HISTOLOGY – EPITHELIUM TISSUE

UNIT 4 – CHAPTER 3

BODY TISSUES

- Cells are generalized for particular functions
- Tissue
  - Groups of cells that are similar in structure and function
- Histology
  - Study of tissues

BODY TISSUES

- 4 Primary Tissue Types
  1. Epithelium
     - Protection, secretion, absorption, filtation
  2. Connective
     - Support, structure
  3. Nervous
     - Communication, control
  4. Muscle
     - Movement (internal & external)

PRIMARY GERM LAYERS

Endoderm (Epithelial)	Mesoderm (Epithelial, Muscle, Connective)	Ectoderm (Epithelial, Nervous)
Digestive & respiratory epithelium	Muscles	Epidermis
Urethra epithelium	Skeleton (bones & cartilage)	Lining of mouth, anus, nostrils
Bladder	Blood	Sweat & sebaceous glands
Liver & pancreas	Blood vessel epithelium	Hair
	Dermis	Brain & spinal cord
	Excretory & reproductive organs	Eyes, nose, ear epithelium

EPITHELIUM TISSUES

- Epithelium
  - Epithe = laid on or covering
  - The lining, covering, and glandular tissue of the body
- Glandular epithelium forms various glands in the body
- Covering and lining epithelium covers all free body surfaces
  - Outer layer of skin
  - Line body cavities
- Nearly all substances given off or received by the body must pass through epithelium

EPITHELIAL TISSUES

- Epithelial Functions
  1. Protection
  2. Sensory
  3. Secretion
  4. Absorption
  5. Excretion

CHARACTERISTICS OF EPITHELIUM

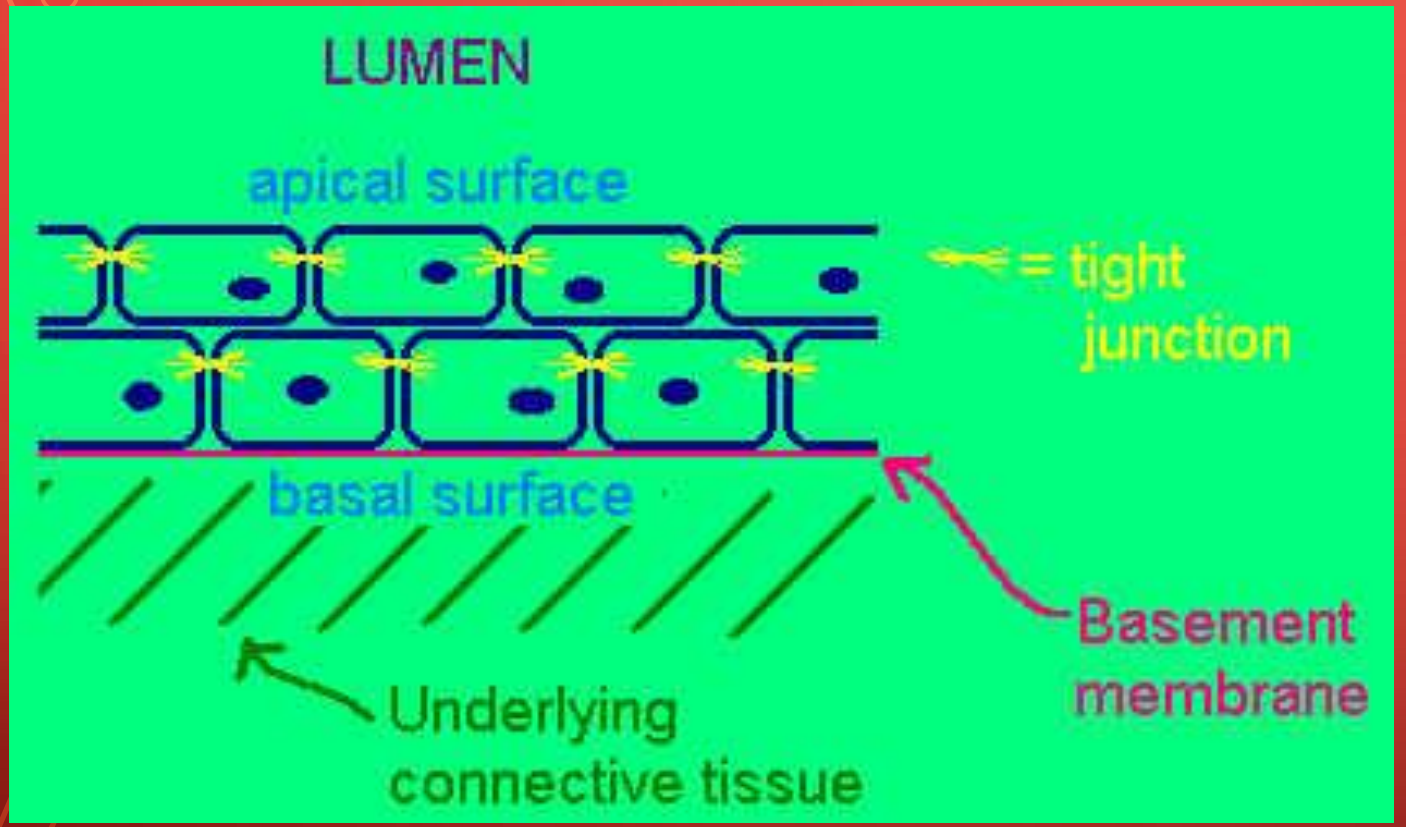
- High Cellularity
  - Cells fit closely together
  - Very little extracellular matrix
- Contains specialized contacts
  - Tight junctions & desmosomes
- Avascular
  - No blood vessels within it
  - Diffusion provides nutrients & carries wastes away
  - Lots of nerve fibers

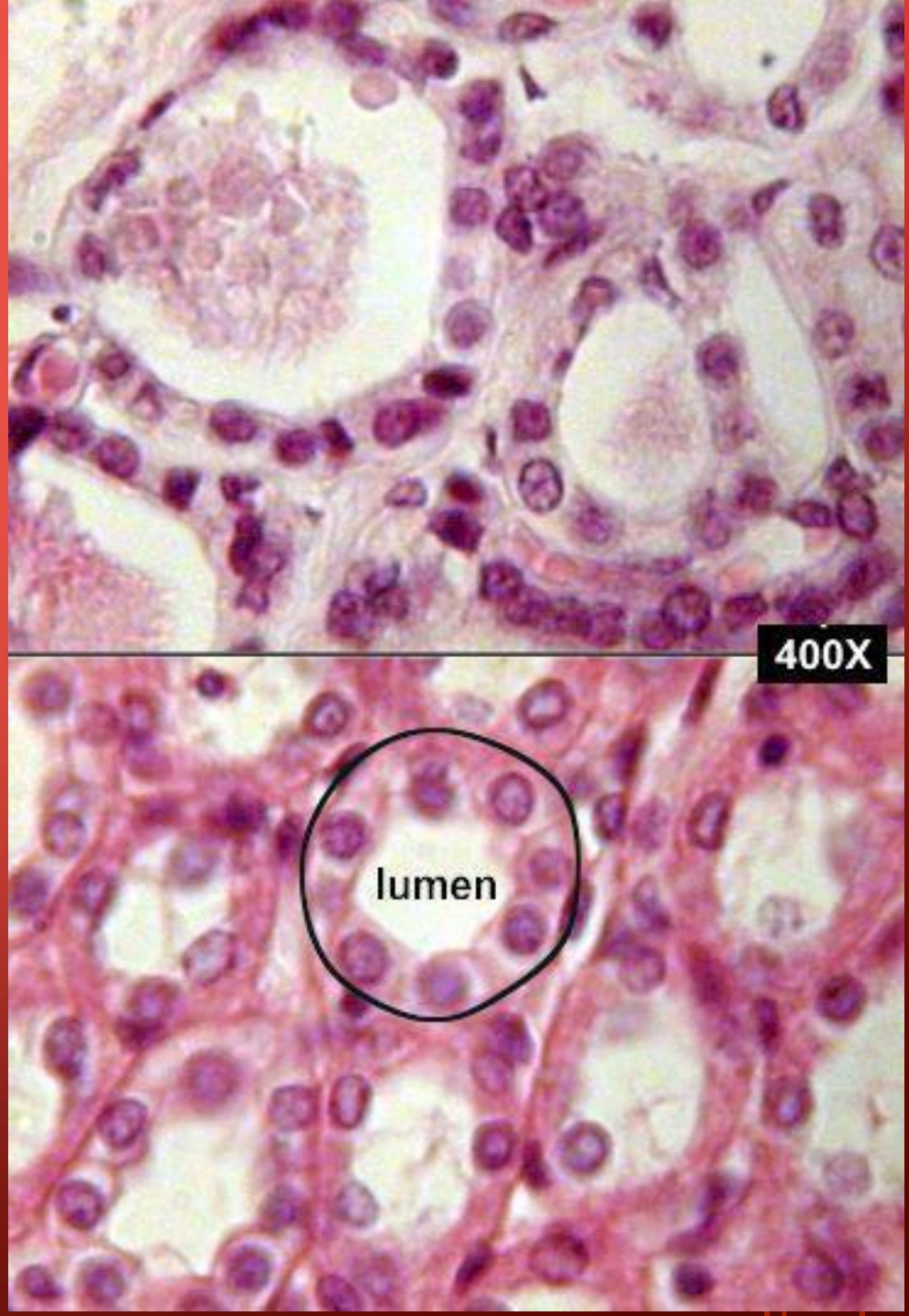
CHARACTERISTICS OF EPITHELIUM

- Reinforcement & Connection
- Defines Boundaries
  - Remember – cancer causes a breach in these boundaries
- Regenerates easily if well nourished
- Found in areas of high friction
- Exposed surfaces of some epithelia are slick and smooth but others exhibit cell surface modifications, such as microvilli or cilia

CHARACTERISTICS OF EPITHELIUM

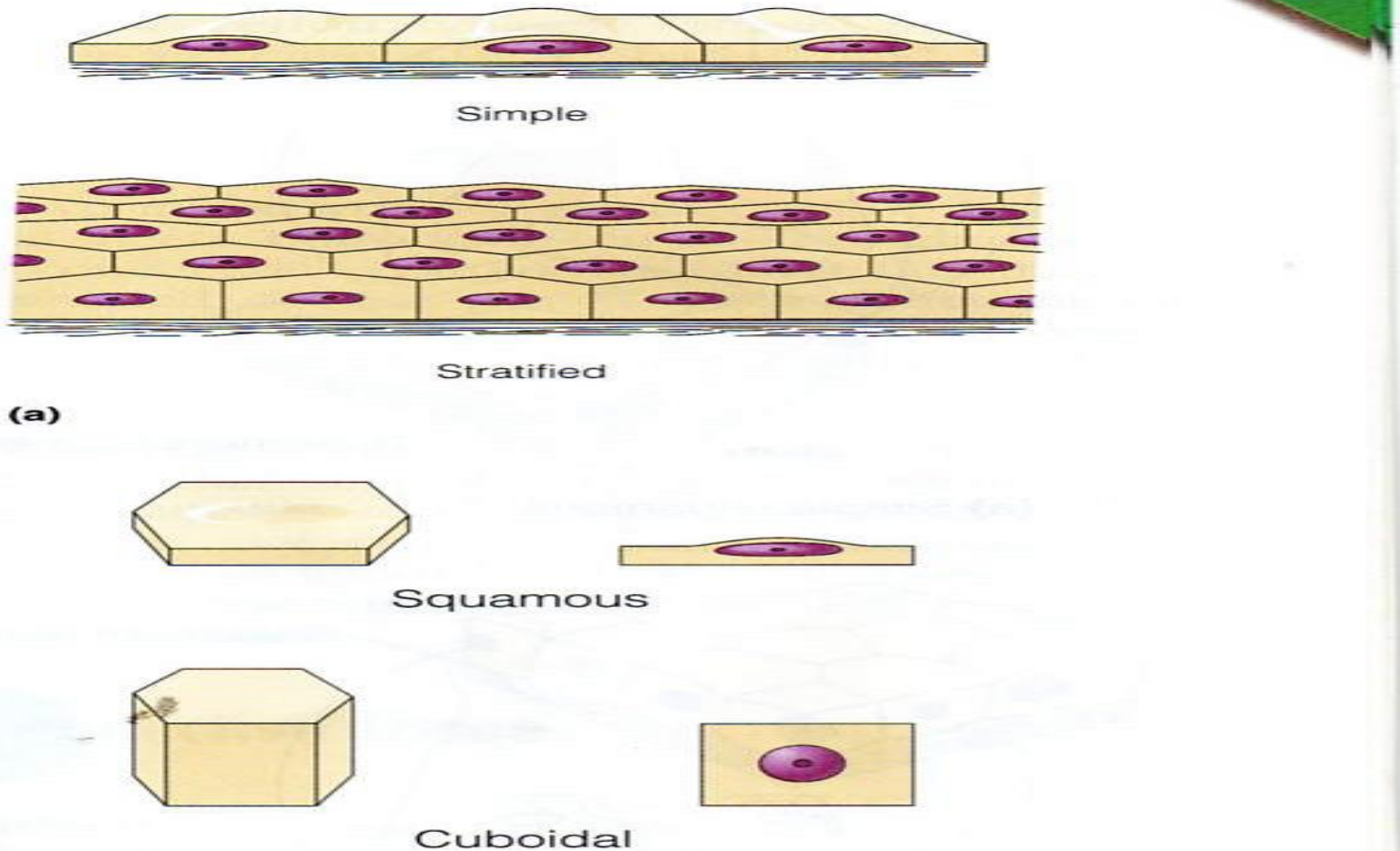
- Membranes always have one free surface or edge
  - Apical Surface
    - Exposed to the body's exterior or to the cavity of an internal organ
- The lower surface of an epithelium rests on a **basement membrane**, a material secreted by the cells


LUMEN
apical surface
= tight junction
basal surface
Basement membrane
Underlying connective tissue


400X
lumen

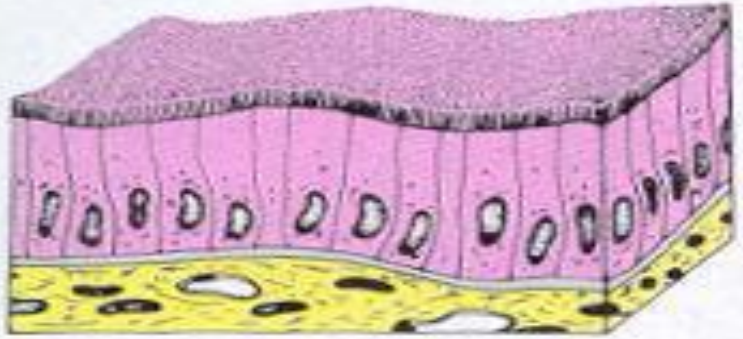
CLASSIFICATION OF EPITHELIUM

- Epithelium is given 2 names
  - Name is a combination of the number of cell layers and the shape of the cells
  - 1st indicates the relative number of cell layers
    - Simple = one layer of cells
    - Stratified = two or more layers of cells
  - 2nd describes the shape of its cells at the **free surface**
    - Squamous = flattened like fish scales
    - Cuboidal = cube-shaped like dice
    - Columnar = shaped like columns


Simple
Stratified
(a)
Squamous
Cuboidal
Columnar
(b)

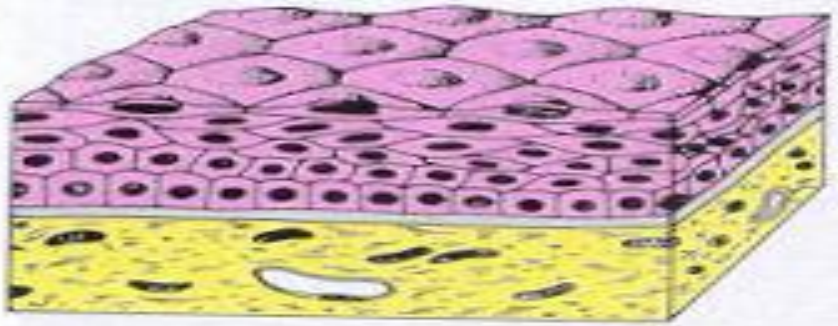
Simple squamous

Simple cuboidal



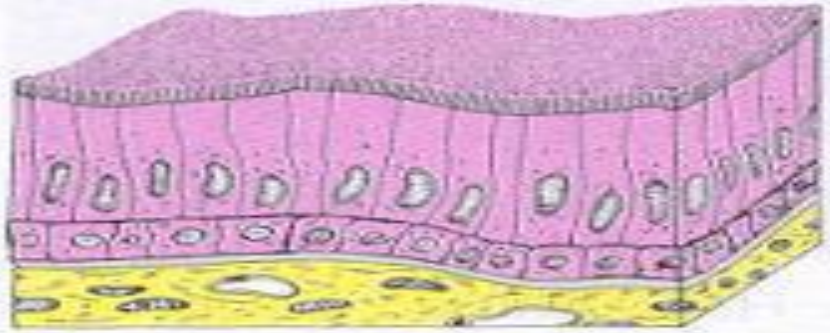
Simple columnar

Pseudo-stratified

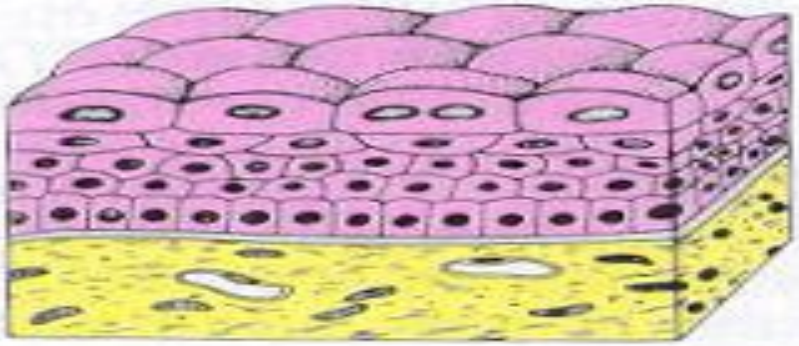


Stratified squamous

Stratified cuboidal



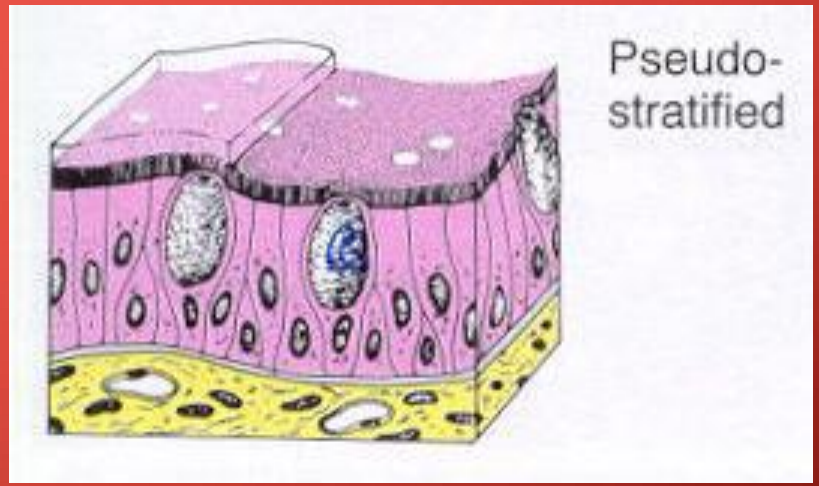
Stratified columnar



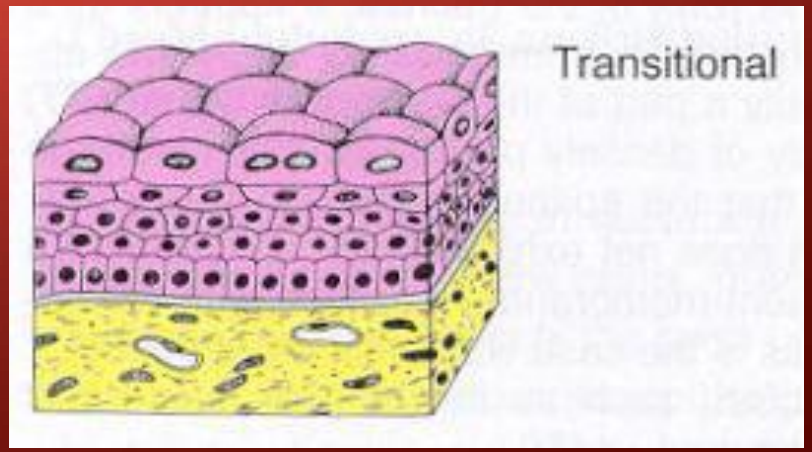
Transitional

CLASSIFICATION OF EPITHELIUM

- Pseudostratified
  - "False" layers
  - Ciliated (respiratory tract)
  - Non-ciliated (male urethra)

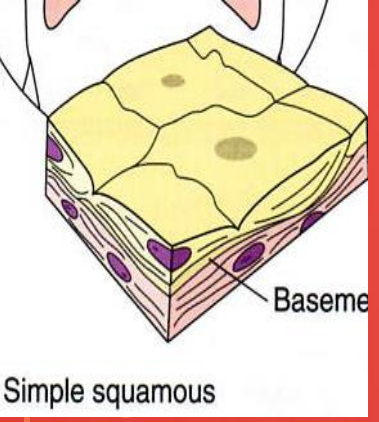


- Transitional
  - Multiple layers of epithelial cells, "hodge-podge"
  - Found in urinary tract
    - Can look cuboidal until bladder stretches, then looks squamous

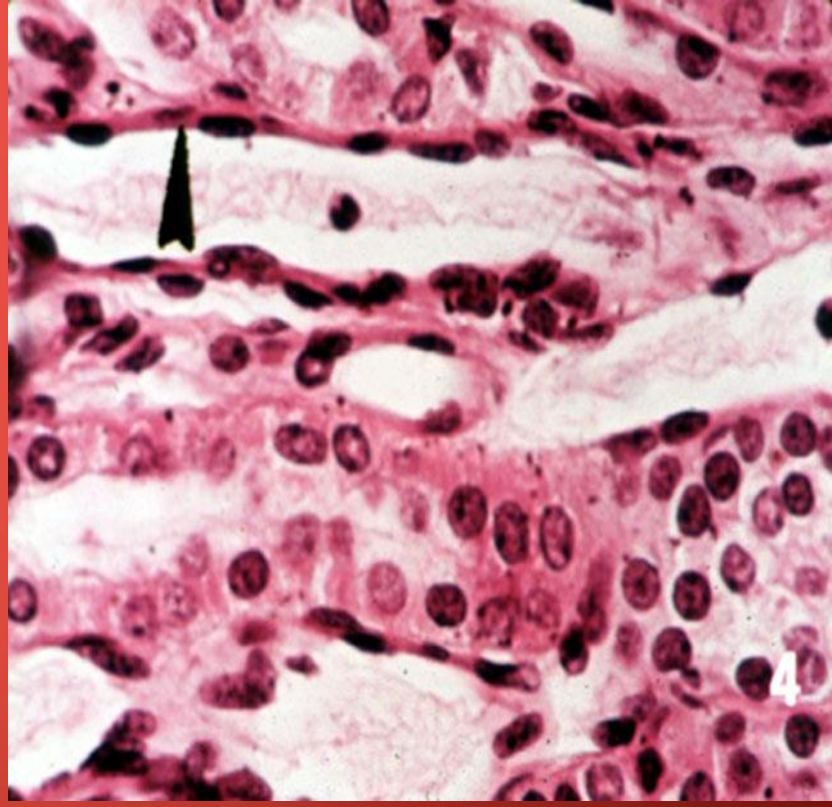


SIMPLE EPITHELIA

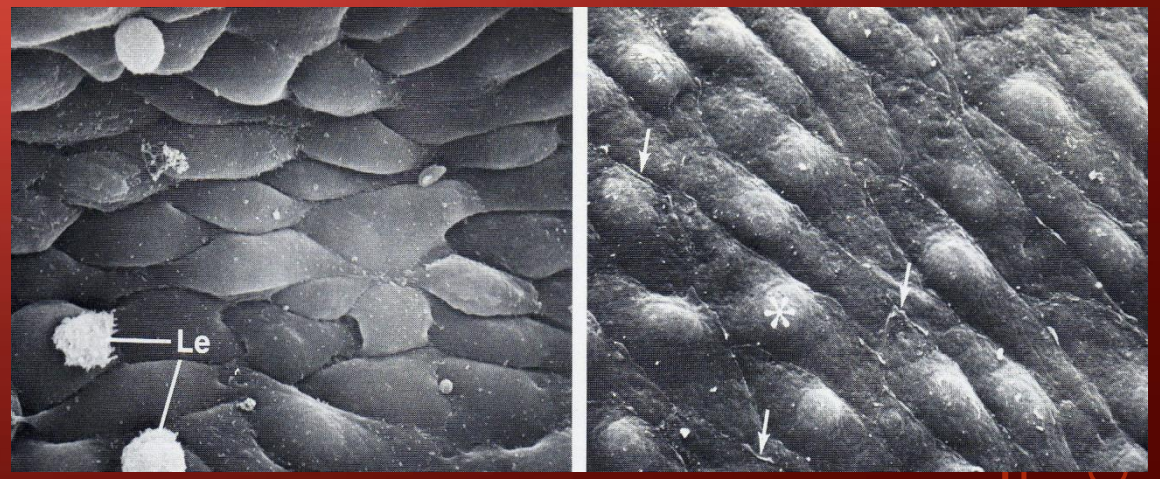
- Simple epithelia are most concerned with absorption, secretin, and filtration
  - Because they are usually very thin, protection is not one of their specialties

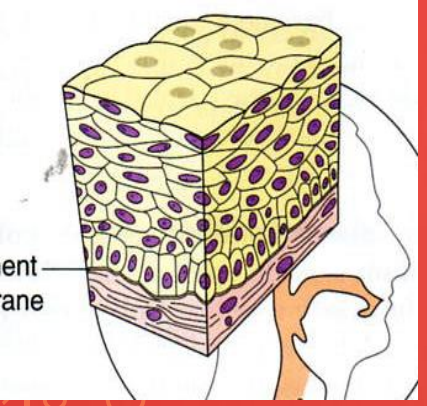


SIMPLE SQUAMOUS EPITHELIUM

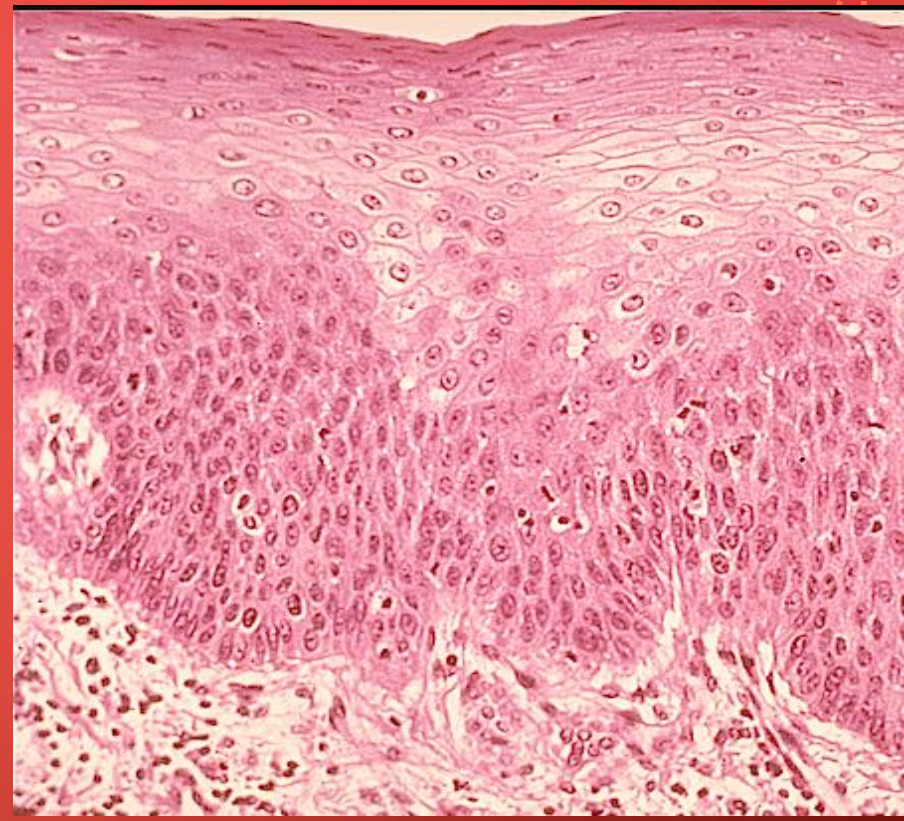


- Structure
  - Single layer of flat, hexagonal cells
  - Cells are so flat, the nuclei appear as bumps on a cross section
- Distribution
  - Lining of blood & lymph vessels (endothelium)
  - Small ducts, aveoli of the lungs, loop of Henle in kidney tubules
  - Lining of serous membranes (mesothelium), and inner surface of the eardrum
- Function
  - Diffusion, filtration, secretion, absorption
  - Protection against friction

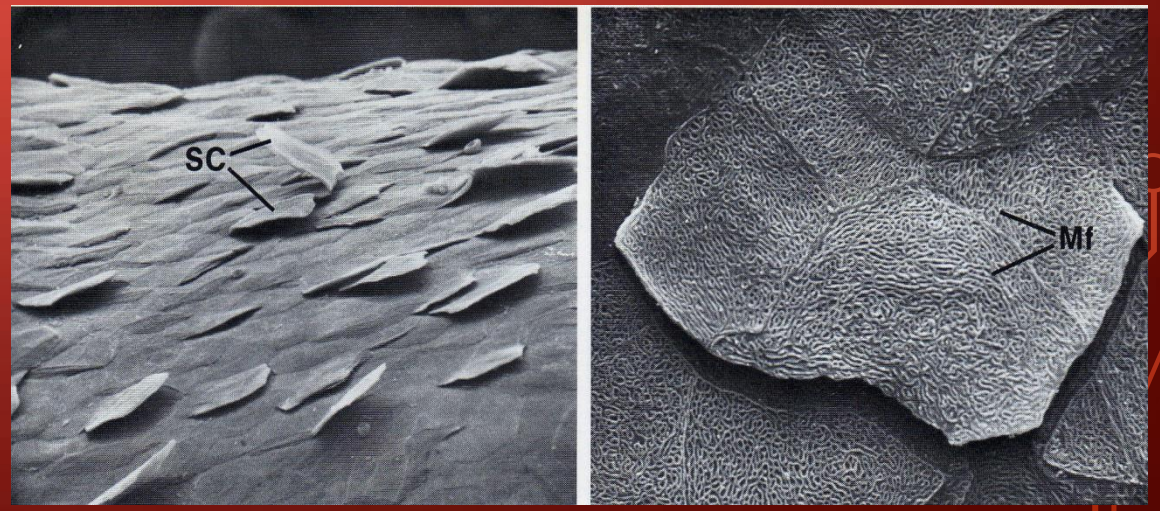


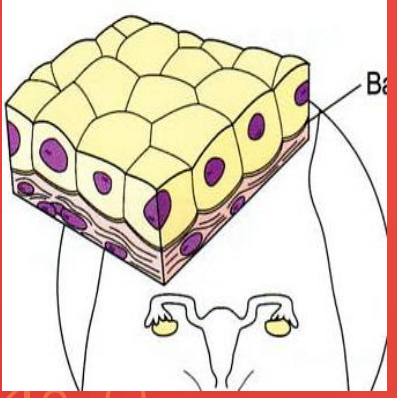


STRATIFIED SQUAMOUS EPITHELIUM



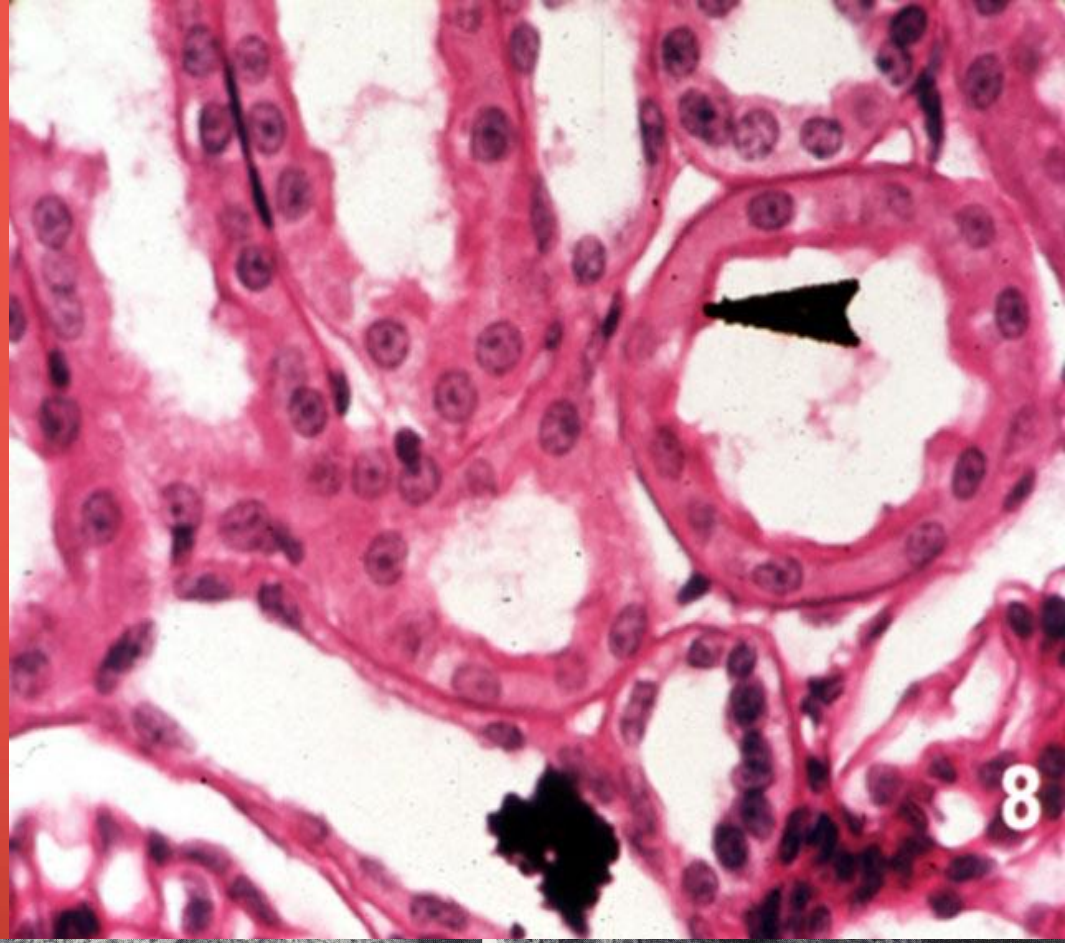
- Structure
  - Multiple layers are cuboidal in basal layer and progressively flatten toward the surface
  - Moist stratified squamous
    - Epithelium surface cells retain a nucleus and cytoplasm
  - Keratinized cells
    - Cytoplasm is replaced by keratin
  - Cells are dead
- Distribution
  - Moist – mouth, throat, larynx, esophagus, anus, vagina, inferior urethra, and cornea
  - Keratinized – skin
- Function
  - Protection against abrasion and infection

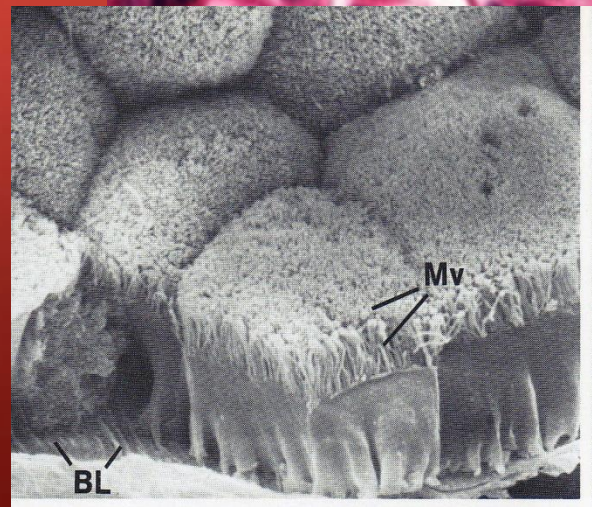


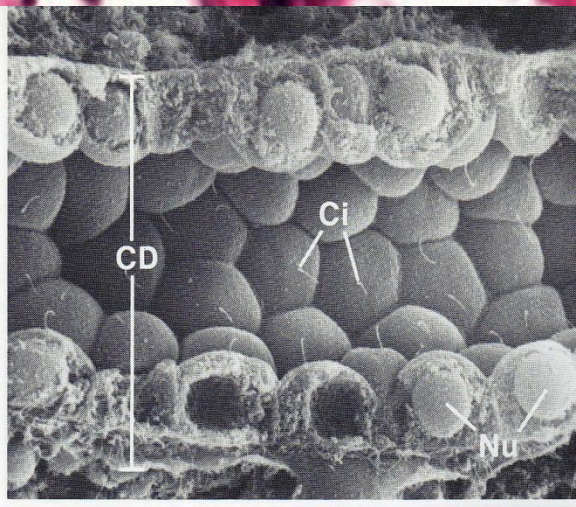


SIMPLE CUBOIDAL EPITHELIUM

- Structure
  - Single layer of cube-shaped cells
  - Some have cilia or microvilli
- Distribution
  - Glands and their ducts
  - Terminal bronchioles of lungs
  - Kidney tubules
  - Choroid plexus of the brain
  - Surface of the ovaries
- Function
  - Absorption and secretion by cells of the kidney tubules; secretion by cells of the choroid plexus and glands
  - Movement of mucus particles out of the terminal bronchioles by ciliated cells

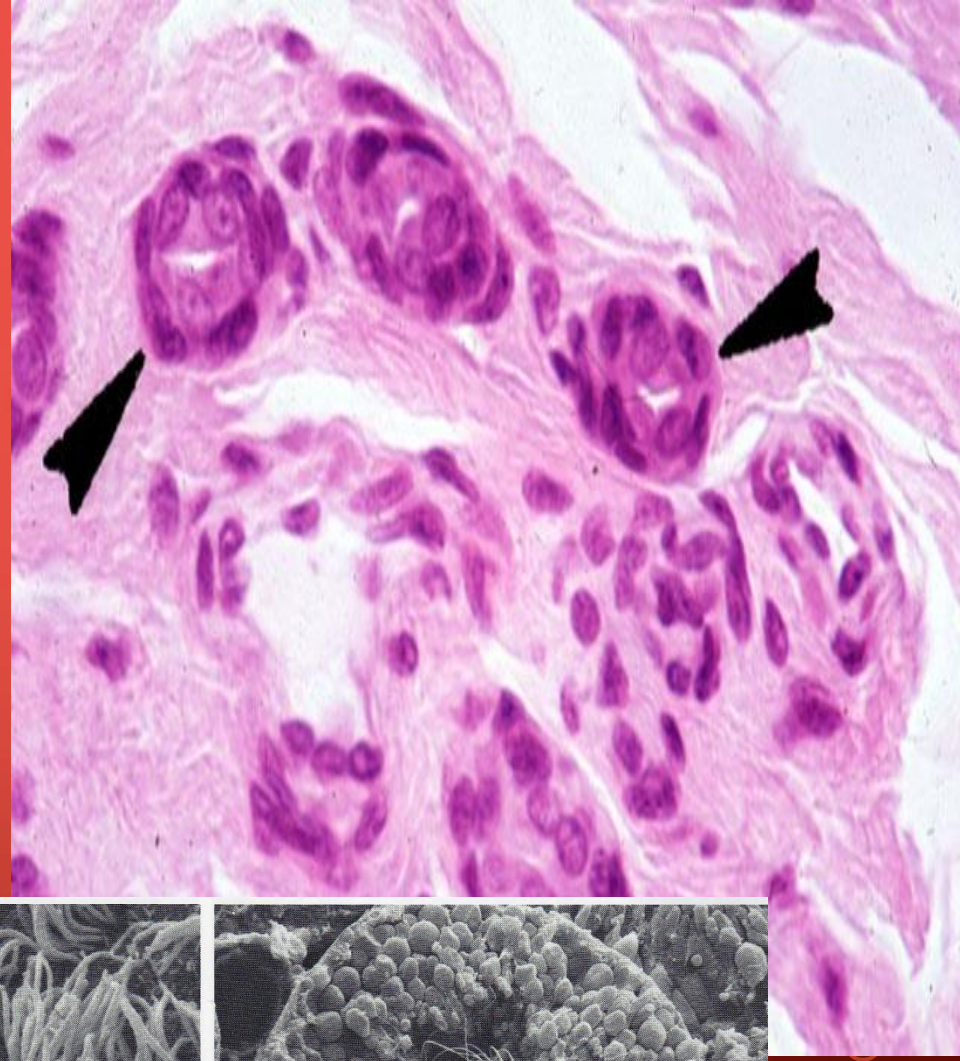


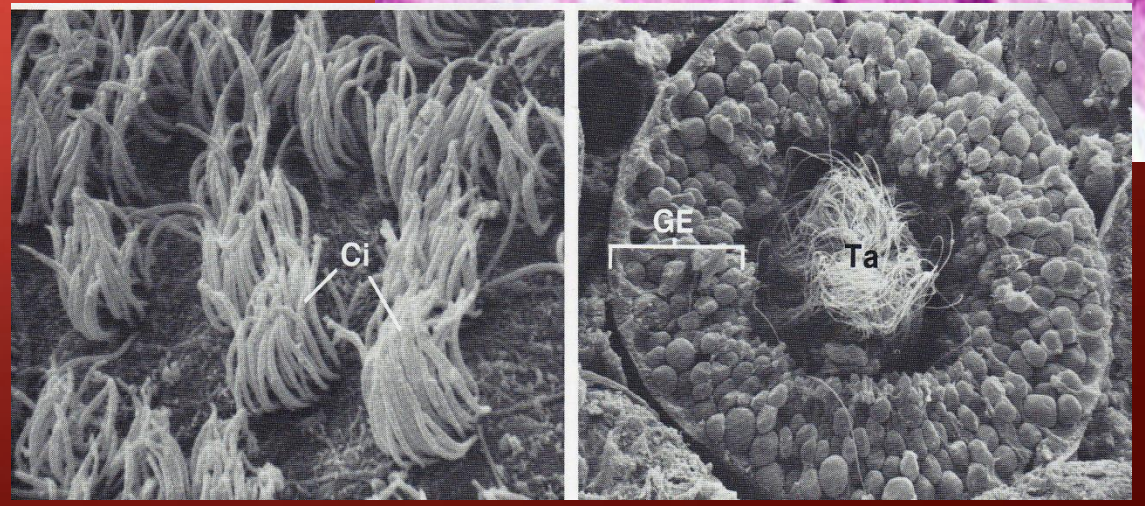


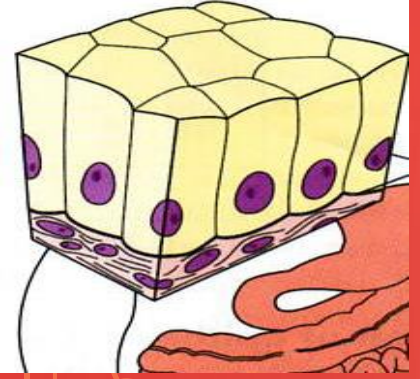


STRATIFIED CUBOIDAL EPITHELIUM

- Structure
  - Multiple layers of somewhat cube-shaped cells
- Distribution
  - Sweat gland ducts & ovarian follicular cells
- Function
  - Secretion, absorption, and protection against infection

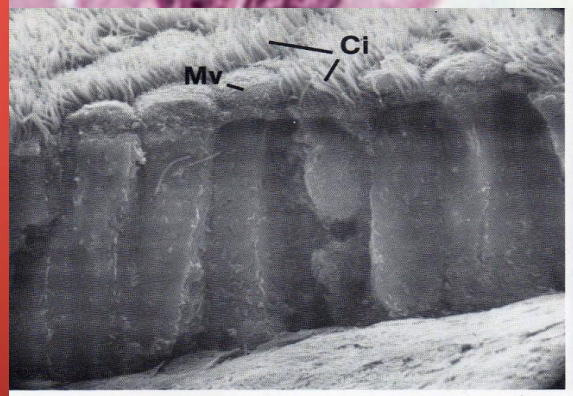


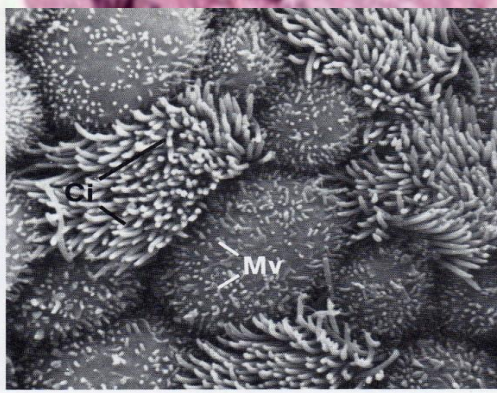


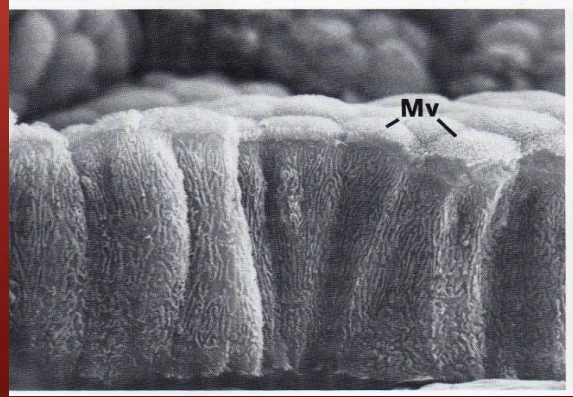


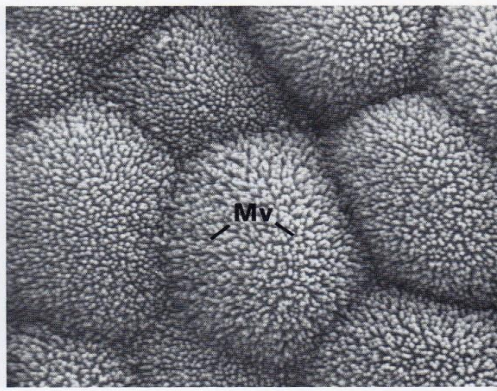
SIMPLE COLUMNAR EPITHELIUM

- Structure
  - Single layer of tall, narrow cells
  - Some cells have cilia (bronchioles of lungs, audiotyr tubes, uterine tubes, uterus) or microvilli (intestines)
- Distribution
  - Glands and some ducts, bronchioles of lungs, auditory tube, uterus, uterine tubes, stomach, intestines, gallbladder, bile ducts, & ventricles of the brain
- Function
  - Movement of particles out of the bronchioles of the lungs
  - Partially responsible for the movement of the egg through the uterine tubes by ciliated cells
  - Secretion by cells of the glands, the stomach, and the intestine
  - Absorption by cells of the intestine



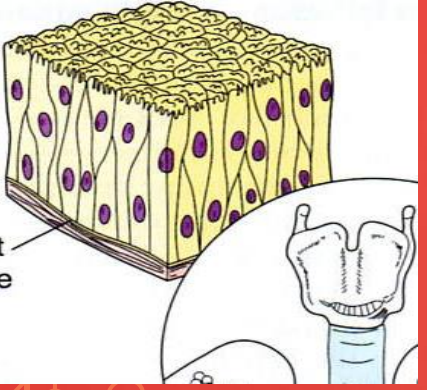




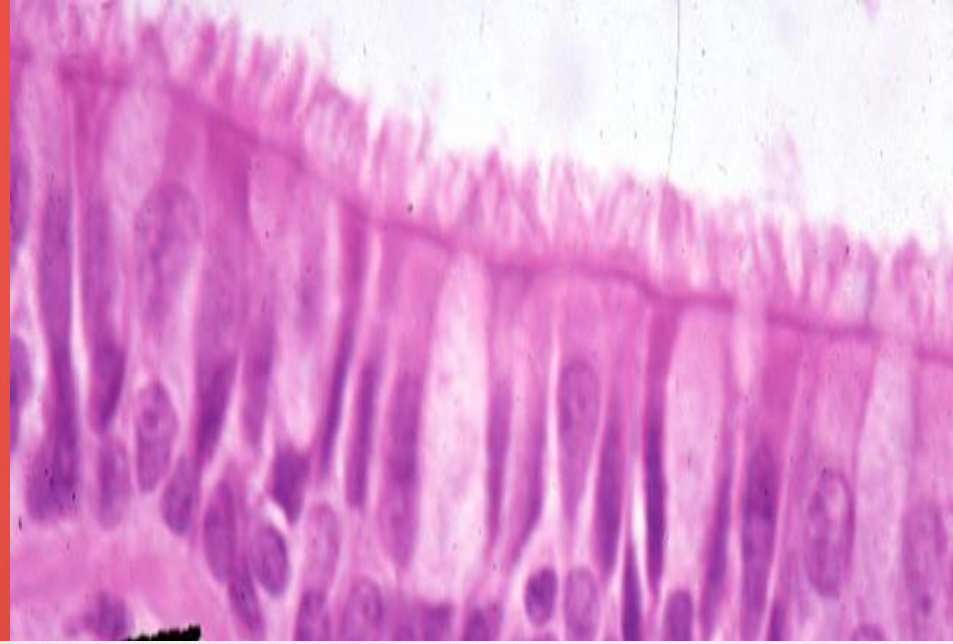


STRATIFIED COLUMNAR EPITHELIUM

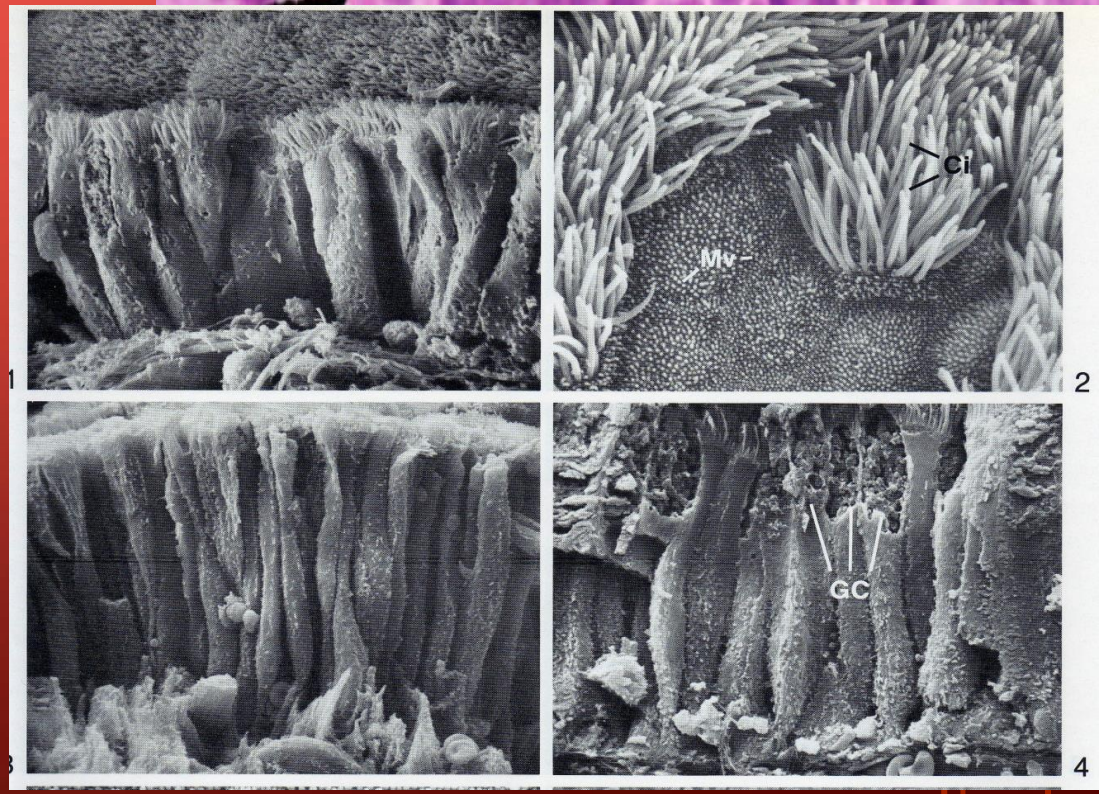
- Structure
  - Multiple layers of cells with tall, thin cells resting on layers of more cuboidal cells
  - Ciliated in the larynx
- Distribution
  - Mammary gland duct, larynx, and a portion of the male urethra
- Function
  - Protection & secretion

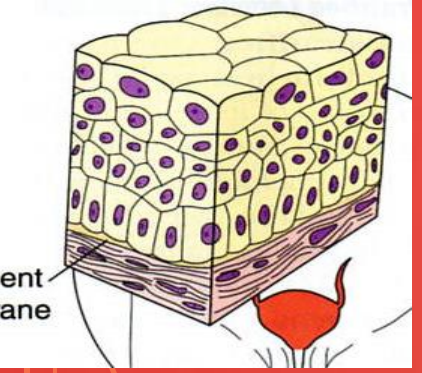


PSEUDOSTRATIFIED CILIATED COLUMNAR EPITHELIUM



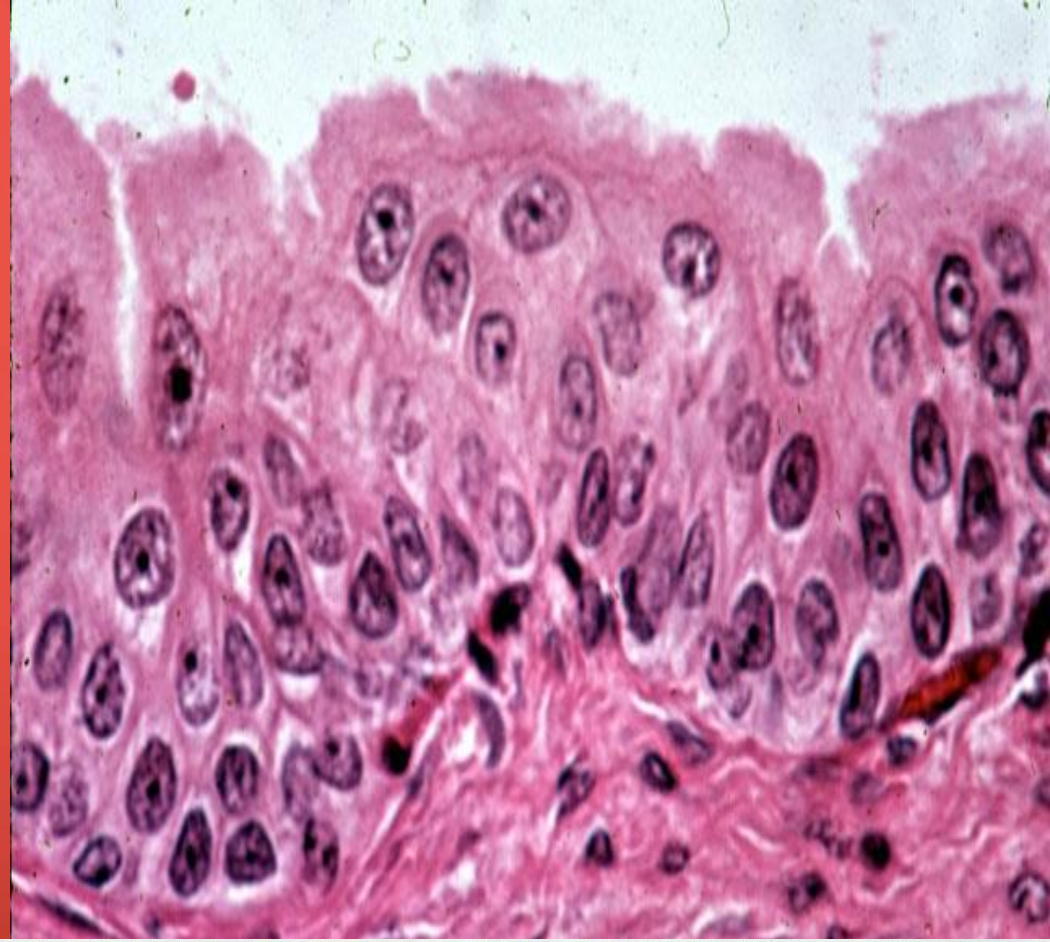
- Structure
  - Single layer of cells
  - All the clels are attached to the basement membrane
  - Some cells are tall and thin and reach the free surface and other don't
  - Nuclei of these cells are at different levels and appear stratified
  - Cells are almost always ciliated and are assoiciated with goblet cells
- Distribution
  - Larynx, nasal cavity, paranasal sinuses, pharynx, auditory tube, trachea, and bronchi of the lungs
- Function
  - Movement of fluid (often mucus) that contains foreign particles

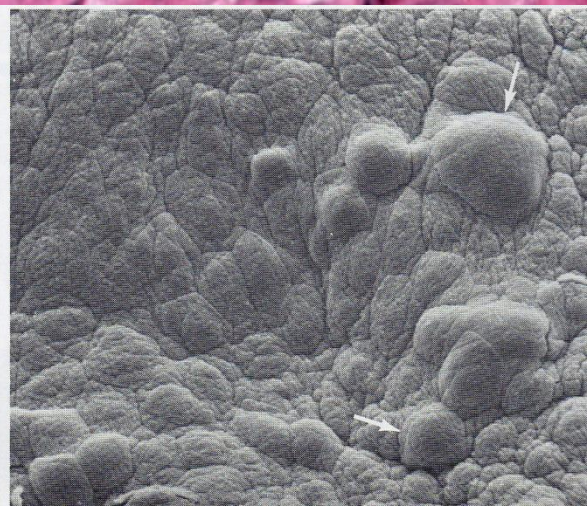




TRANSITIONAL EPITHELIUM

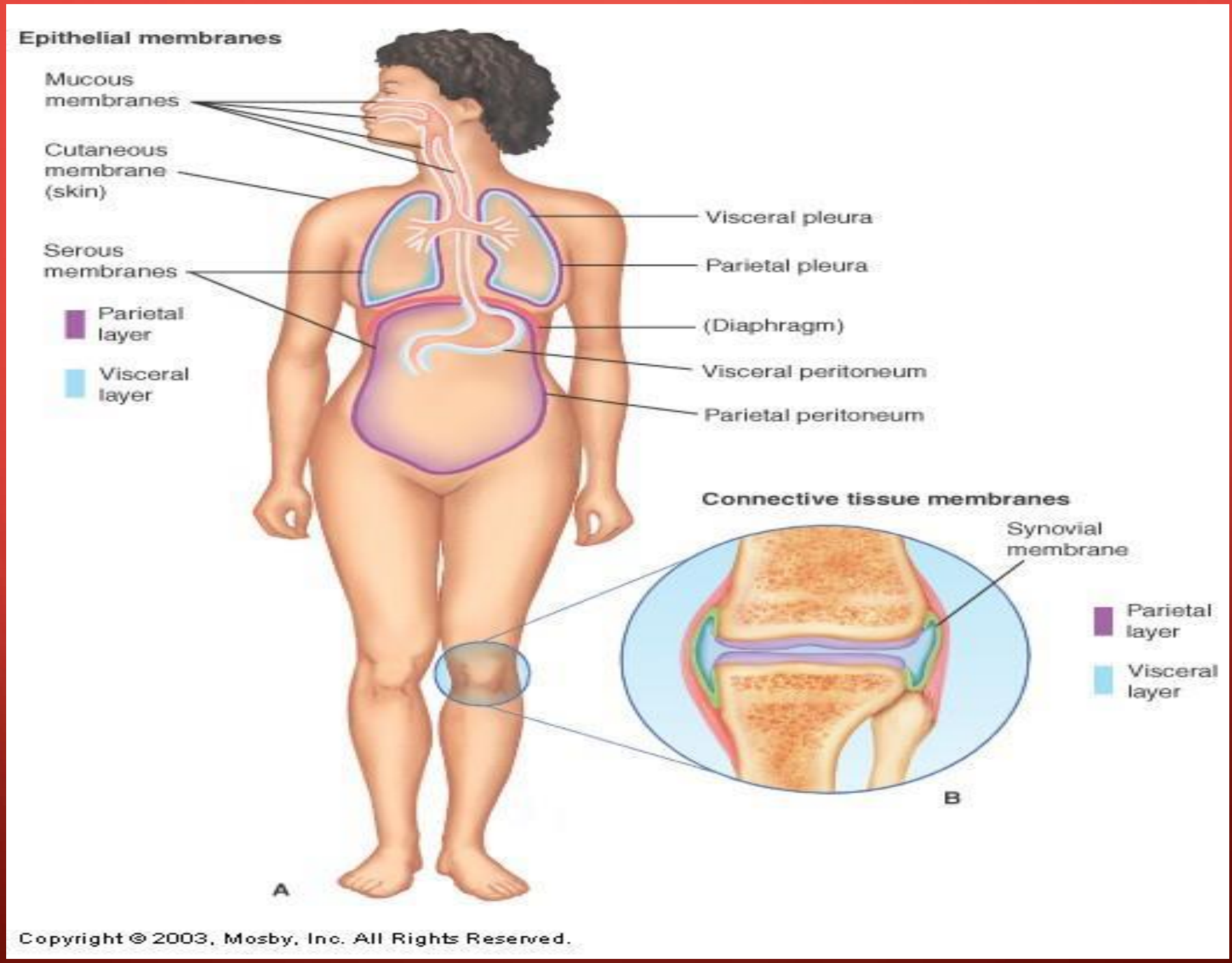
- Structure
  - Stratified cells that appear cube-like when the organ or tube is relaxed and appear squamous when the organ or tube is distended by fluid
- Distribution
  - Urinary bladder, ureters, and superior urethra
- Function
  - Formation of a permeability barrier and protection against caustic effect of urine
  - Accommodation of fluid-content fluctuations in organ or tube





EPITHELIAL MEMBRANES

- Mucous Membranes
  - Line body cavities OPEN to exterior
  - Examples: digestive, respiratory, urogenital
  - Mucus protects by trapping microorganisms, substances in mucus
- Cutaneous Membranes
  - Skin
  - Helps waterproof & protect body
  - First line of defense in immune system
- Serous Membranes
  - Lines all CLOSED body cavities
  - Serous fluid located between layers to reduce friction due to organ motion


Epithelial membranes
Mucous membranes
Cutaneous membrane (skin)
Serous membranes
Parietal layer
Visceral layer
Visceral pleura
Parietal pleura
(Diaphragm)
Visceral peritoneum
Parietal peritoneum
A
Connective tissue membranes
Synovial membrane
Parietal layer
Visceral layer
B
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