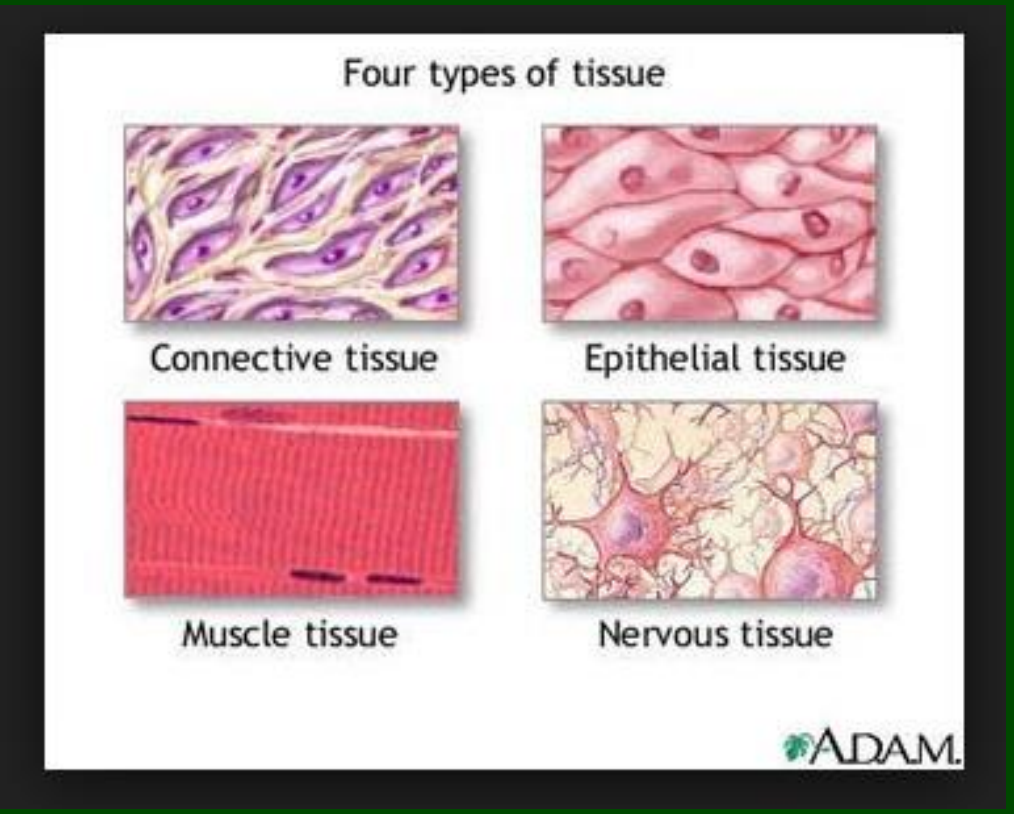
Types of Tissues



د. نوار غسان

Tissues

- Types of tissues:
  1. Epithelial – lining and covering
  2. Connective – support
  3. Muscle – movement
  4. Nervous – control

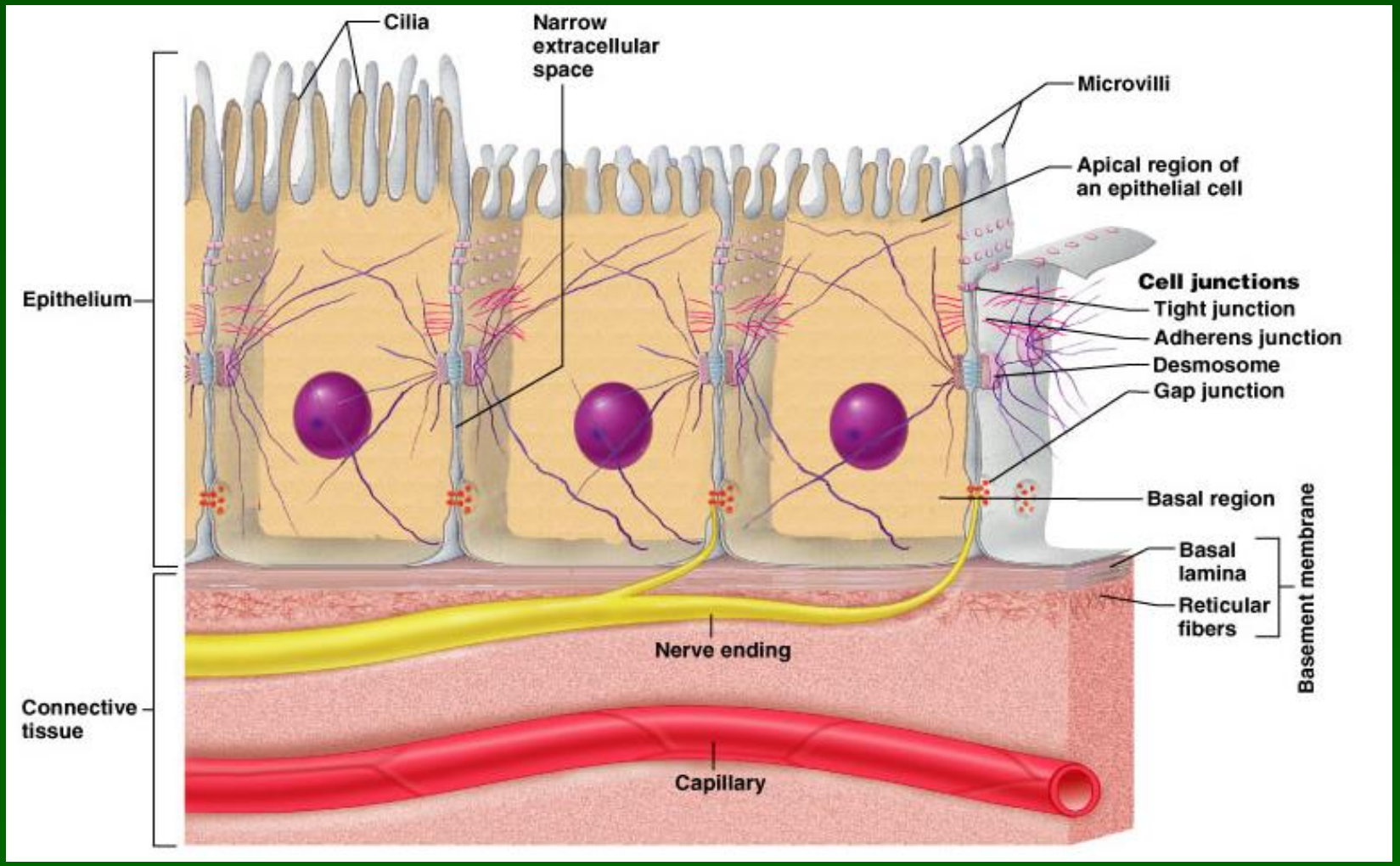
Epithelial Tissue – General Characteristics & Functions

- Covers a body surface or lines a body cavity
- Forms most glands
- Functions of epithelium
  - Protection
  - Absorption, secretion, and diffusion
  - Filtration
  - Forms slippery surfaces (mucus secretion)

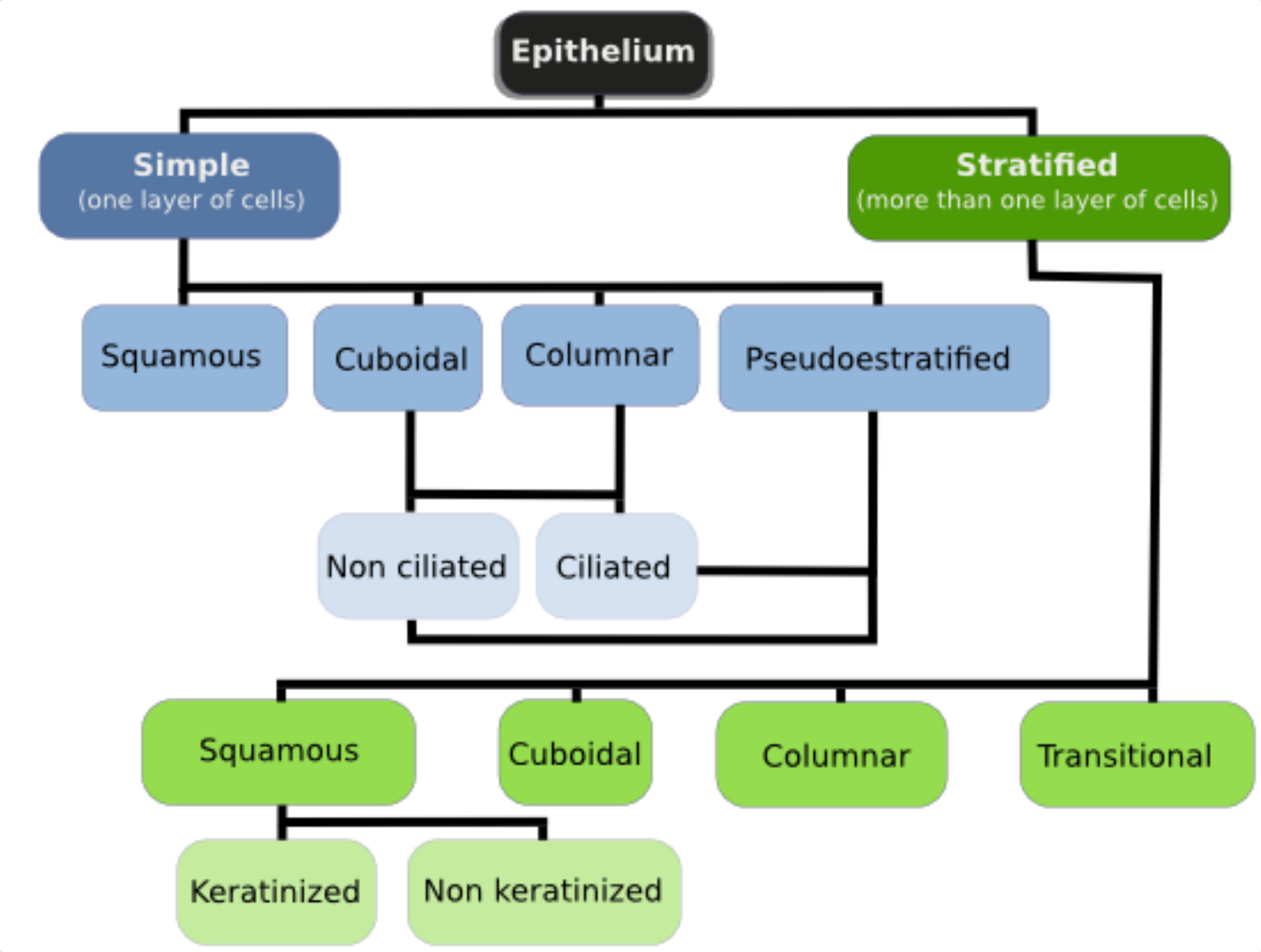
Special Characteristics of Epithelia

- Cellularity
  - cells are in close contact with each other with little or no intercellular space between them
- Specialized contacts
  - may have junctions for both attachment and communication
- Polarity
  - epithelial tissues always have an apical and basal surface
- Support by connective tissue
  - at the basal surface, both the epithelial tissue and the connective tissue contribute to the basement membrane
- Avascular
  - nutrients must diffuse from basal layer
- Innervated
- Regenerative
  - epithelial tissues are highly mitotic

Special Characteristics of Epithelia

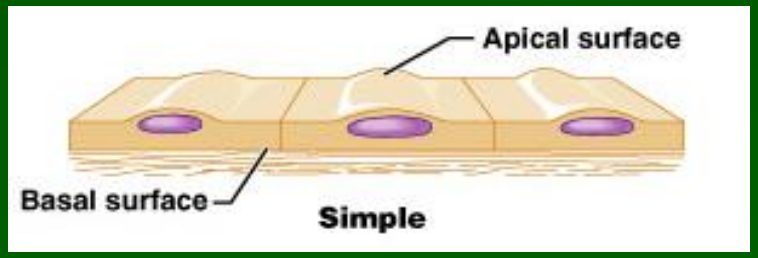


Classifications of Epithelia

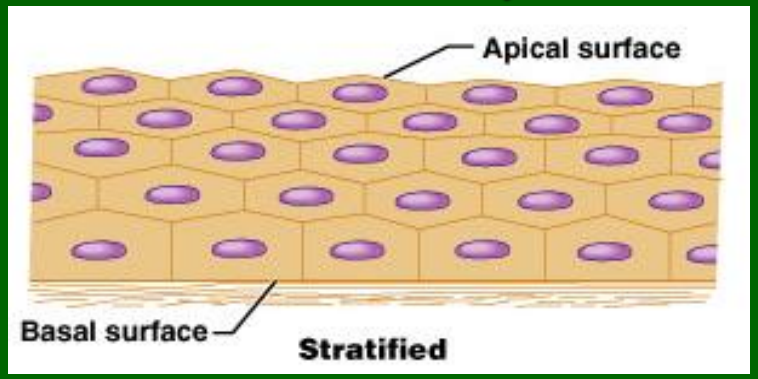


Classifications of Epithelia

- First name of tissue indicates number of layers
  - Simple – one layer of cells



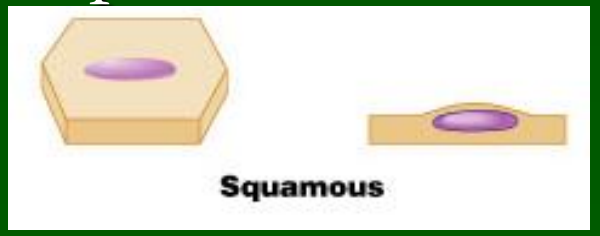
  - Stratified – more than one layer of cells

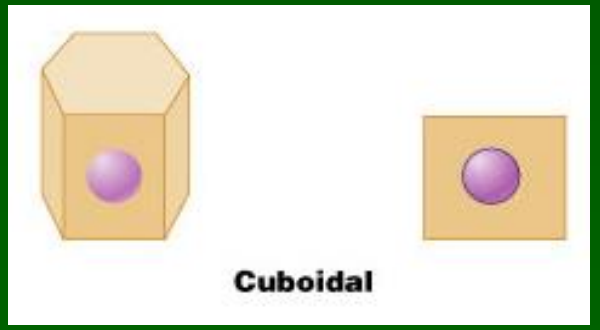


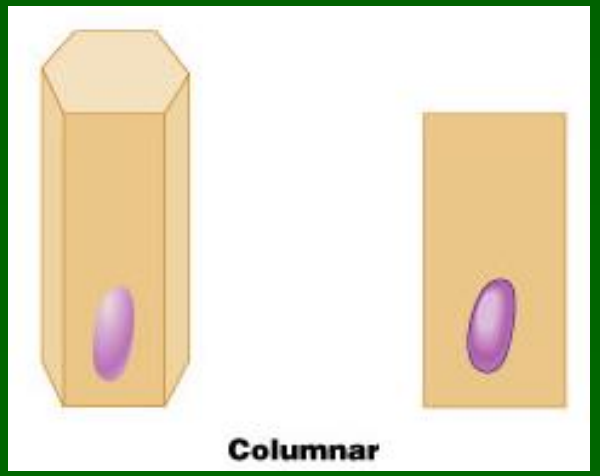
Classifications of Epithelia

- Last name of tissue describes shape of cells
  - Squamous – cells wider than tall (plate or "scale" like)
  - Cuboidal – cells are as wide as tall, as in cubes

Columnar – cells are taller than they are wide, like columns







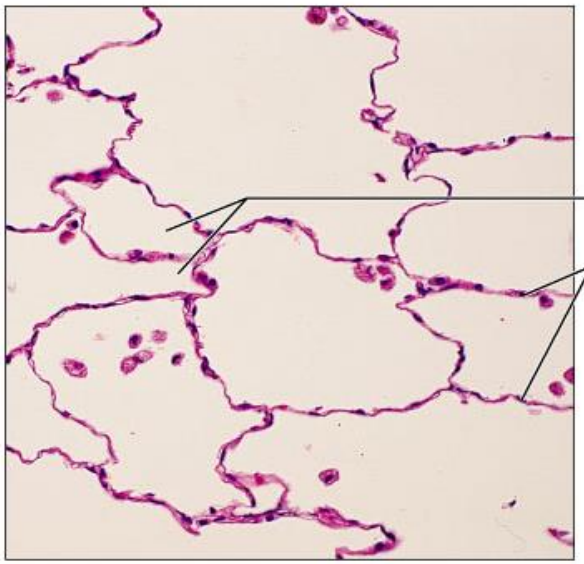
Simple Squamous Epithelium

- Description
  - single layer of flat cells with disc-shaped nuclei
- Special types
  - Endothelium (inner covering)
    - slick lining of hollow organs
  - Mesothelium (middle covering)
    - Lines peritoneal, pleural, and pericardial cavities
    - Covers visceral organs of those cavities

Simple Squamous Epithelium

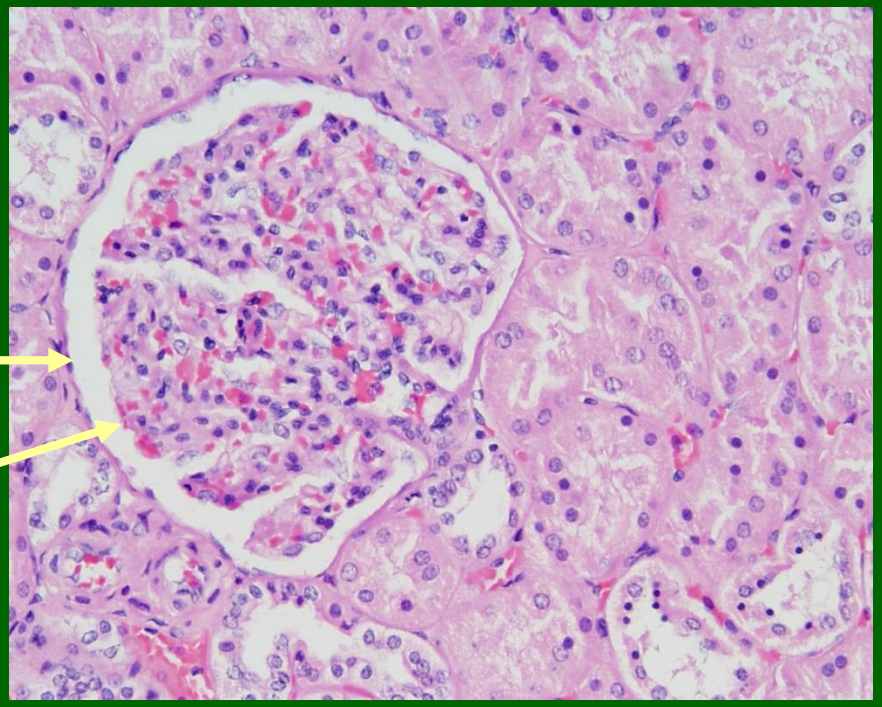
- Function
  - Passage of materials by passive diffusion and filtration
  - Secretes lubricating substances in serous membranes
- Location
  - Renal corpuscles (kidneys)
  - Alveoli of lungs
  - Lining of heart, blood and lymphatic vessels
  - Lining of ventral body cavity (serosae/serous memb.)

Simple Squamous Epithelium



Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (400×).

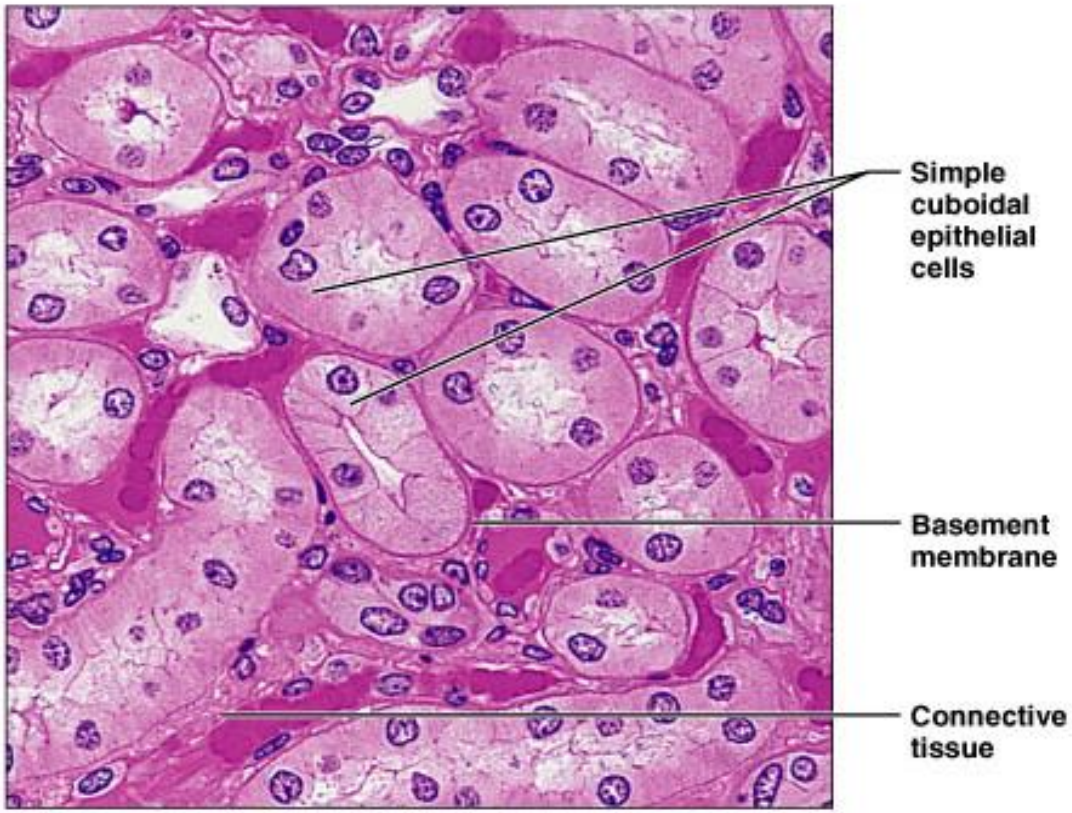
Simple squamous lining the walls of the capillary



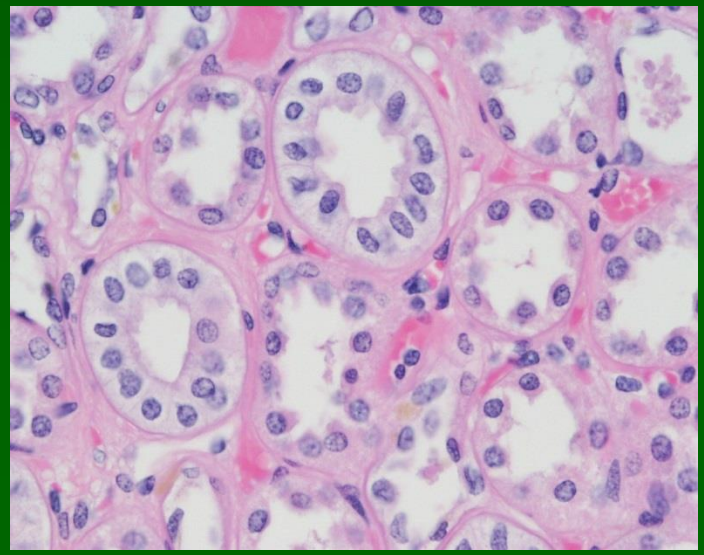
Simple Cuboidal Epithelium

- Description
  - single layer of cube-like cells with large, spherical central nuclei
- Function
  - secretion and absorption
- Location
  - kidney tubules, secretory portions of small glands, ovary surface

Simple Cuboidal Epithelium



Photomicrograph: Simple cuboidal epithelium in kidney tubules (400×).

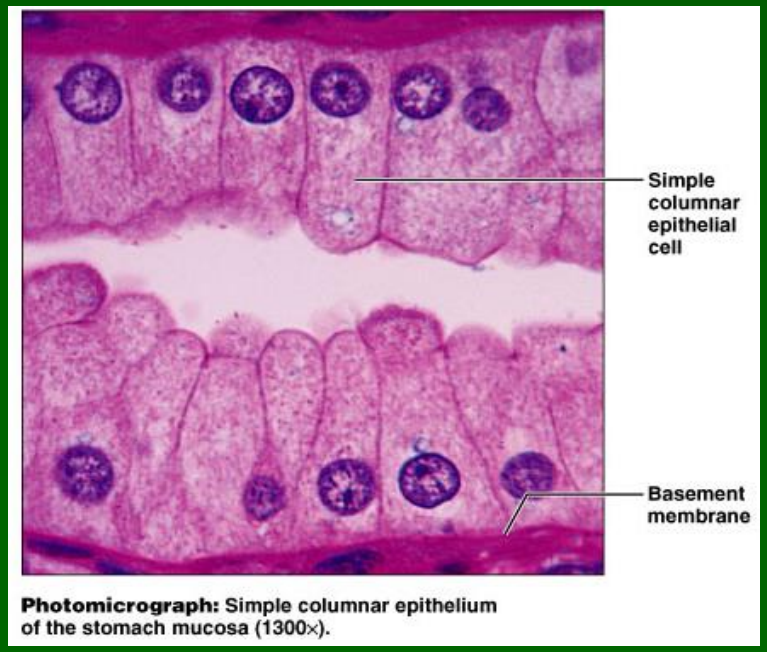


Simple Columnar Epithelium

- Description
  - single layer of column-shaped (rectangular) cells with oval nuclei
    - Some bear cilia at their apical surface
    - May contain goblet cells
- Function
  - Absorption; secretion of mucus, enzymes, and other substances
  - Ciliated type propels mucus or reproductive cells by ciliary action

Simple Columnar Epithelium

- Location
  - Non-ciliated form
    - Lines digestive tract, gallbladder, ducts of some glands
  - Ciliated form
    - Lines small bronchi, uterine tubes, and uterus



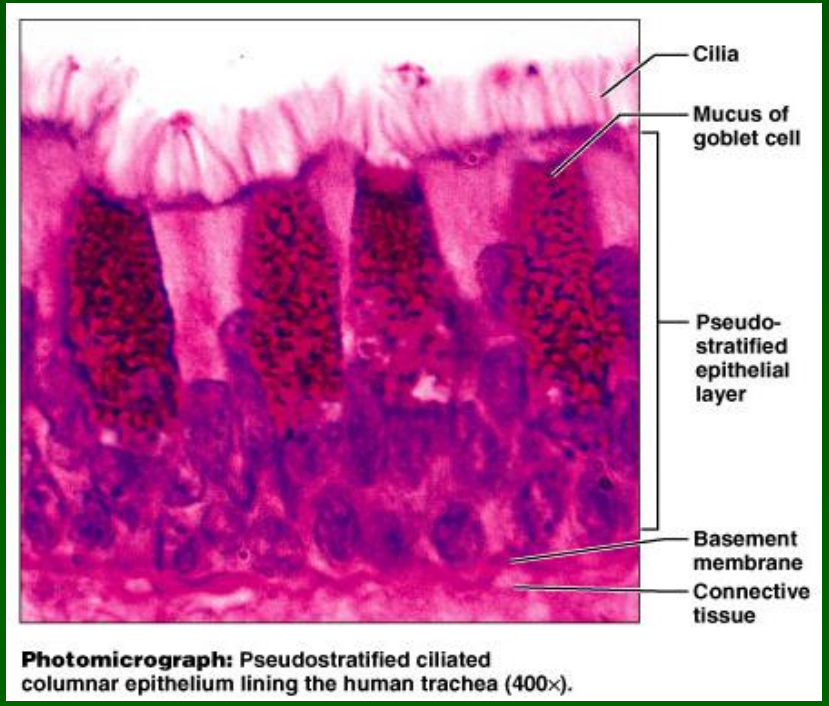
Photomicrograph: Simple columnar epithelium of the stomach mucosa (1300×).

Pseudostratified Columnar Epithelium

- Description
  - All cells originate at basement membrane
  - Only tall cells reach the apical surface
  - May contain goblet cells and bear cilia
  - Nuclei lie at varying heights within cells
    - Gives false impression of stratification
- Function
  - secretion of mucus; propulsion of mucus by cilia

Pseudostratified Columnar Epithelium

- Locations
  - Non-ciliated type
    - Ducts of male reproductive tubes
    - Ducts of large glands
  - Ciliated variety
    - Lines trachea and most of upper respiratory tract



Photomicrograph: Pseudostratified ciliated columnar epithelium lining the human trachea (400×).

Stratified Epithelia

- Contain two or more layers of cells
- Regenerate from below
- Major role is protection
- Are named according to the shape of cells at apical layer

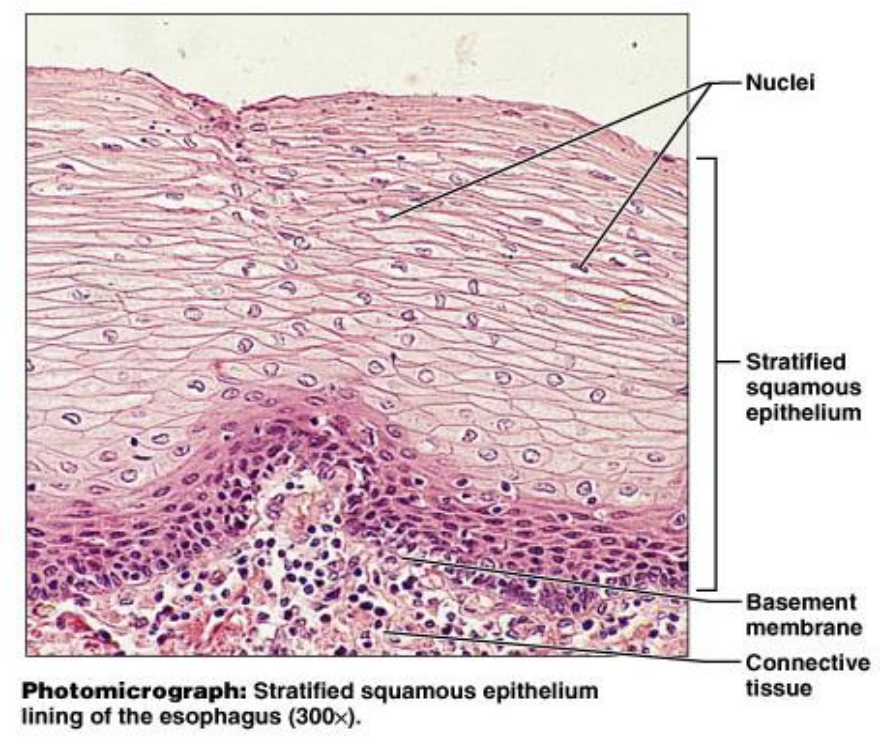
Stratified Squamous Epithelium

- Description
  - Many layers of cells – squamous in shape
  - Deeper layers of cells appear cuboidal or columnar
  - Thickest epithelial tissue – adapted for protection

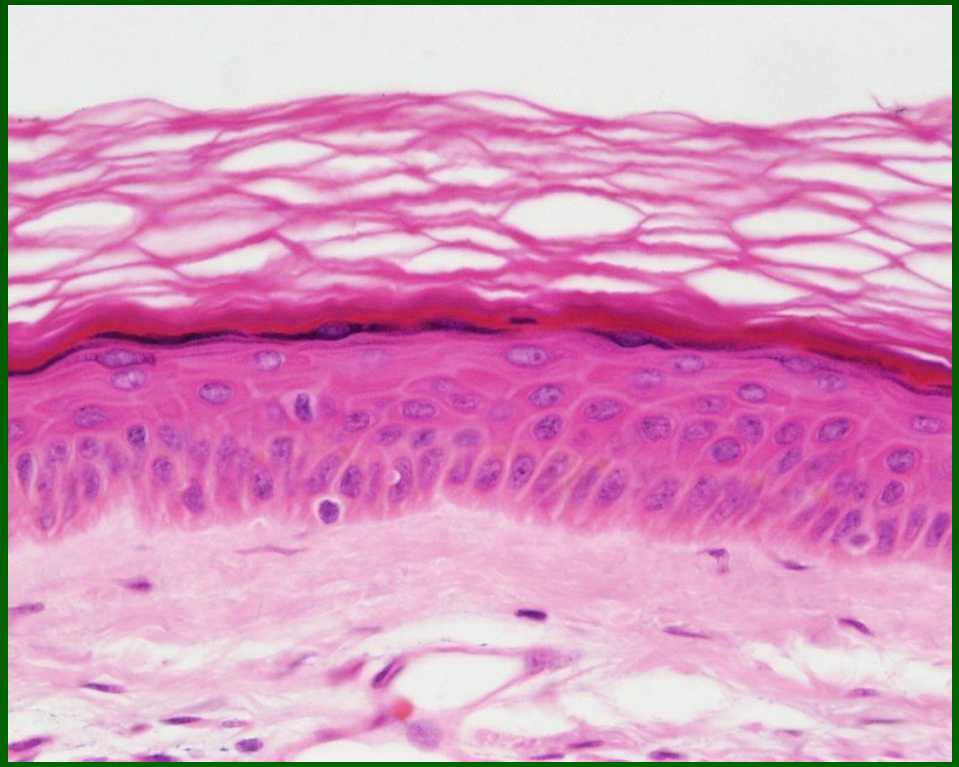
Stratified Squamous Epithelium

- Specific types
  - Keratinized – contain the protective protein keratin
    - Surface cells are dead and full of keratin
  - Non-keratinized – forms moist lining of body openings
- Function
  - Protects underlying tissues in areas subject to abrasion
- Location
  - Keratinized – forms epidermis
  - Non-keratinized – forms lining of esophagus, mouth, and vagina

Stratified Squamous Epithelium



Photomicrograph: Stratified squamous epithelium lining of the esophagus (300×).

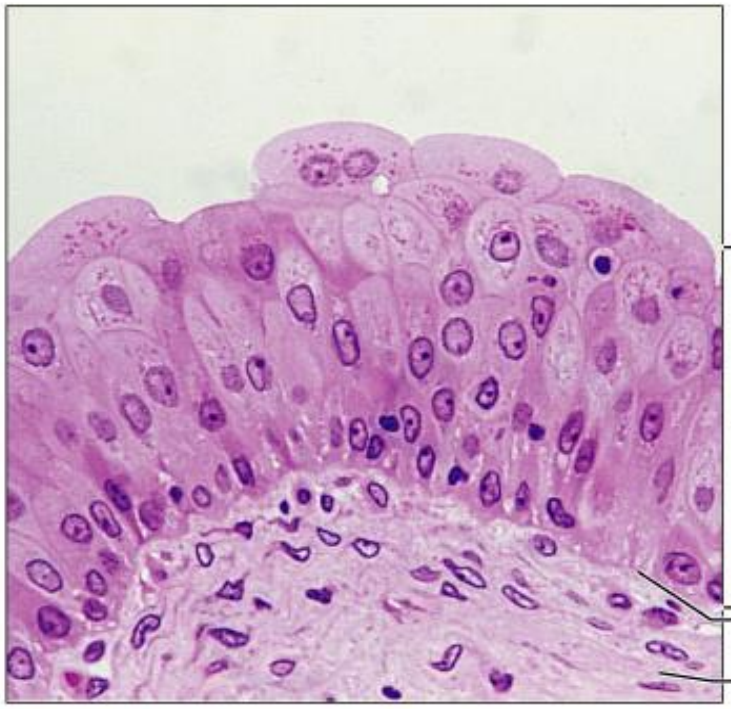


Non-keratinized vs. Keratinized

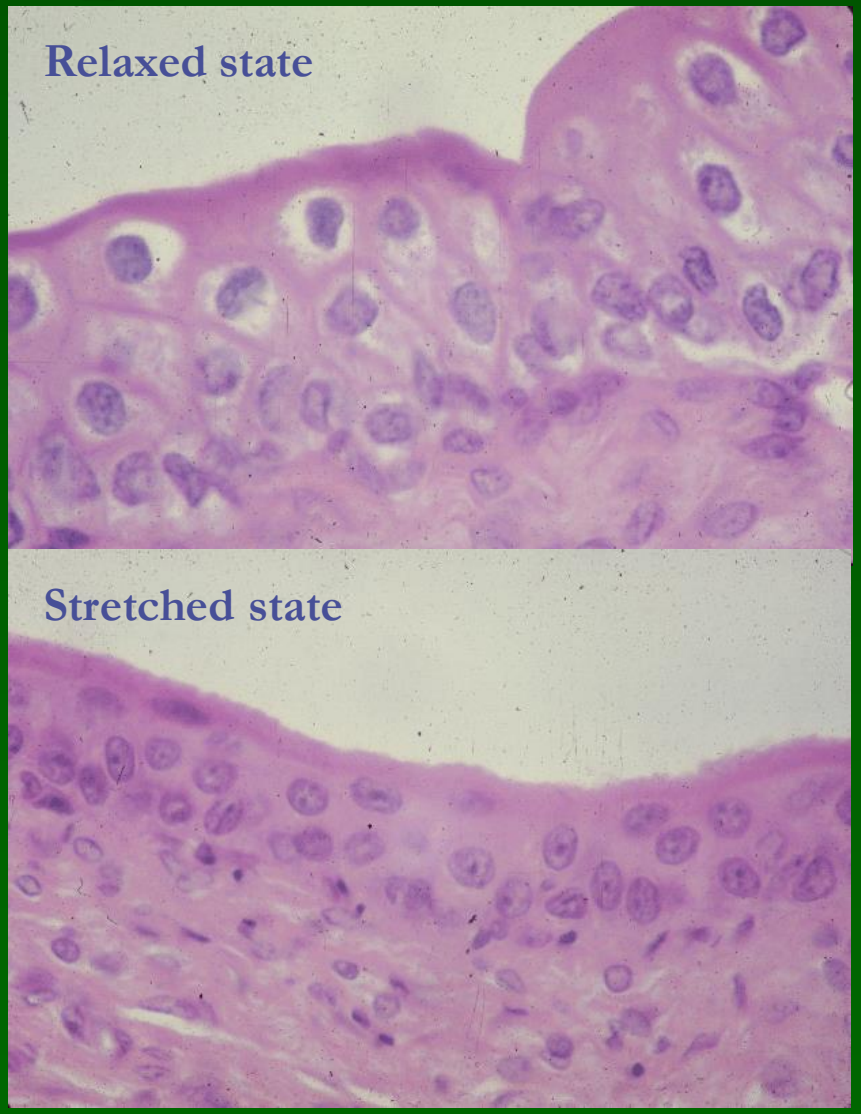
Transitional Epithelium

- Description
  - Basal cells usually cuboidal or columnar
  - Superficial cells dome-shaped or squamous
- Function
  - stretches and permits distension of urinary bladder
- Location
  - Lines ureters, urinary bladder and part of urethra

Transitional Epithelium



Photomicrograph: Transitional epithelium lining of the bladder, relaxed state (500×); note the bulbous, or rounded, appearance of the cells at the surface; these cells flatten and become elongated when the bladder is filled with urine.



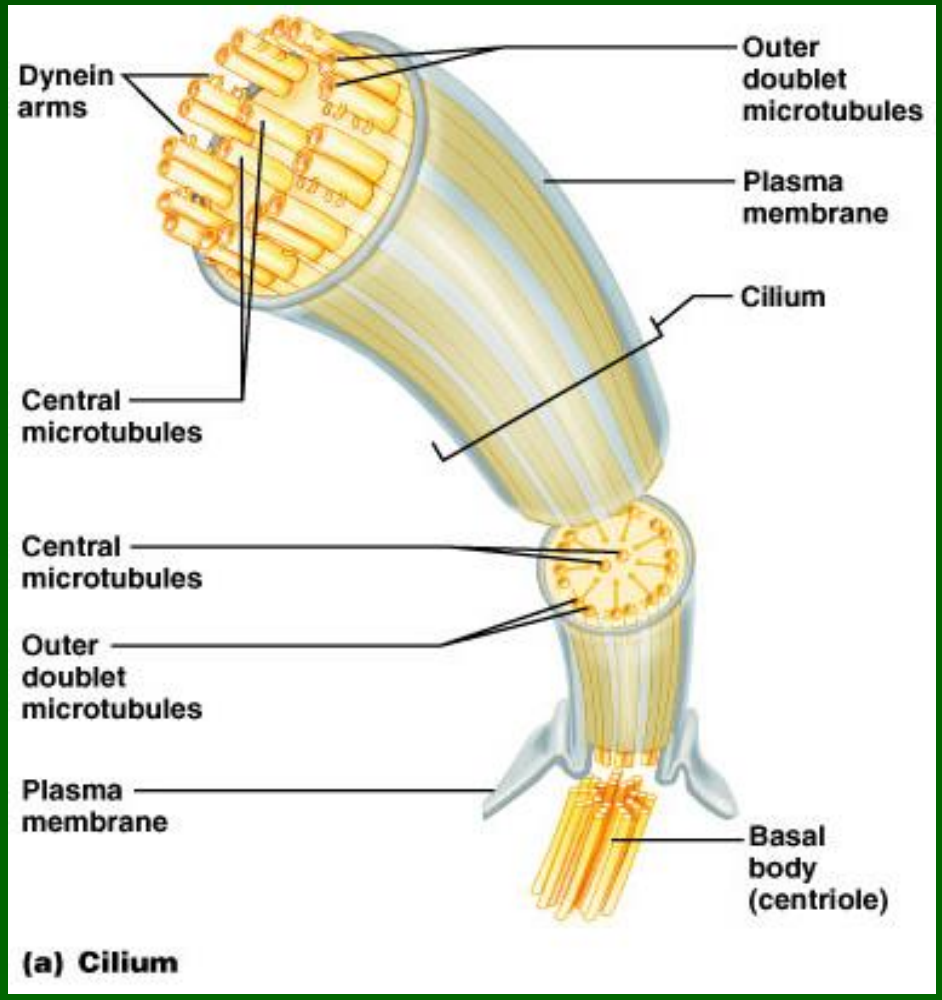
Epithelial Surface Features

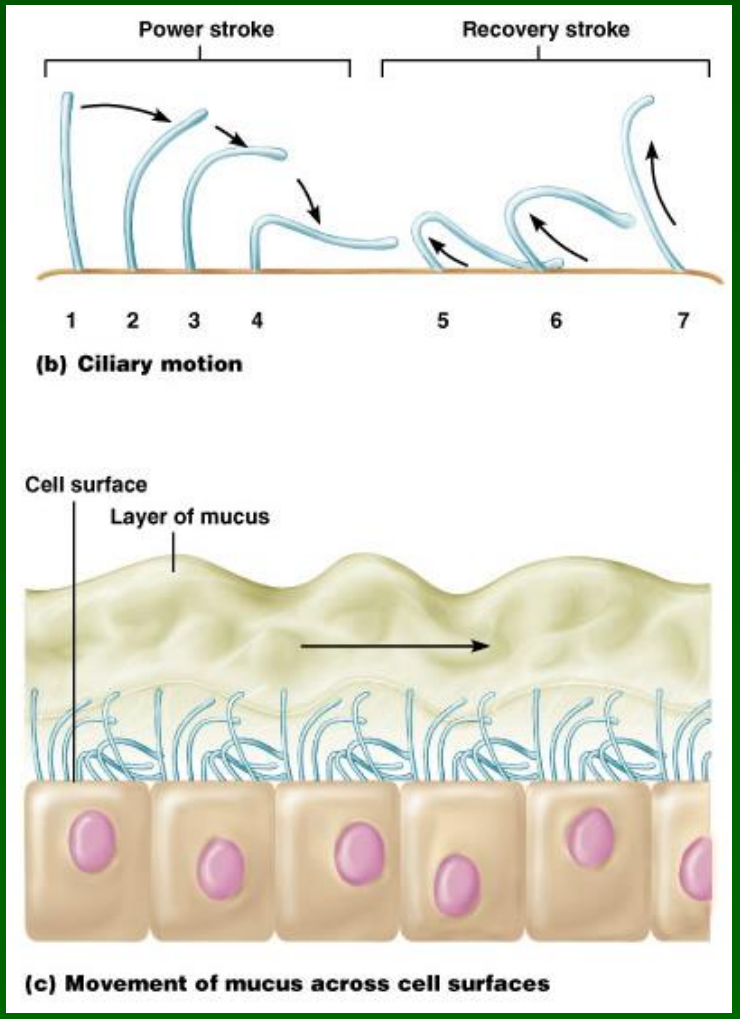
- Apical surface features
  - Microvilli – finger-like extensions of plasma membrane
    - Abundant in epithelia of small intestine and kidney
    - Maximize surface area across which small molecules enter or leave
    - Act as stiff knobs that resist abrasion

Epithelial Surface Features

- Apical surface features
  - Cilia – whip-like, highly motile extensions of apical surface membranes
    - Contains a core of nine pairs of microtubules encircling one middle pair
    - Axoneme – a set of microtubules
    - Each pair of microtubules – arranged in a doublet
    - Microtubules in cilia – arranged similarly to cytoplasmic organelles called centrioles
    - Movement of cilia – in coordinated waves

A Cilium


Dynein arms
Outer doublet microtubules
Plasma membrane
Cilium
Central microtubules
Central microtubules
Outer doublet microtubules
Plasma membrane
Basal body (centriole)
(a) Cilium


Power stroke
Recovery stroke
1
2
3
4
5
6
7
(b) Ciliary motion
Cell surface
Layer of mucus
(c) Movement of mucus across cell surfaces


thank you