Tissue = A collection of cells that perform related functions, and are similar in structure, or a mass of like cells

Histology = The study of tissues

The Four Primary Tissue Types

Epithelial
Connective
Muscular
Nervous
Epithelial Tissue

1. Epithelium / -a = cell layer (barrier)
   - Epi = on or upon
   - Protection: covering or lining—inside and out
   - Permeability control: selective secretion and absorption
   - Sensation: touch receptors etc. and neuroepithelium of special senses

2. Glands = secretory structure
   - Specialized secretions
     - Saliva, hormones, many others

• The Four Primary Tissue Types
  Epithelial
  Connective
  Muscular
  Nervous
Cellularity (little to no IC Space)
Cell to cell contacts
Polarity (sometimes)
Basement Membrane
Support by connective tissue
Avascular (esp. epidermis)
Regeneration/repair
Polarity of (some) Epithelial Cells
Classification of Epithelia

- The function of the epithelium determines which type.

- Typically classified according to
  1. Number of cell layers
     - Simple vs. Stratified
  2. Shape of cell
     - Squamous, cuboidal, columnar
A Concept Map

Epithelial tissues

- Squamous
  - Simple
  - Stratified
    - Keratinized
    - Nonkeratinized

- Columnar
  - Simple
  - Pseudostratified
  - Transitional

- Cuboidal
  - Simple
  - Stratified
- Location:
  - Lining of ventral body cavities, e.g. peritoneum
  - Lining of blood vessels (endothelium)
  - Alveoli of lung
  - Bowman’s Capsule

Simple Squamous Epithelium

- **Location:**
  - Lining of ventral body cavities, e.g. peritoneum
  - Lining of blood vessels (endothelium)
  - Alveoli of lung
  - Bowman’s Capsule

- **Description:** Single layer of flattened cells with disc-shaped central nuclei and sparse cytoplasm; the simplest of the epithelia.

- **Function:** Allows passage of materials by diffusion and filtration in sites where protection is not important; secretes lubricating substances in serosa.

- **Location:** Kidney glomeruli and corpuscles; air sacs of lungs; lining of heart, blood vessels, and lymphatic vessels; lining of ventral body cavity (serosa).
Function of Simple Squamous E.

- Friction reduction (cavity lining)
- Blood vessel permeability control (capillaries and Bowman’s capsule)
- Gas absorption and secretion (lung)
- Not protective—only one cell thick
Stratified Squamous Epithelium

- **Function**
  - Protection against abrasion, pathogens, chemicals, heat/cold...

- Keratinized vs. non-keratinized

- Location? Where we need protection!
  - Skin surface
  - Entrances/exits of body, e.g. mouth, vagina
Keratinized (cornified) stratified squamous epithelium

Thick skin
Nonkeratinized (noncornified) stratified squamous epithelium

**Description:** Thick membrane composed of several cell layers; basal cells are cuboidal or columnar and metabolically active; surface cells are flattened (squamous); in the keratinized type, the surface cells are full of keratin and dead; basal cells are active in mitosis and produce the cells of the more superficial layers.

**Function:** Protects underlying tissues in areas subjected to abrasion.

**Location:** Nonkeratinized type forms the moist linings of the esophagus, mouth, and vagina; keratinized variety forms the epidermis of the skin, a dry membrane.

**Photomicrograph:** Stratified squamous epithelium lining of the esophagus (300×).
Simple Columnar Epithelium

- The “classical” epithelium

- Function:
  - Secretion
  - Absorption

- Location:
  - GI tract
  - Many excretory ducts

- Cilia (uterine tube)
- Microvilli (small intestine)
Pseudostratified Ciliated Columnar Epithelium

- **Function:** Mucociliary Blanket

- **Mixture of cell types ⇒ nuclei located at various distances from surface. Yet: all cells contact BM**

- **Location:** Ducts of Respiratory tract
  - i.e., trachea and bronchi
Cilia
Cytoplasm
Nuclei
Basement membrane
Loose connective tissue
Transitional Epithelium

- Function ?
- Extreme expansion & recoil
- Layered appearance due to overcrowding. All cells contact BM.
- Location ?
  - Bladder, ureters, renal pelvis
Epithelium (relaxed)

Basement membrane

Connective tissue and smooth muscle layers

stretched
Bladder
Simple Cuboidal Epithelium

- **Function:**
  - Secretion
  - Absorption

- **Location:** Lining of ducts
  - e.g., kidney tubules
  - Glands (salivary, pancreas, thyroid)
Kidney tubule

Thyroid Follicle
Stratified cuboidal epithelium: quite rare, found in glands and ducts

Sweat gland
Glandular Epithelia

Types of Glandular Secretions:

- **Exocrine**
  - Glands have ducts
  - Secretion to the “outside” of the body
  - Simple or compound

- **Endocrine**
  - Glands have no ducts
  - Hormones (into the bloodstream)