

## Tissues

- Epithelial (covers)
- Connective (supports)
- Nervous (controls)
- Muscular (movement)

### To view tissues

1. Fixed (preserved)
2. Cut into pieces (slices)
3. Stained (enhance)

-**Artifacts**- minor distortions

-**Electron microscope stain**- acidic/negatively charged; basic/positively charged

-**TEM**- heavy metal salts

-**SEM**- takes 3D image of unsliced tissue

## Epithelial Tissue

-Sheets of cells that line or cover surface

-Covering- lines skin, organs

-Glandular epithelial- lines glands of body

-Mitotic throughout life

-**Functions (6)**

(all things that enter and leave the body contact epithelial tissue)

1. Protect
2. Absorb
3. Filtrate
4. Excrete
5. Secrete
6. Sensory receptors

-**Characteristics (5)**

### 1. Polarity

-**Apical-basal polarity**- upper free surface (apical) exposed to body exterior, or cavity of internal organ and a lower attached (basal)

-**Apical**- smooth and slick, most have microvilli

-**Microvilli**- increase surface area

-**Cilia**- hair like projections that propel substances along

-**Basal**

-**Basal lamina**- thin supporting sheet

-Consists of glycoproteins and collagen fibers

-Selective filter to underlying connective tissue

-Repair wounds

### 2. Specialized contacts

-**Tight junctions and desmosomes**- bind adjacent cells together at many points

- Help keep apical region of membrane from diffusing to basal region (maintains polarity)

### **3. Supported by connective tissues**

- Reticular lamina**- layer of extracellular material containing a network of fibers that belongs to connective tissue

- Basement membrane**- formed by the two lamina

- Reinforces epithelial sheet

- Helps resist stretching and tearing

- Defines epithelial border

### **4. Avascular but innervated**

- Avascular**- contains no blood vessels

- Innervated**- supplied by nerve fibers

- Nourished by substances that diffuse from underlying connective tissue blood supply

### **5. Regeneration**

- Reproduce rapidly

- As long as receive adequate nutrition

## **-Classification**

- Two names**: 1<sup>st</sup> indicates number of cell layers present, 2<sup>nd</sup> describes shape of cell

- Simple epithelia**- single cell layer, thin (absorption, secretion, and filtration)

- Cells usually have same shape

- Not for protection

- Stratified epithelia**- two or more cell layers, stacked. High abrasion areas (protection)

- Cells differ at different layers

- Named according to shape of cells in apical layer

### **-Common shapes**

- Squamous cells**- flattened and scale like

- Nucleus-flat disc

- Cuboidal cells**- boxlike, as tall as they are wide

- Nucleus- spherical

- Columnar cells**- tall and column shaped

- Nucleus- elongated from top to bottom, closed to cell base

- Shape of nucleus conforms to shape of cell

## **Simple Squamous Epithelium**

- Flattened laterally

- Cytoplasm sparse

- Thin and permeable

- Endothelium**- provides slick, friction-reducing lining

- Lymphatic vessels and in hollow organs

- Mesothelium**- found in ventral body cavity, and covering organs

## **Simple Cuboidal Epithelium**

- Single layer cells
- Nuclei stain dark (cells appear like stream of beads)
- Secretion and absorption
- Forms small ducts and glands, kidney tubules

### **Single Columnar Epithelium**

- Single layer, tall and packed
- Lines digestive tract (stomach → rectum)
- Absorption and secretion
- Dual function:
  - Dense microvilli on apical surface of absorptive cells
  - Tubular glands made primarily of cells that secrete mucus
- Cilia on free surfaces

### **Pseudostratified Columnar Epithelium**

- Vary in height
- All cells rest in basement membrane
- Only tallest cells reach free surface of epithelium
- Tissues give false (pseudo) impressions that several cell layers are present
- Secretes and absorbs
- Cilia version containing mucus-secreting glands line respiratory tract
- Dust trapping mucus

### **Stratified Epithelia**

- Composed of two cell layers
- Regenerate from basal cells and push apically to replace older cells
- Durable, protection
- Stratified Squamous Epithelium**
  - Most widespread of stratified
  - Composed of several layers → thick
  - Free surface is squamous, deeper layer cuboidal and columnar
  - Forms outer layer of skin (which is keratinized)
- Stratified cuboidal epithelium**- rare in body, mainly in larger gland ducts
  - Two layers of cuboidal cells
- Stratified columnar epithelium**- found in pharynx, male urethrae, and some glandular ducts
  - Often in junction areas (in-between two types of epithelia)
  - Only apical layer columnar
- Transitional Epithelium**- lining of urinary organs, stretching
  - Basal layer- cuboidal or columnar
  - Apical layer varies based on stretching of organ
    - When organ stretches- epithelium thins from 6 layers to 3
  - Allows more urine to flow/store
- Glandular epithelia**
  - Gland**- consists of one or more cells that make and secrete a particular product
    - Secretion- aqueous fluid that contains proteins in variation
    - Some release a lipid or steroid based secretion