Today’s Objectives
1. Learn the 4 types of tissues
2. Understand the origins of all tissues
3. Know the general features of
   - epithelial tissue
   - nervous tissue
4. Lab

The Study of Tissues
- 50 trillion cells of 200 different cell types
- Tissues: Group of similar cells
  - common embryonic origin
  - common function
- 4 broad categories of tissues
  - epithelial tissue
  - connective tissue
  - nervous tissue
  - muscular tissue
- organ – Two or more tissues working together common function
- histology (microscopic anatomy) – the study of tissues

Sectioning Solid Objects
- sectioning a cell with a centrally located nucleus
- some slices miss the cell nucleus
- in some the nucleus is smaller

Sectioning Hollow Structures
- cross section of blood vessel, gut, or other tubular organ.
- longitudinal section of a sweat gland. notice what a single slice could look like.

Tissue Sections
- longitudinal section (I.S.)
  - tissue cut along long direction of organ
- cross section (C.S. or X.S.) or transverse section (T.S.)
  - tissue cut perpendicular to length of organ
- oblique section
  - tissue cut at angle between cross and longitudinal section

4 Primary Tissues
1. Epithelial Tissue:
   - covers surfaces
   - lines hollow organs, cavities and ducts
   - forms glands (beneath surface)
2. Connective Tissue:
   - supports - binds structures together
   - stores energy as fat
   - provides immunity to disease
   - transports things
4 Primary Tissues

3. Muscle Tissue:
   - cells shorten in length producing movement
   - produce kinetic energy

4. Nerve Tissue:
   - cells that conduct electrical signals
   - detect stimuli inside and outside the body
   - communication

Origin of Tissues

• Primary germ layers within the embryo
  - Endoderm
  - Mesoderm
  - Ectoderm

• Tissue derivations
  - G.I. Tract, respiratory tract, Urinary from Endoderm
  - connective tissue & muscle from mesoderm
  - nerve tissue and epidermis from ectoderm

Cell Junctions

1. Anchor
2. Form seals between cells
3. Provide channels

Basement Membrane

• Basal lamina
  - from epithelial cells
  - collagen fibers
  - Adhesive glycoproteins (laminin)

• Reticular lamina
  - secreted by connective tissue cells
  - reticular fibers
  - Collegen fibers
  - holds cells to connective tissue

Two Types of Epithelium

1. Covering and lining epithelium
   - epidermis of skin
   - lines blood vessels and ducts
   - lines respiratory, reproductive, urinary & GI tracts

2. Glandular epithelium
   - secreting portion of glands
Classification of Epithelium

- Layers of cells
  - Simple = one cell layer thick
  - Stratified = many cell layers thick
  - Pseudostratified = single layer of cells where all cells don’t reach apical surface
    - Nuclei at different levels - looks multilayered

- Shape of surface cells
  - Squamous = flat
  - Cuboidal = cube-shaped
  - Columnar = tall column
  - Transitional = shape varies with tissue stretching

Examples

by layers

by shape

Examples by layers

Examples by shape

Simple Squamous Epithelium

- Single layer of flat cells
- E.g., lines blood vessels & body cavities

Simple Cuboidal Epithelium

- Nucleus of simple cuboidal cell
- Nucleus of simple squamous cell
**Ciliated Simple Columnar Epithelium**
- Single layer rectangular cells with cilia
- Mucus from goblet cells moved along by cilia

**Nonciliated Simple Columnar Epithelium**
- Single layer rectangular cells
- Unicellular glands = goblet cells secrete mucus
  - lubricate GI, respiratory, and urinary systems
- Microvilli

**Pseudostratified Columnar Epithelium**
- Single cell layer
- Not all cells reach apical surface
- Nuclei at varying depths
- Respiratory system, male urethra & epididymis

**Stratified Cuboidal Epithelium**
- Multilayered
- Surface cells cuboidal
  - rare
Stratified Columnar Epithelium
- Multilayered
- Surface cells columnar
- Rare

Transitional Epithelium
- Multilayered
- Surface cells vary in shape
- Lines hollow organs that expand from within

Glandular Epithelium
- Derived from epithelial cells
  - Exocrine glands (glands with ducts)
    - cells that secrete onto free surface of epithelial layer
  - Endocrine glands (glands without ducts)
    - secrete hormones into the bloodstream

Goblet Cell

Classification of Exocrine Glands
Single-celled glands: Goblet cells
Multicellular glands:
- unbranched = simple
- branched = compound

- Tubular vs. rounded secretory parts
  1. Tubular = tubular
  2. Acinar = rounded (flask-like shape)
  3. Tubuloacinar = both tubular & rounded shapes
Types of Exocrine Glands

- **simple** - unbranched duct
- **compound** - branched duct
- **shape of gland**
  - tubular – duct and secretory portion have uniform diameter
  - acinar - secretory cells form dilated sac (acinus or alveolus)
  - tubuloacinar - both tubular and acinar portions

Types of Secretions

- **serous glands**
  - produce thin, watery secretions
  - perspiration, milk, tears and digestive juices

- **mucous glands**
  - produce glycoprotein, mucin, that absorbs water to form a sticky secretion called mucus
  - goblet cells – unicellular mucous glands

- **mixed glands**
  - contain both cell types and produce a mixture of the two types of secretions

- **cytogenic glands**
  - release whole cells, sperm and egg cells

Methods of Secretion

**Merocrine Gland**

- merocrine glands (eccrine glands) – vesicles release secretion by exocytosis
  - tear glands, pancreas, gastric glands, and others

- apocrine glands – primarily merocrine mode of secretion
  - axillary sweat glands, mammary glands

**Holocrine Gland**

- holocrine glands – product synthesized then the cell disintegrates
  - secretion a mixture of cell fragments and synthesized substance
  - oil glands of scalp, glands of eyelids

Methods of Glandular Secretion

- Cell types – neurons and neuroglial (supporting) cells
- Nerve cell structure: Cell body, Dendrites, axons
- Action potential - neurotransmitter