

Tissues

Tissues

- Groups of cells similar in structure and function
- Types of tissues
 - Epithelial tissue
 - Connective tissue
 - Muscle tissue
 - Nerve tissue

Epithelial Tissue (Epithelium)

- Two main types (by location):
 1. Covering and lining epithelia
 2. Glandular epithelia

Characteristics of Epithelial Tissue

1. Cells have polarity—apical (upper, free) and basal (lower, attached) surfaces
 - Apical surfaces may bear microvilli (e.g., brush border of intestinal lining) or cilia (e.g., lining of trachea)
 - Noncellular basal lamina of glycoprotein and collagen lies adjacent to basal surface

Characteristics of Epithelial Tissue

2. Are composed of closely packed cells
3. Supported by a connective tissue reticular lamina (under the basal lamina)
4. Avascular but innervated
5. High rate of regeneration

Classification of Epithelia

- Ask two questions:
 1. How many layers?
 - 1 = simple epithelium
 - >1 = stratified epithelium

Classification of Epithelia

2. What type of cell?
 - Squamous
 - Cuboidal
 - Columnar

- (If stratified, name according to apical layer of cells)

Overview of Epithelial Tissues

- For each of the following types of epithelia, note:
 - Description
 - Function
 - Location

Epithelia: Simple Squamous

- Two other locations
 - Endothelium
 - The lining of lymphatic vessels, blood vessels, and heart
 - Mesothelium
 - The epithelium of serous membranes in the ventral body cavity

Epithelia: Stratified Cuboidal

- Quite rare in body
- Found in some sweat and mammary glands
- Typically two cell layers thick

Epithelia: Stratified Columnar

- Limited distribution in body
- Small amounts in pharynx, male urethra, and lining some glandular ducts
- Also occurs at transition areas between two other types of epithelia

Glandular Epithelia

- A gland is one or more cells that makes and secretes an aqueous fluid
- Classified by:
 - Site of product release—endocrine or exocrine
 - Relative number of cells forming the gland—unicellular (e.g., goblet cells) or multicellular

Endocrine Glands

- Ductless glands
- Secrete hormones that travel through lymph or blood to target organs

Exocrine Glands

- More numerous than endocrine glands

- Secrete products into ducts
- Secretions released onto body surfaces (skin) or into body cavities
- Examples include mucous, sweat, oil, and salivary glands

Unicellular Exocrine Glands

- The only important unicellular gland is the goblet cell

Multicellular Exocrine Glands

- Multicellular exocrine glands are composed of a duct and a secretory unit
- Classified according to:
 - Duct type (simple or compound)
 - Structure of their secretory units (tubular, alveolar, or tubuloalveolar)

Modes of Secretion

- Merocrine
 - Products are secreted by exocytosis (e.g., pancreas, sweat and salivary glands)
- Holocrine
 - Products are secreted by rupture of gland cells (e.g., sebaceous glands)

Connective Tissue

- Most abundant and widely distributed tissue type
- Four classes
 - Connective tissue proper
 - Cartilage
 - Bone tissue
 - Blood

Major Functions of Connective Tissue

- Binding and support
- Protection
- Insulation
- Transportation (blood)

Characteristics of Connective Tissue

- Connective tissues have:
 - Mesenchyme as their common tissue of origin
 - Varying degrees of vascularity

- Cells separated by nonliving extracellular matrix (ground substance and fibers)

Structural Elements of Connective Tissue

- Ground substance
 - Medium through which solutes diffuse between blood capillaries and cells
- Components:
 - Interstitial fluid
 - Adhesion proteins (“glue”)
 - Proteoglycans

Structural Elements of Connective Tissue

- Three types of fibers
 - Collagen (white fibers)
 - Strongest and most abundant type
 - Provides high tensile strength
 - Elastic
 - Networks of long, thin, elastin fibers that allow for stretch
 - Reticular
 - Short, fine, highly branched collagenous fibers

Structural Elements of Connective Tissue

- Cells
 - Mitotically active and secretory cells = “blasts”
 - Mature cells = “cytes”
 - Fibroblasts in connective tissue proper
 - Chondroblasts and chondrocytes in cartilage
 - Osteoblasts and osteocytes in bone
 - Hematopoietic stem cells in bone marrow
 - Fat cells, white blood cells, mast cells, and macrophages

Connective Tissue: Embryonic

- Mesenchyme—embryonic connective tissue
 - Gives rise to all other connective tissues
 - Gel-like ground substance with fibers and star-shaped mesenchymal cells

Overview of Connective Tissues

- For each of the following examples of connective tissue, note:
 - Description
 - Function
 - Location

Connective Tissue Proper

- Types:
 - Loose connective tissue

- Areolar
- Adipose
- Reticular
- Dense connective tissue
 - Dense regular
 - Dense irregular
 - Elastic

Connective Tissue: Cartilage

- Three types of cartilage:
 - Hyaline cartilage
 - Elastic cartilage
 - Fibrocartilage

Nervous Tissue

Muscle Tissue

Muscle tissue

- Highly cellular, well-vascularized
- Responsible for most types of body movement
- Possess myofilaments (actin and myosin) which are responsible for movement or contraction of cell types
- Three kinds: Skeletal, Cardiac, Smooth

Skeletal

- Skeletal muscle tissue is packaged by connective tissue sheets into organs called skeletal muscles
- These are attached to the bones of the skeleton
- Skeletal muscle cells are also called muscle fibers because they are long and cylindrical.
- These cells are striated
- They contain many nuclei
- Voluntary

Cardiac

- Found only in the walls of the heart and the first part of the aorta
- Its contractions help propel blood through the blood vessels to all parts of the body
- Striated
- Involuntary
- Uni or binucleated

- Possess unique junctions called intercalated discs which hold branching cells together tightly

Smooth muscle

- So named, because this muscle possesses no visible striations
- Individual cells are spindle-shaped
- Contain one centrally located nucleus
- Found in the walls of the hollow organs (except the heart)
- Functions to squeeze substances through these organs by alternatively contracting and relaxing.
- Involuntary

Epithelial Membranes

- Cutaneous membrane (skin) (More detail with the Integumentary System, Chapter 5)

Epithelial Membranes

- Mucous membranes
 - Mucosae
 - Line body cavities open to the exterior (e.g., digestive and respiratory tracts)

Epithelial Membranes

- Serous Membranes
 - Serosae—membranes (mesothelium + areolar tissue) in a closed ventral body cavity
 - Parietal serosae line internal body walls
 - Visceral serosae cover internal organs