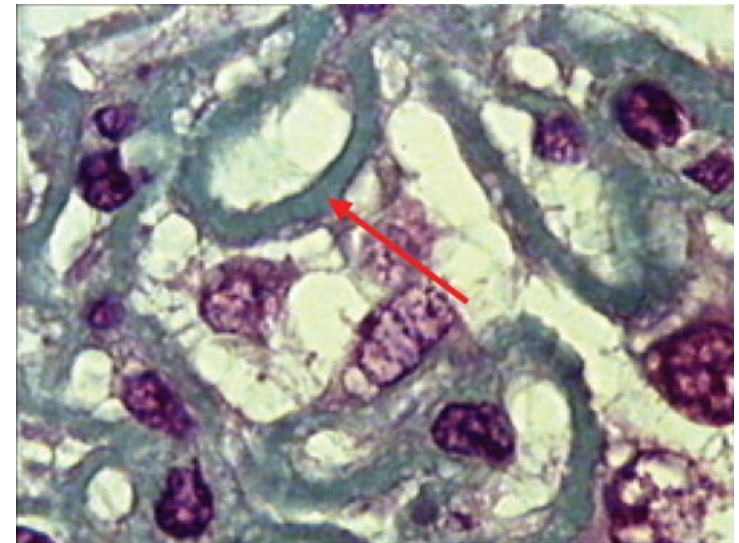
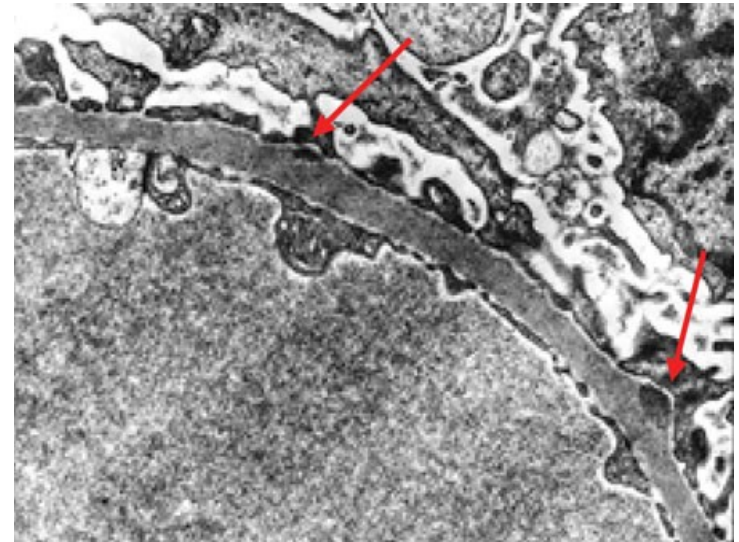
# Basement membrane

## Tissue specific distribution

- Descemet's membrane (under endothelial layer of cornea)
- Glomerular basement membrane (Bowman capsule)
- part of Bruch's membrane in retina
- ....

## Pathology example- Membranous glomerulonephritis

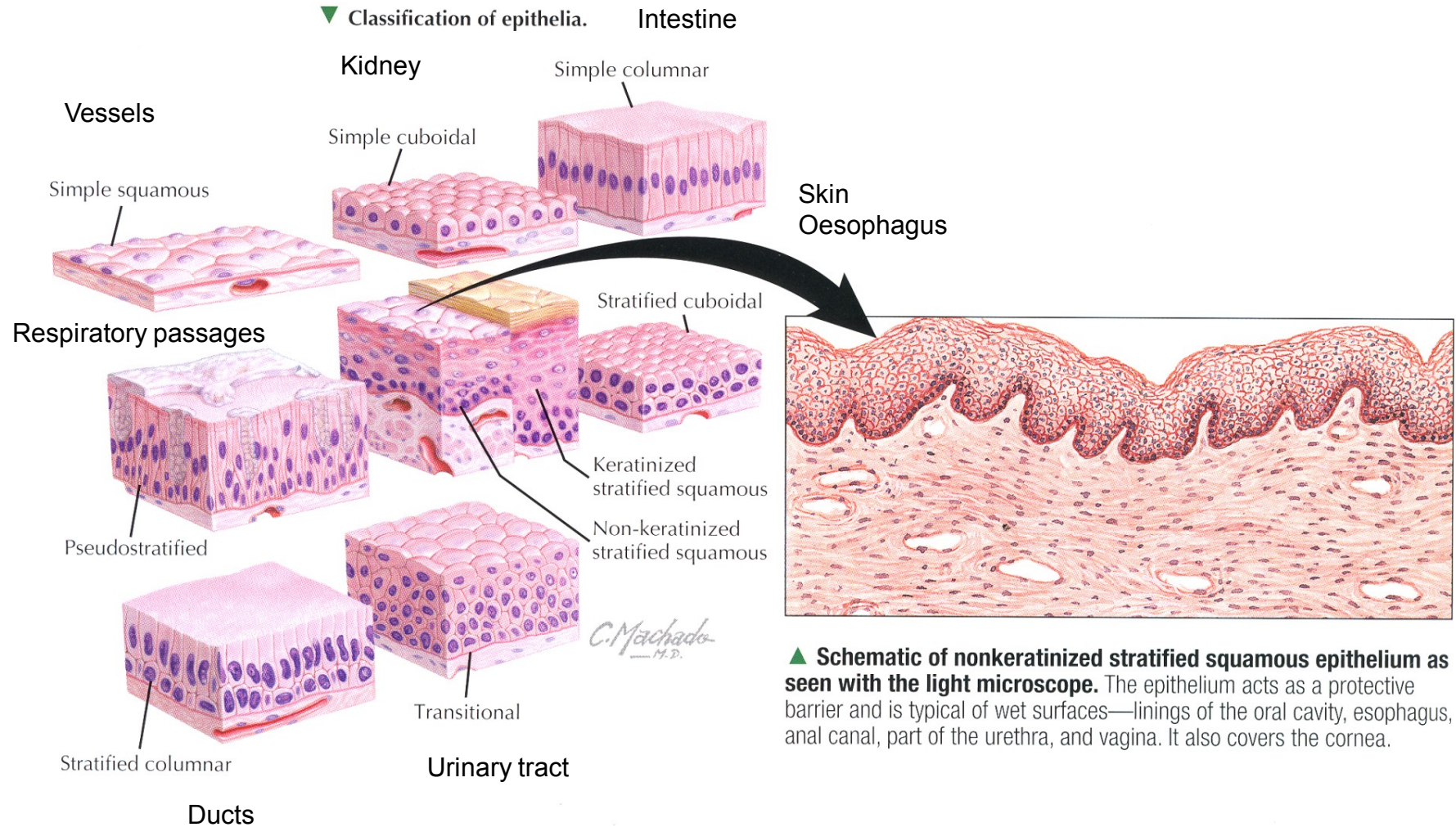
- circulating antibodies bind to glomerular basement membrane
- complement (C5b-C9) complex forms and attacks glomerular epithelial cells
- filtration barrier is compromised
- proteinuria, edema, hematuria, renal failure



# Classification of epithelial tissues

## Covering epithelium

### ▼ Classification of epithelia.

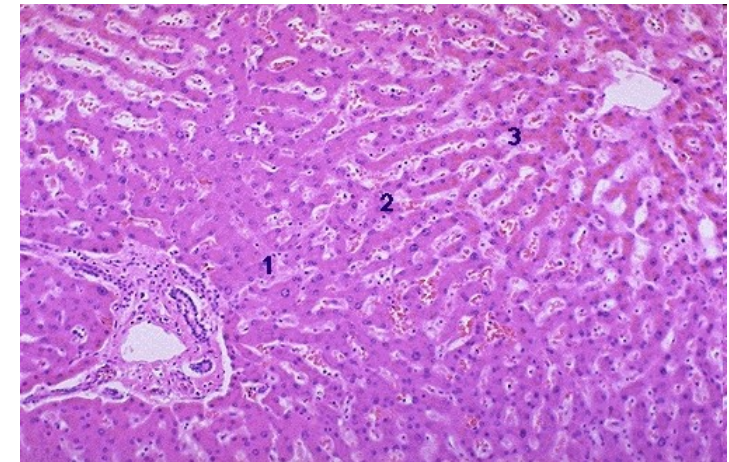
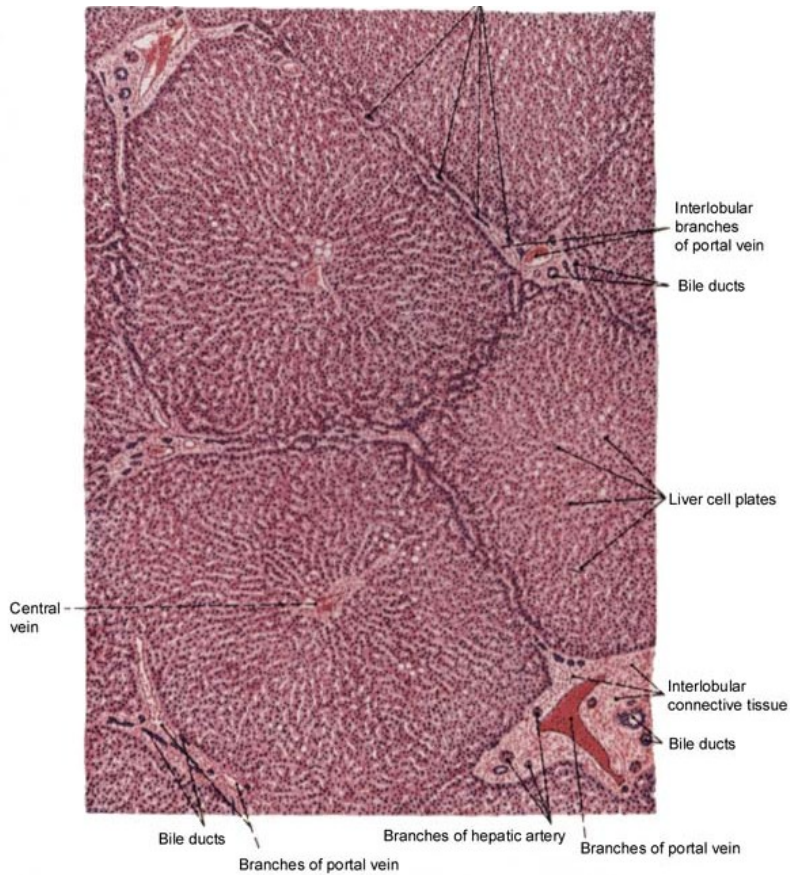
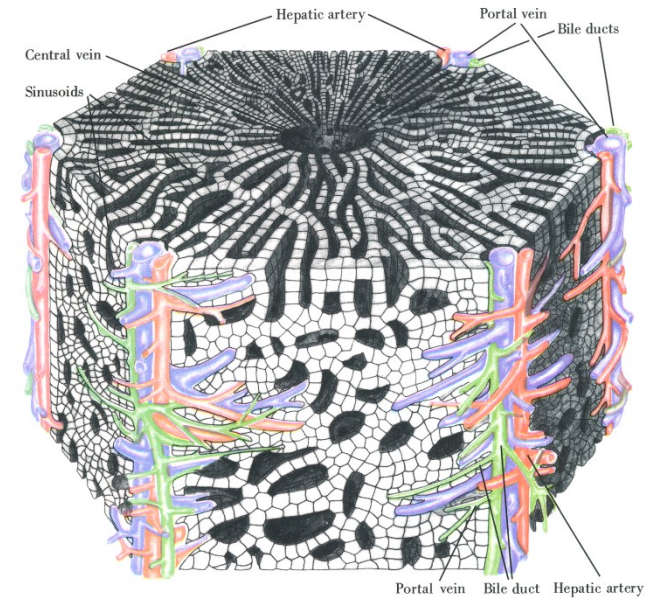




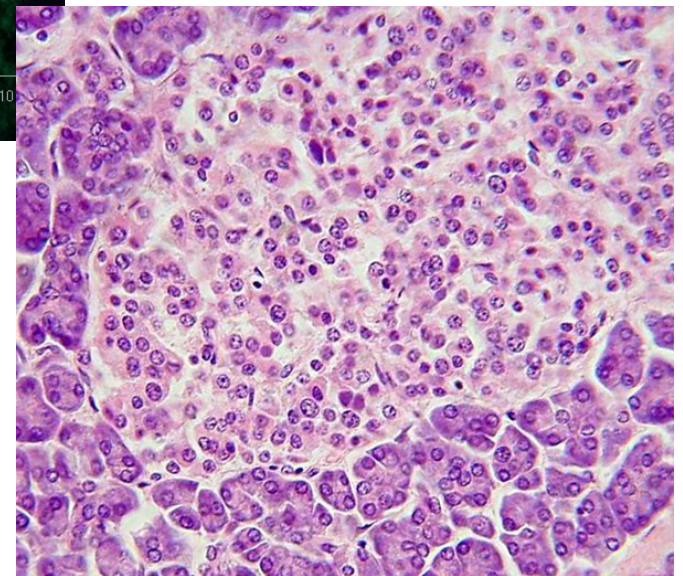
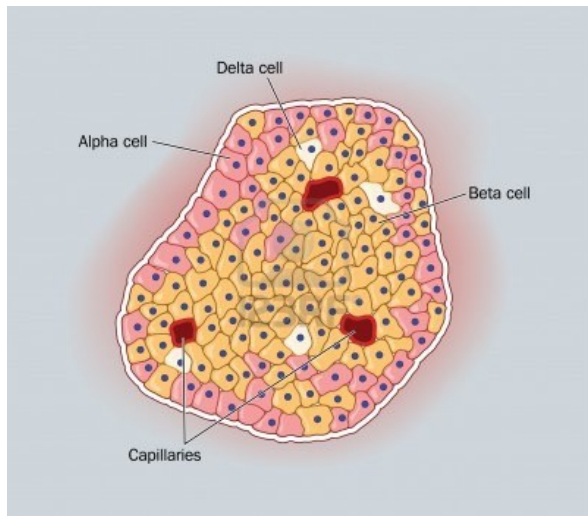
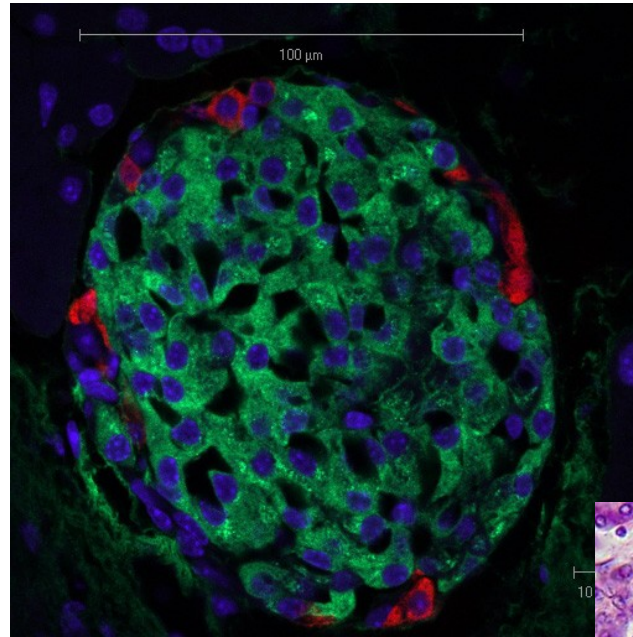
# Classification of epithelial tissues

## Trabecular epithelium

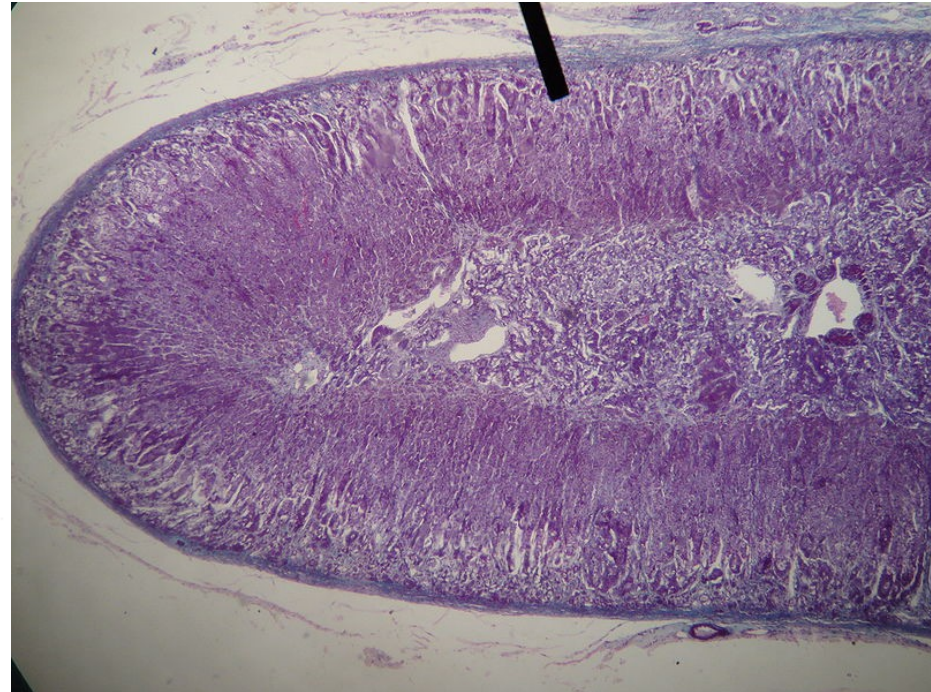
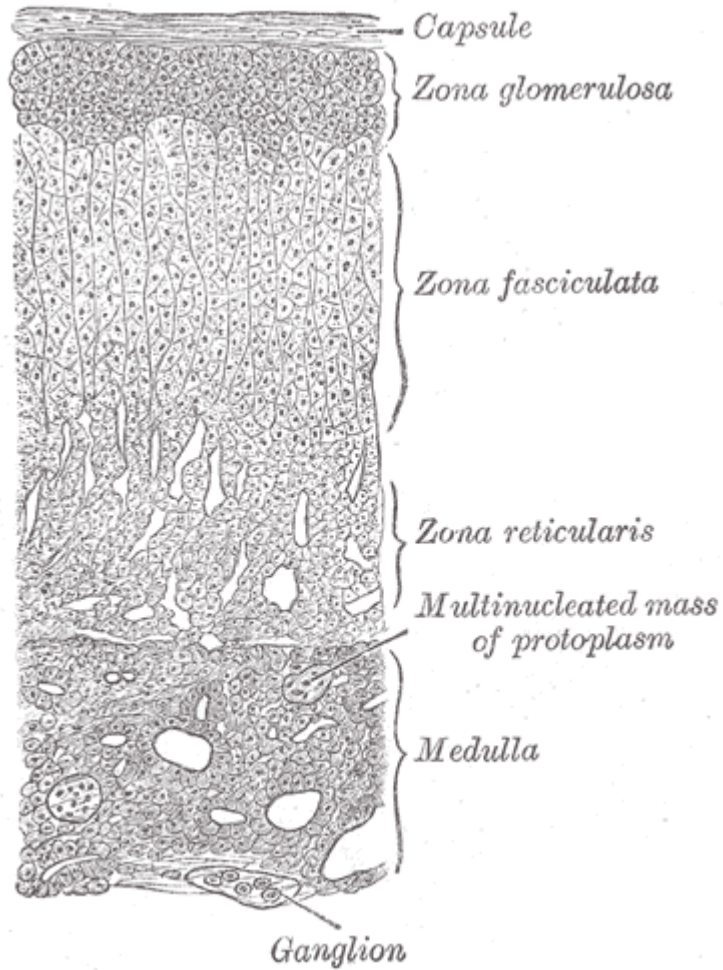
(Liver)



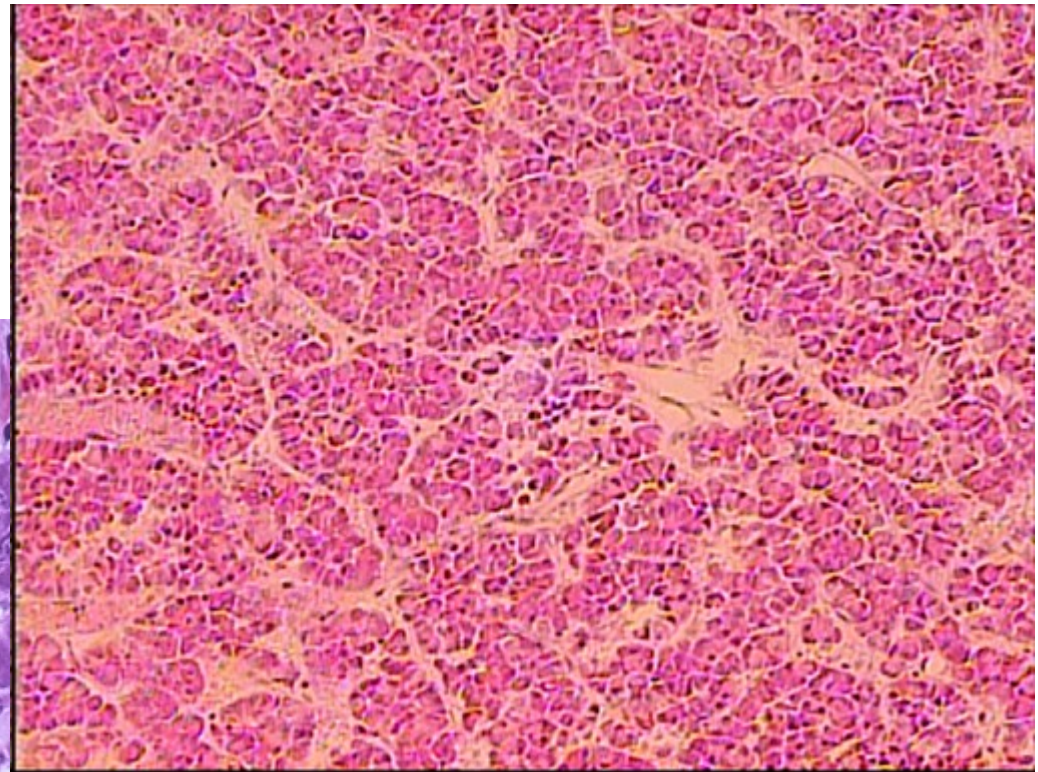
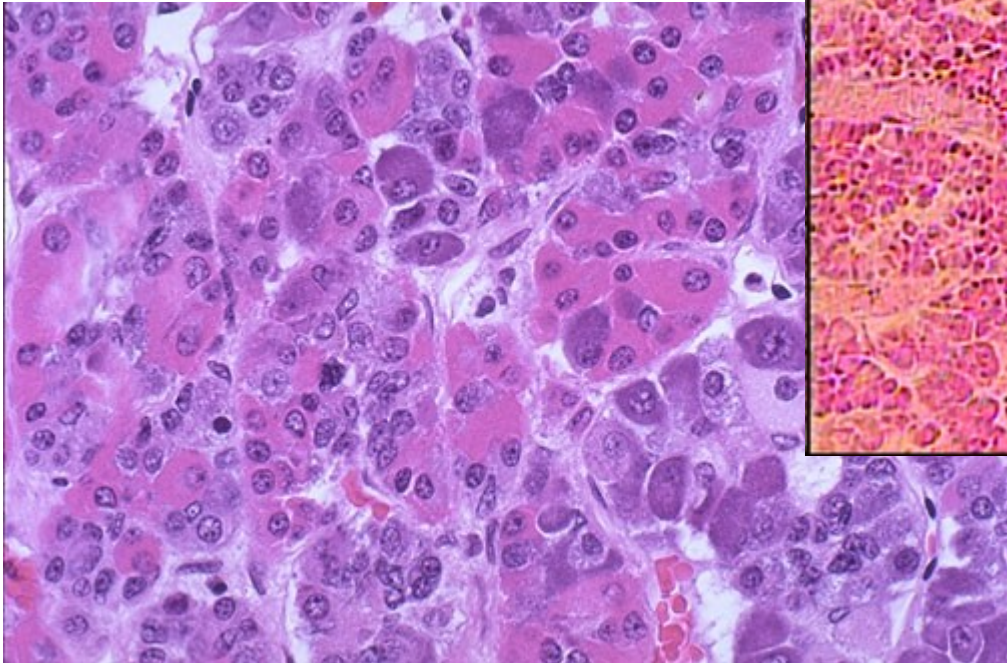
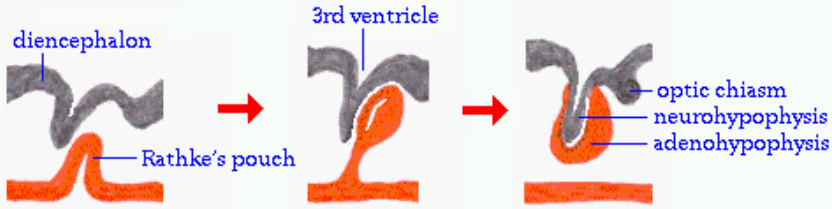
# Langerhans islets



# Adrenal cortex



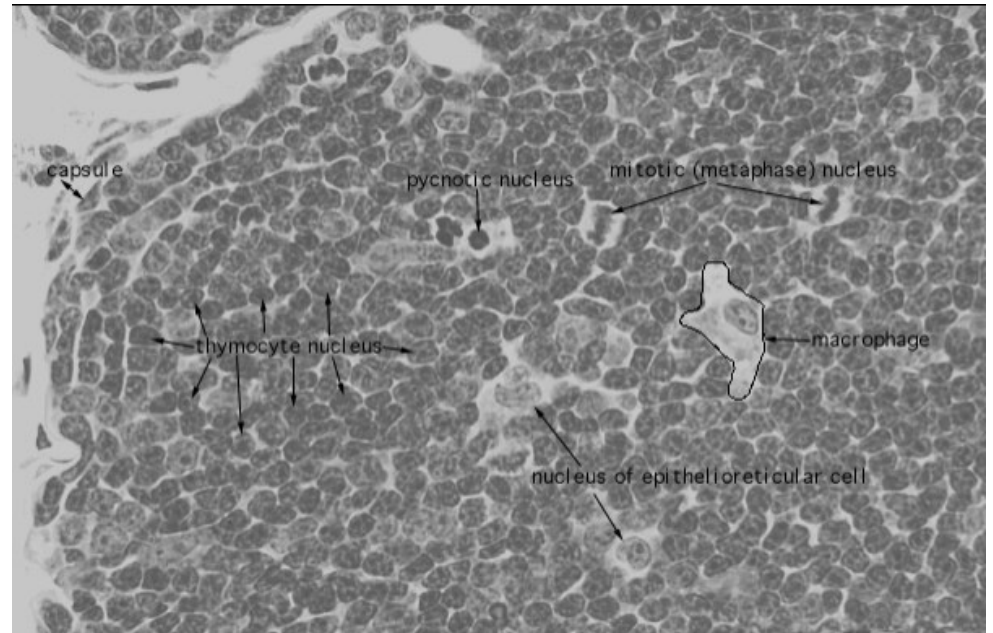
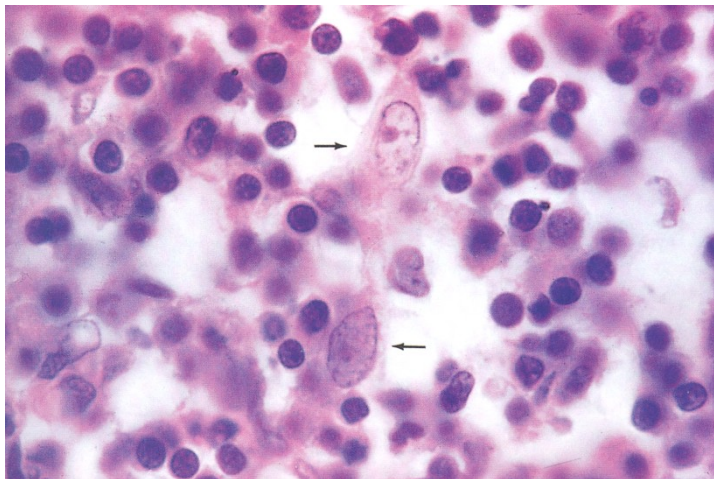
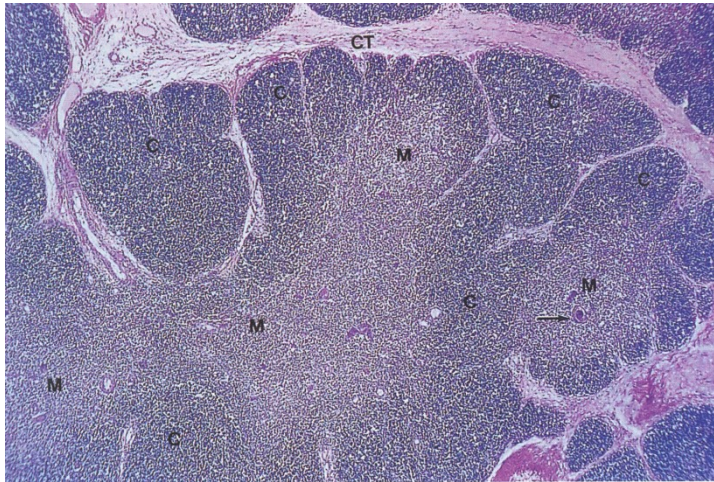
# Adenohypophysis – anterior pituitary



# Classification of epithelial tissues

## Reticular epithelium

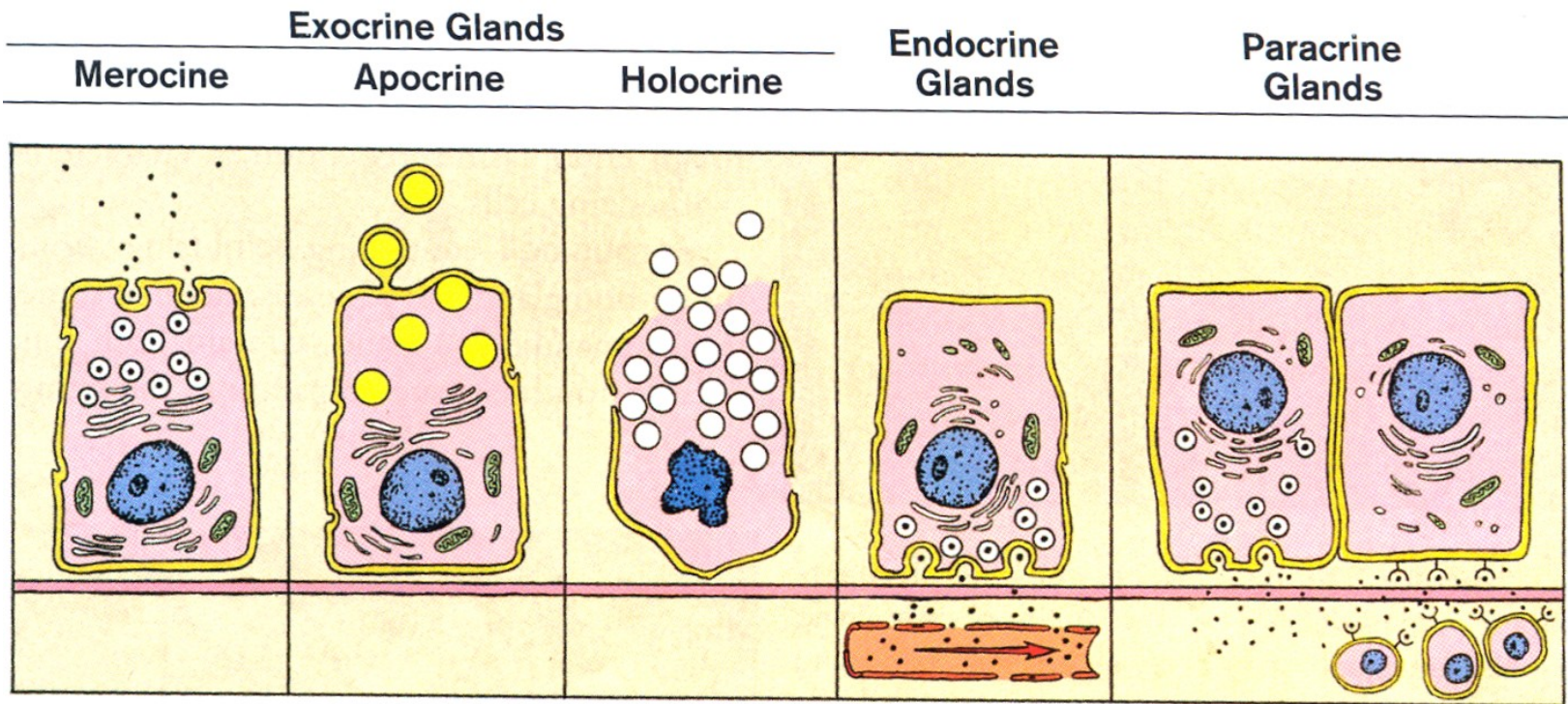
(Thymus)



# Epithelium may possess a function

- Glandular epithelium

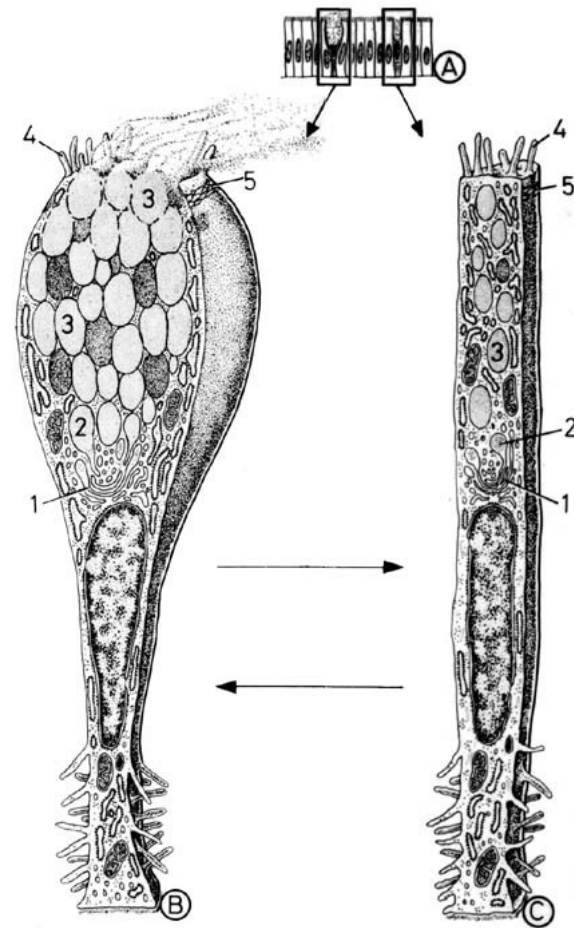
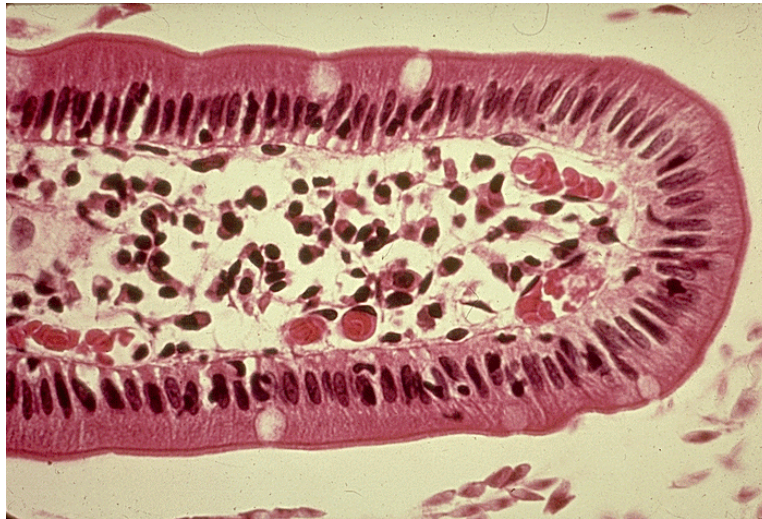
Process of secretion:



# Glandular epithelium

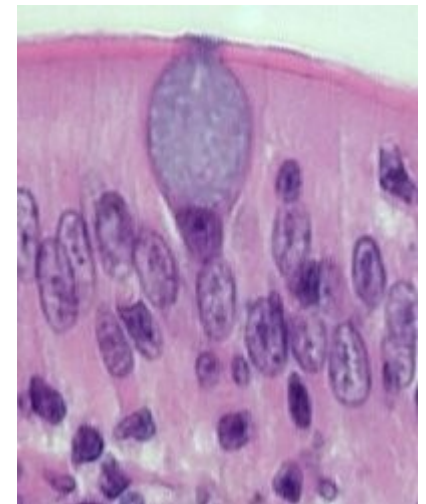
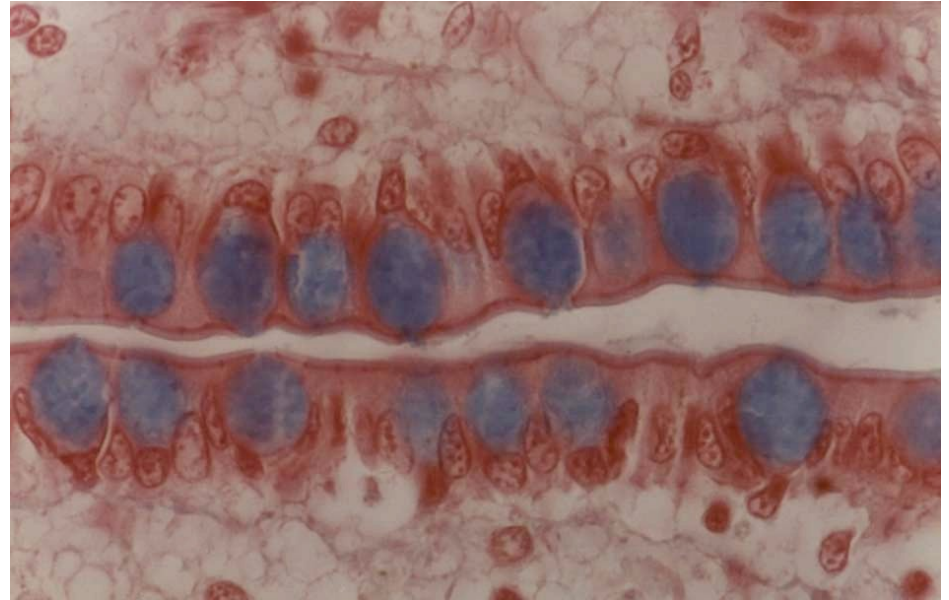
## Single cell

- Goblet
- Enteroendocrine



# Goblet cells

- Mainly respiratory and intestinal tract
- Produce mucus = viscous fluid composed of electrolytes and highly glycosylated glycoproteins (mucins)
- Protection against mechanical shear or chemical damage
- Trapping and elimination of particulate matter
- Secretion by secretory granules constitutive or stimulated
- After secretion mucus expands extremely – more than 500-fold in 20ms
- Dramatic changes in hydration and ionic charge
- Chronic bronchitis or cystic fibrosis – hyperplasia or metaplasia of goblet cells





- **Multicellular glands**
  - **Endoepithelial**
  - **Exoepithelial**
    - **Shape of secretion part**
      - Alveolar
      - Tubulous
      - Tuboalveolar
    - **Branching**
      - Simple
      - Branched
      - Compound
    - **Secretion**
      - Mucous
      - Serous
      - Compound

# Multicellular glands

- Endoepithelial

- Exoepithelial

- Shape of secretion part

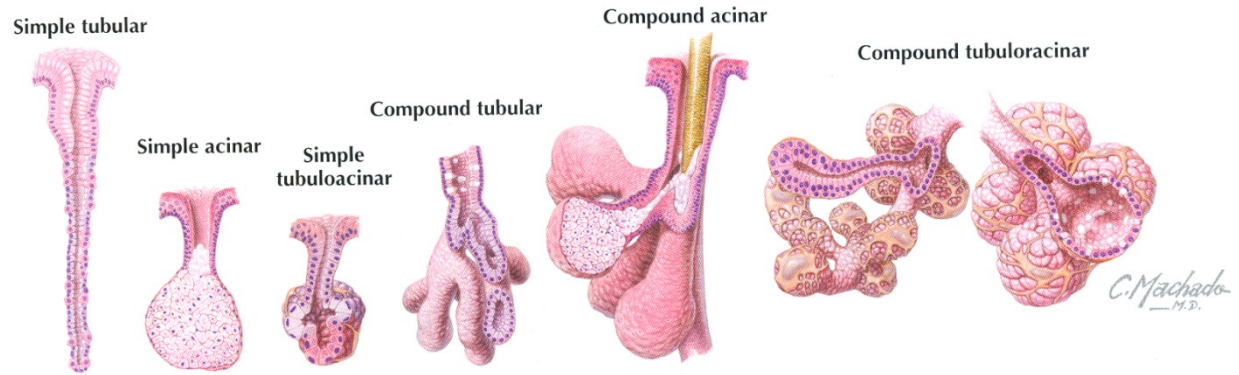
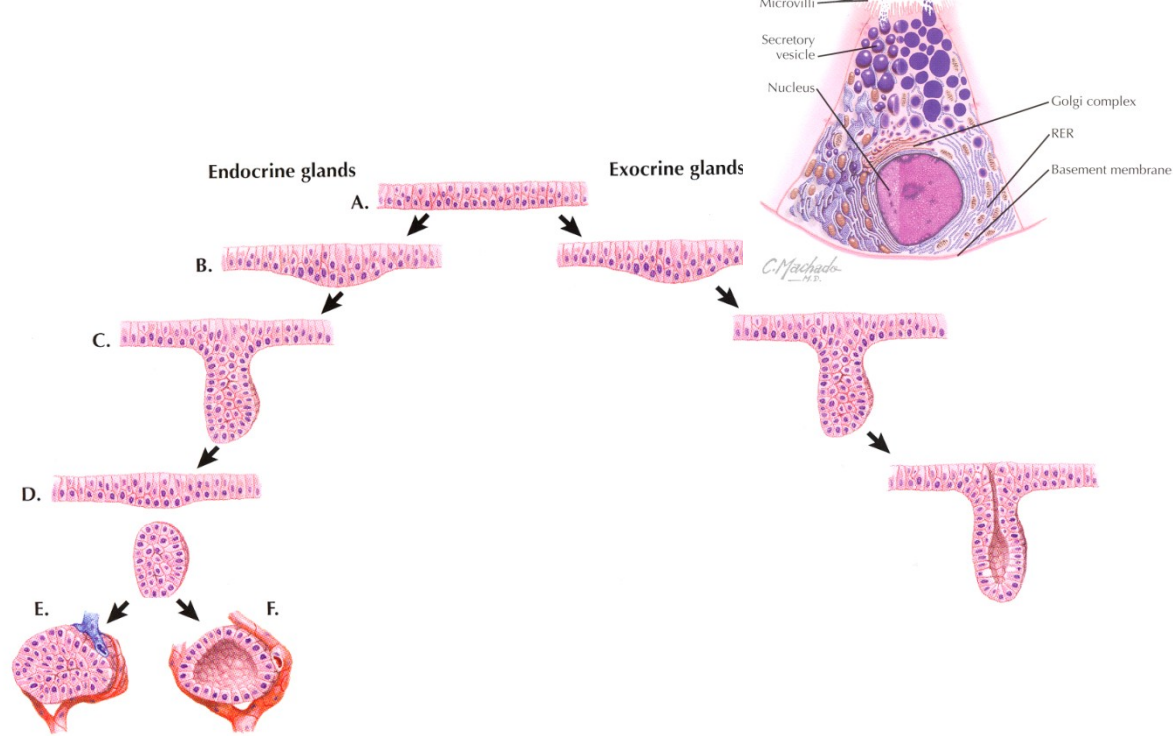
- Alveolar
- Tubulous
- Tuboalveolar

- Branching

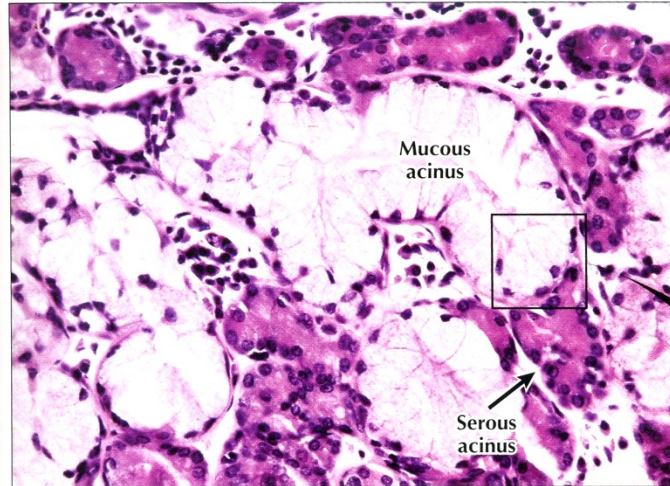
- Simple
- Branched
- Compound

- Secretion

- Mucous
- Serous
- Compound

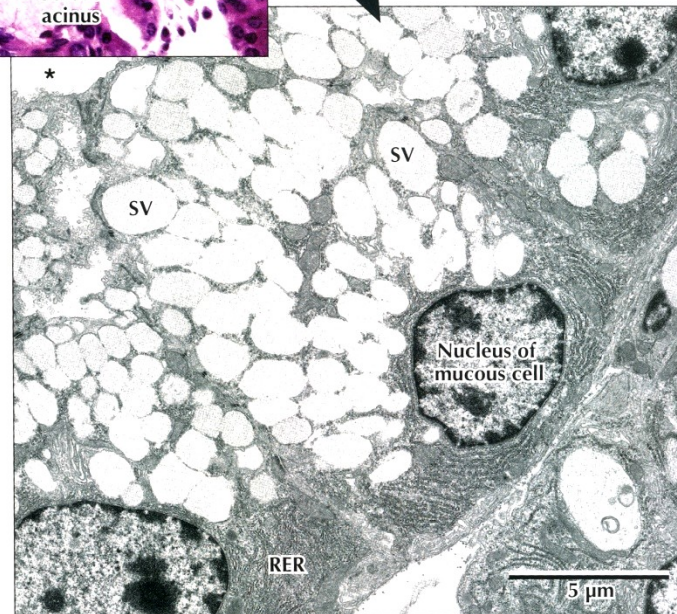


# Mucous glands

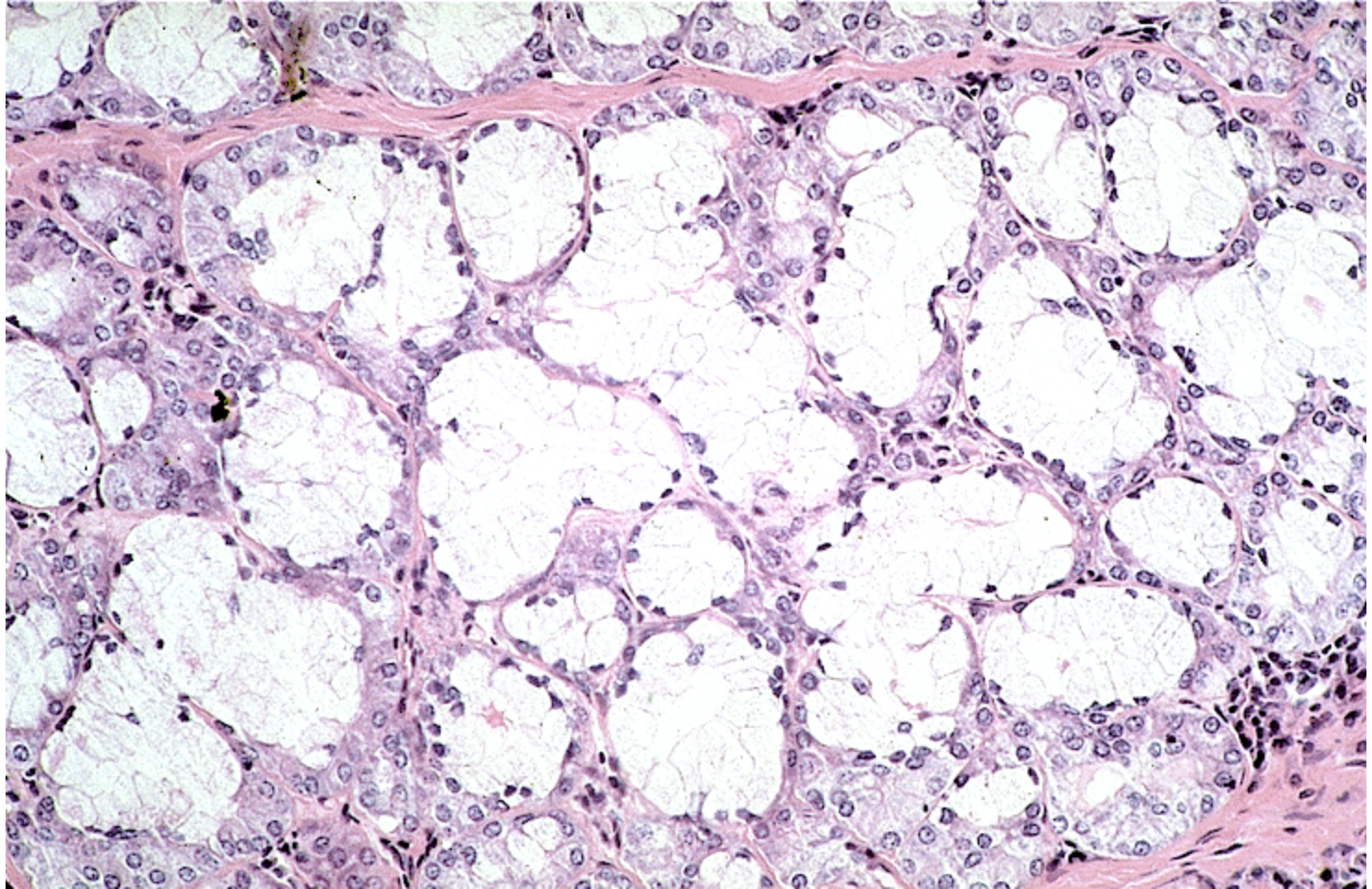


◀ **LM of part of a mixed seromucous gland in the trachea.** Several mucous acini with pale-stained mucous cells are seen. The basal nuclei are flat, and cells appear washed out because mucous droplets dissolved during specimen preparation. Darker stained serous cells in adjacent acini have more rounded basal nuclei. Serous cells are smaller than mucous cells. The square outlines the area of interest seen in the EM below. 295 $\times$ . H&E.

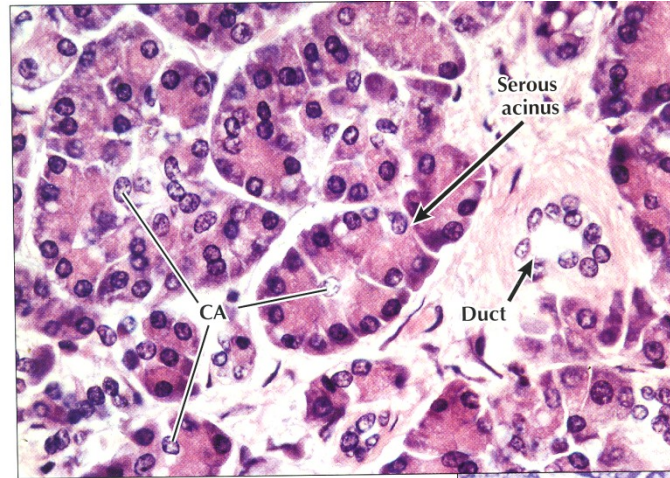
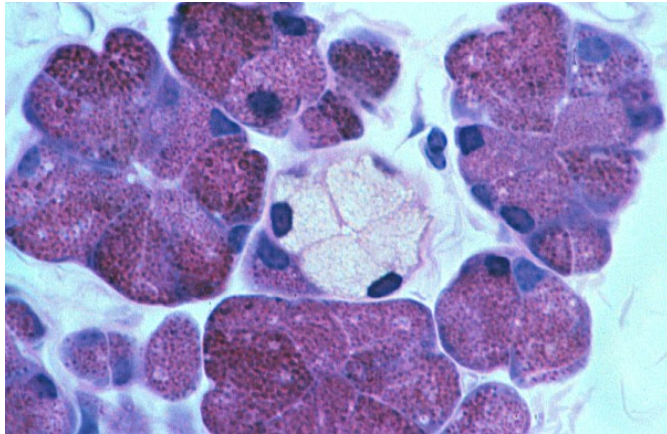
▶ **EM of part of a mucous acinus in a mixed salivary gland.** Parts of three mucous cells line the acinus lumen (\*). Euchromatic basal nuclei have prominent nucleoli. Basal cytoplasm contains many profiles of rough endoplasmic reticulum (RER). Many large, electron-lucent secretory vesicles (SV) dominating the remaining cytoplasm are discharged by exocytosis into the acinus lumen. 5400 $\times$ .



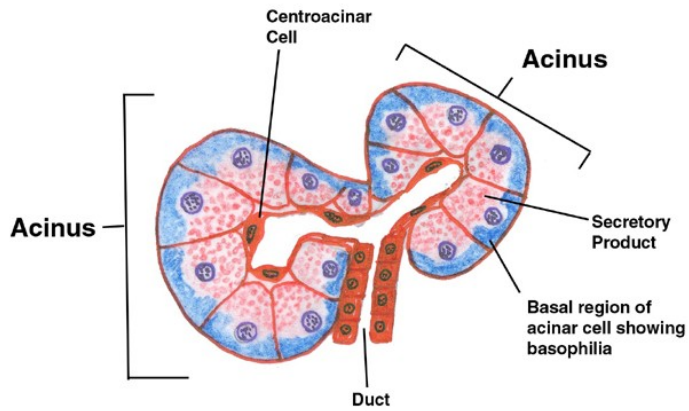
# Mucous glands



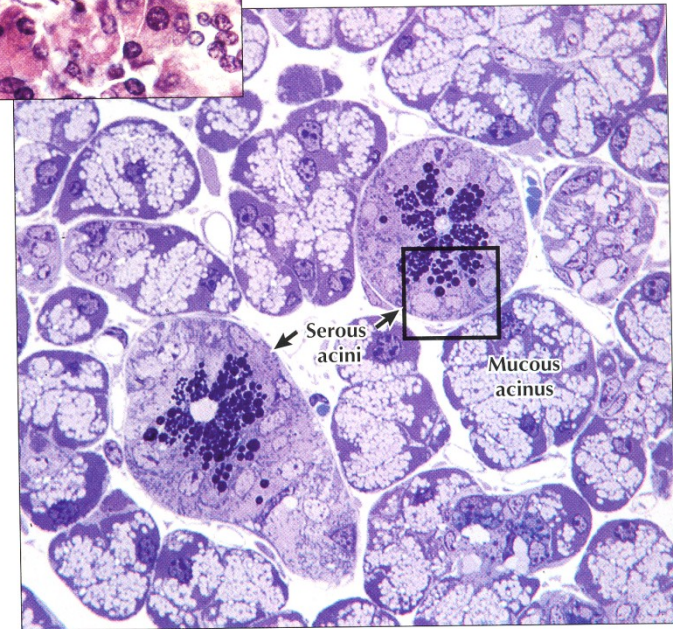
# Serous glands



◀ **LM of part of the exocrine pancreas.** The exocrine part of the gland consists of closely packed spherical or pear-shaped serous acini. Several columnar to pyramidal acinar cells, with round basal nuclei, face a small central lumen in each **serous acinus**. Basal cytoplasm is basophilic; apical cytoplasm is more eosinophilic. Small clear centroacinar cells (**CA**) in acini centers help distinguish this purely serous gland from others, such as the parotid salivary gland. A small **duct**, in the connective tissue stroma, conveys secretions from acini to larger pancreatic ducts. 385 $\times$ . H&E.

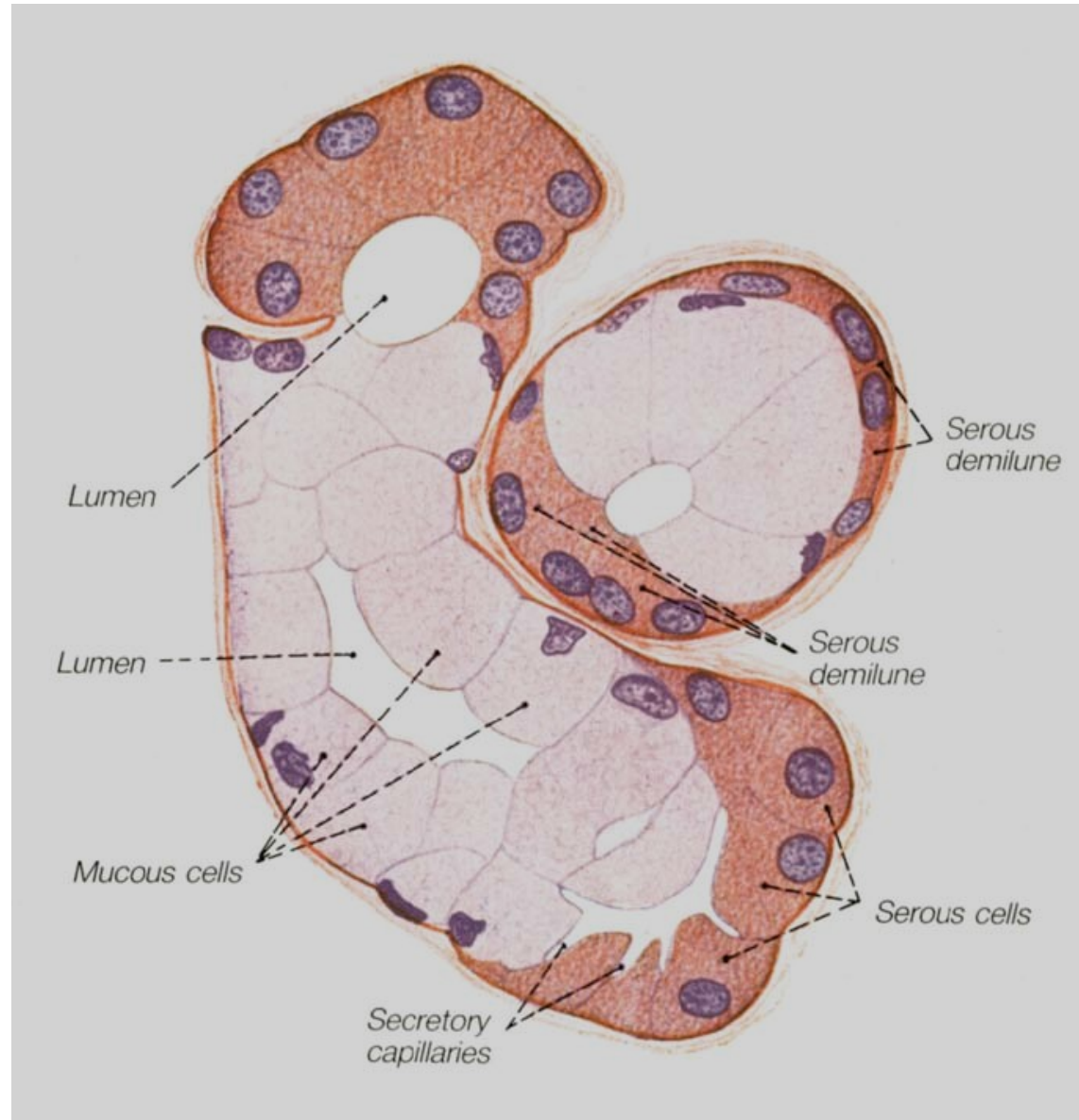


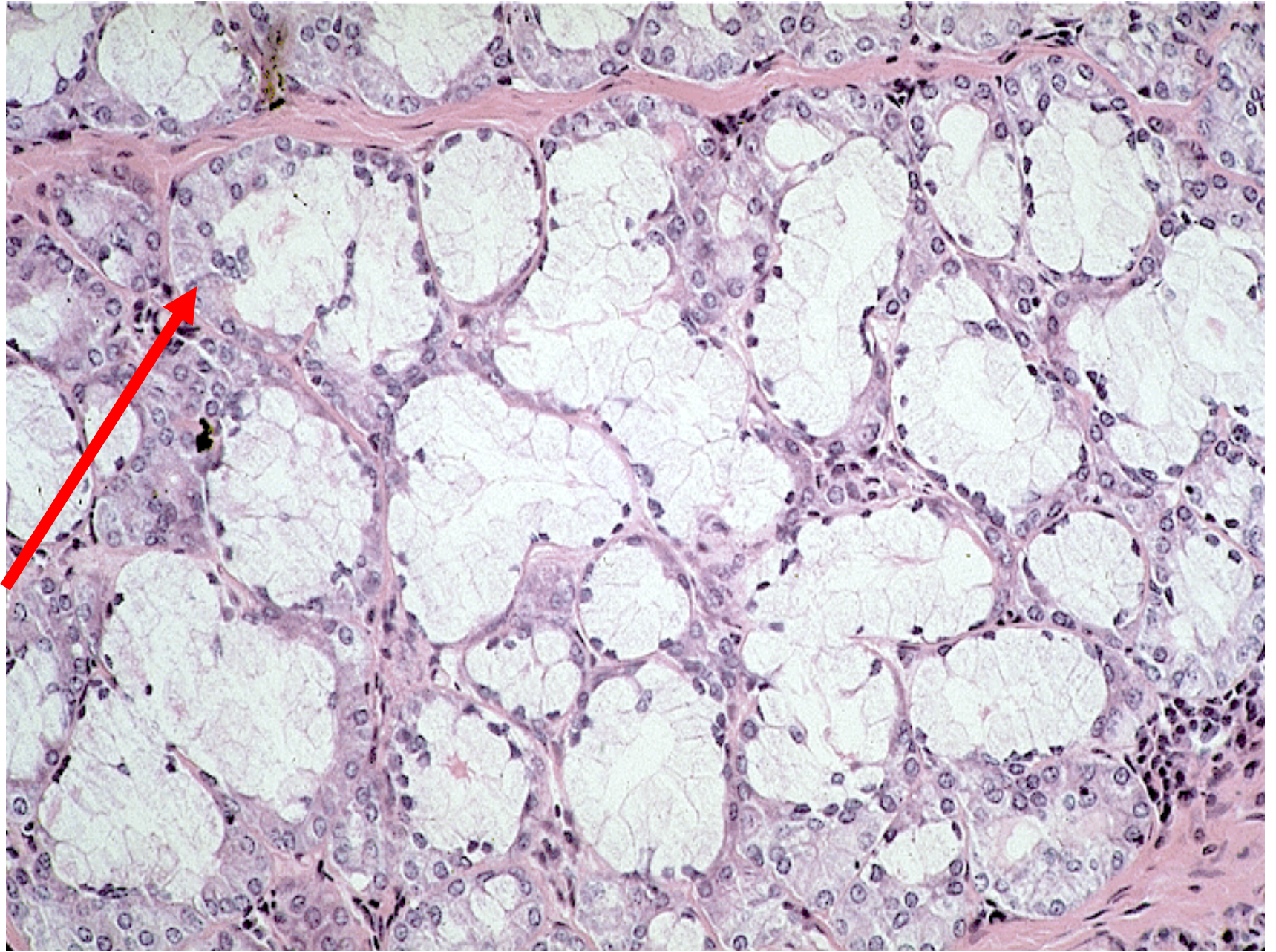
▶ **LM of part of a mixed salivary gland.** Several pale **mucous acini** surround two round **serous acini**. Serous cells have conspicuous, dark-stained secretory vesicles; mucous cells look vacuolated and washed out. EM in 2.15 shows the area in the square in detail. 600 $\times$ . Toluidine blue, plastic section.



# Compound glands

- both serous and mucous component





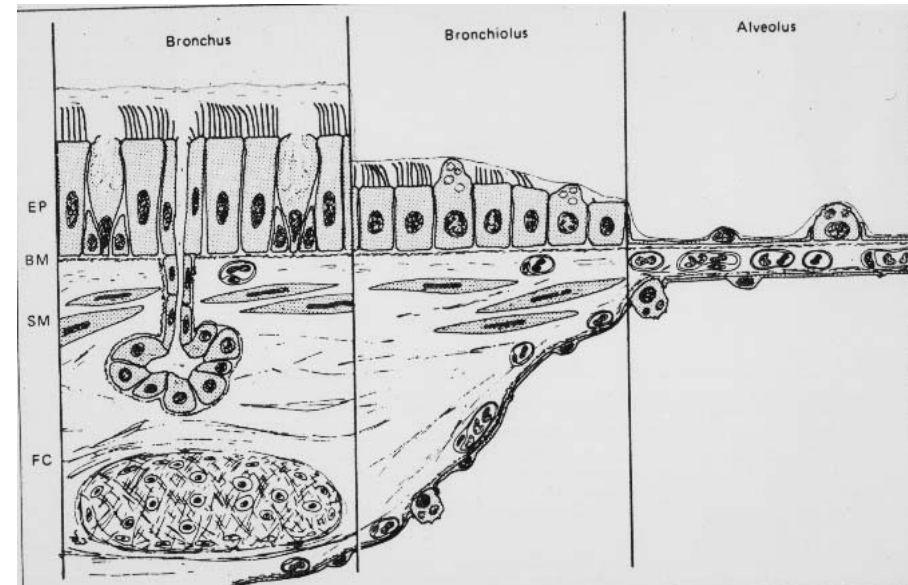
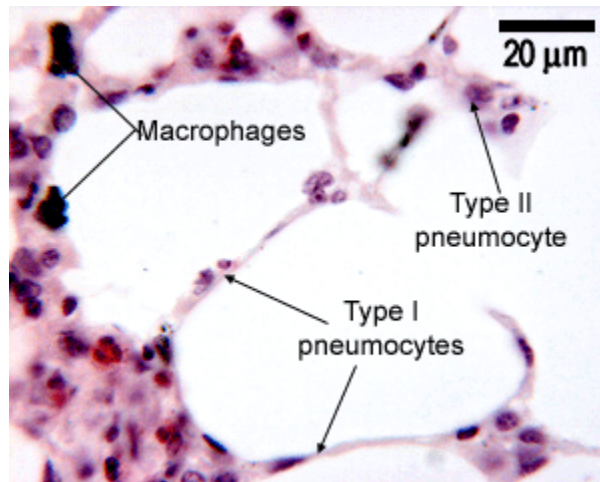
## ▪ Respiratory epithelium

### Respiratory passages

- Moistens, protect against injury and pathogen
- Remove particles by „mucociliary escalator“
- Pseudostratified columnar epithelium with cilia
- Basal cells- epithelium renewal

### Alveolar epithelium

- Gas exchange
- Respiratory bronchiols, alveolar passages and alveoli
- Type I and II pneumocytes





## ▪ Sensory epithelium

– Supportive and sensory cells

**Primary sensory cells** – directly convert stimulus to membrane potential

Receptory region, body, axonal process

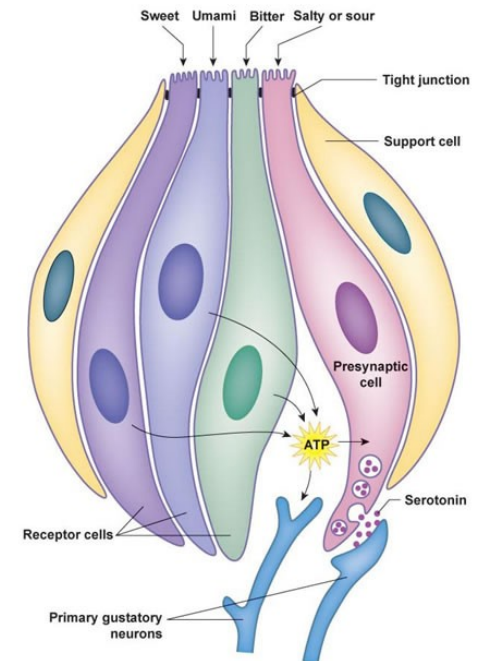
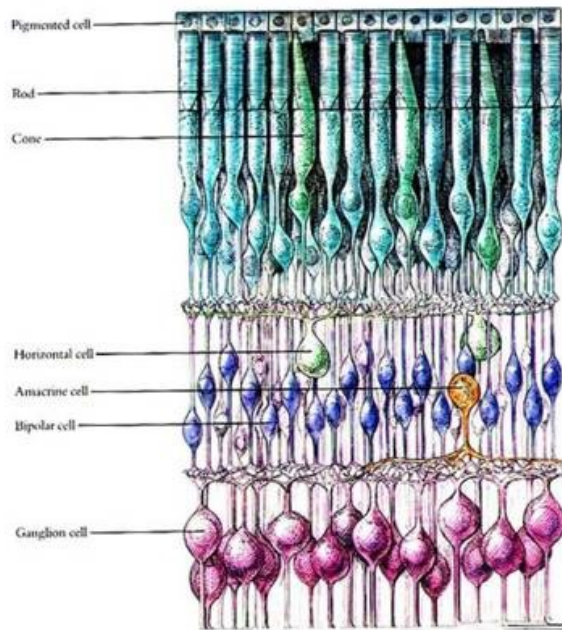
Nasal epithelium (regio olfactoria nasi), rods and cones

### **Secondary sensory cells**

Receptory region and body

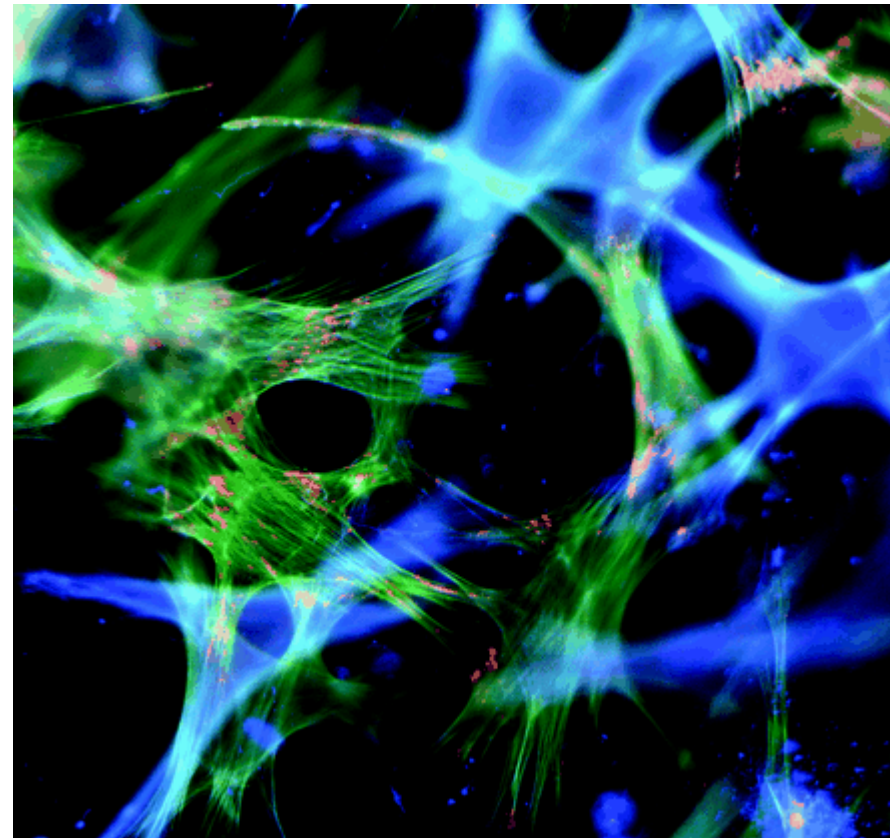
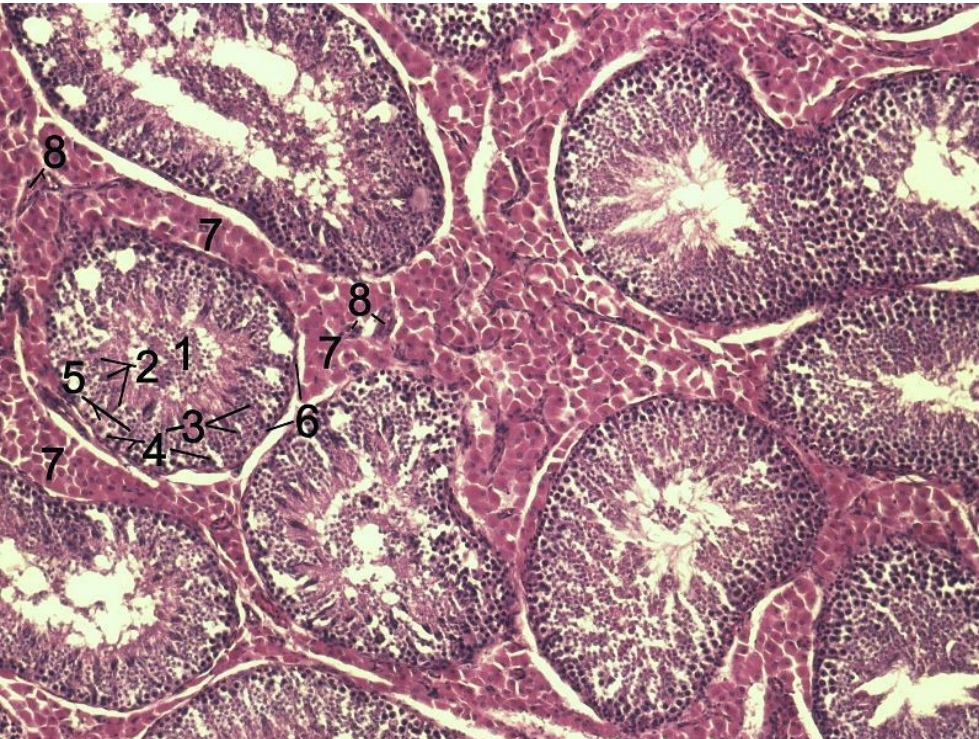
Signal is transmitted by adjacent neurons ending on secondary sensory cell

Taste buds. vestibulocochlear apparatus



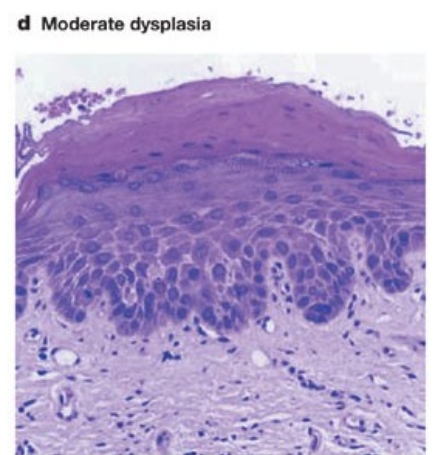
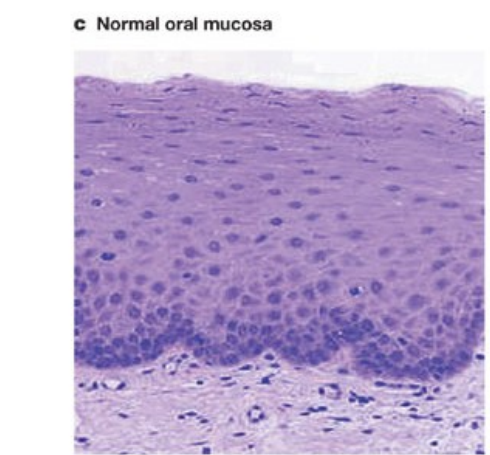
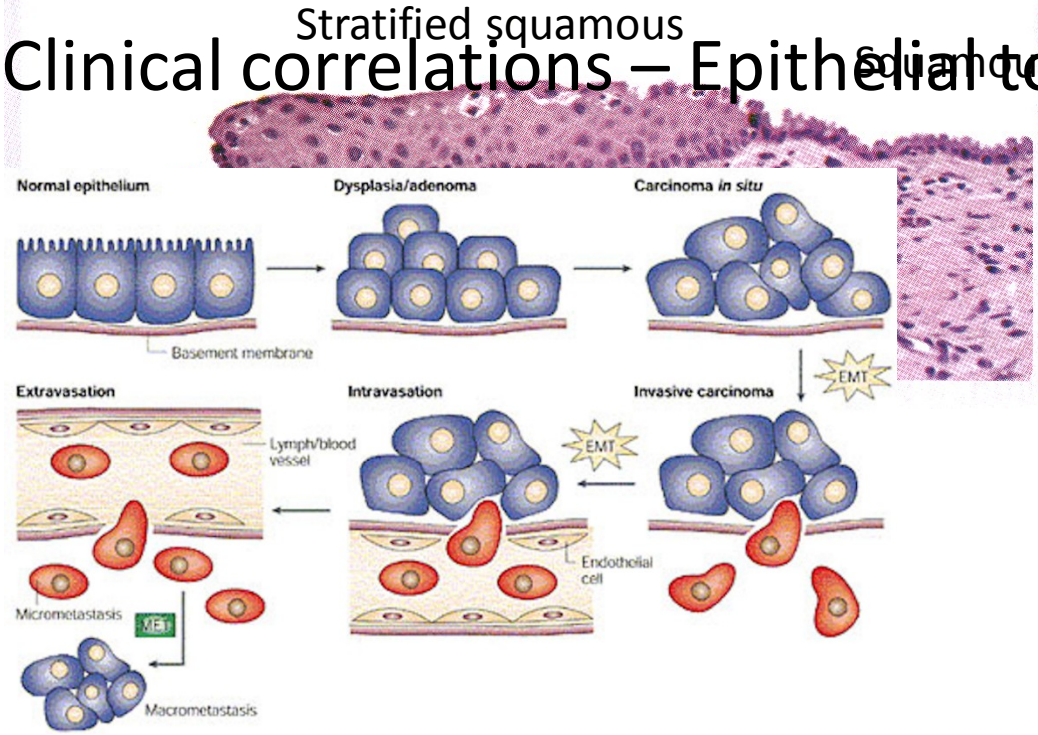
## ■ Myoepithelium

- Star-like or spindle cells
- Connected by nexus and desmosomes
- Actin microfilaments, myosin and tropomyosin
- Contraction
- Sweat and salivary glands – enhance secretion

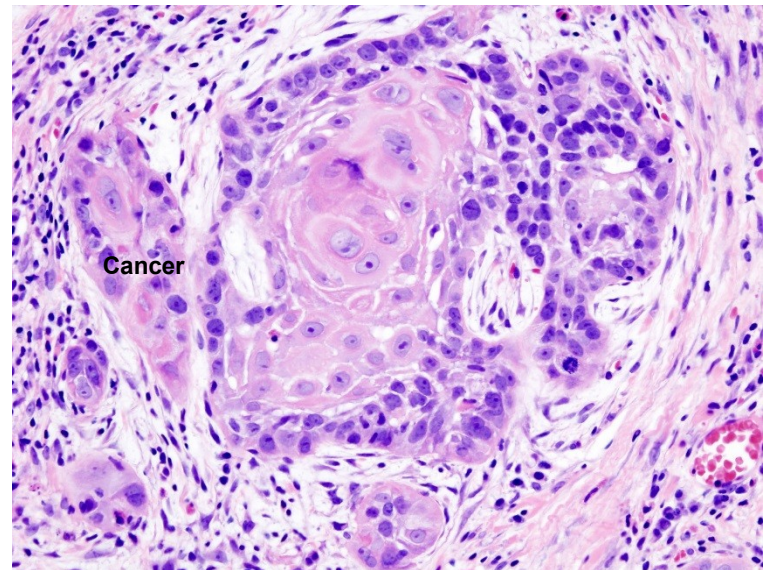


# Clinical correlations - Metaplasia

## Clinical correlations – Epithelial to mesenchymal transition



Simple columnar



# Thank you for attention

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