

Histology

- Complements study of gross anatomy
- Tissues are groups of cells w/common and related functions.
- Primary tissue types:
**Epithelial(covering),Connective(support),
Muscle(movement), Neural(control).**

Epithelial Tissue

- Occurs in the body as:
Covering, lining, glandular epithelium
- Functions include:
Protection, absorption, filtration,secretion.

Epithelial Tissue Characteristics

- Composed of close packed cells; tiny amount of extra-cellular material in narrow spaces between them.
- Specialized contacts-Form continuous sheets; junctions.
- Apical surface, lateral, base

Epithelial Classification

- **Number of layers:** *Simple*(single cell) layer for absorption, filtration, & thin barrier. *Stratified* (two or more)layers common in high abrasion areas.
- **Shape:** *Squamous, Cuboidal, Columnar* (nuclear shape conforms to cell shape)

Simple Epithelia

- **Simple Squamous**- Cells laterally flattened; located in areas of filtration/rapid diffusion.
Endothelial lining-provides frictionless lining; blood vessels/heart chambers.
Mesothelial-epithelium found lining organs.

Simple Epithelia (cont'd)

- **Simple Cuboidal**-Spherical nuclei; absorption & secretion; kidney tubules and secretory ducts.
- **Simple Columnar**-Single layer of tall cells aligned in rows;some have cilia;absorption & secretion.
- **Pseudostratified Columnar**- Cells vary in height; absorption & secretion; trachea.

Stratified Epithelia

- **Stratified Squamous**- Most widespread (in areas of wear and tear);superficial cells less viable than deep cells>epidermis is keratinized, other areas non-keratinized.
- **Stratified Columnar**- Rare tissue; forms large gland ducts and male urethra.
- **Transitional**- Basal cells are cuboidal/colum., apical cells vary in shape according to distension of organ;urinary bladder.

Connective Tissue

- **Found throughout entire body but never exposed.**
- **Classes :** (1)Connective tissue proper (2)cartilage (3)bone (4) blood.
- **Functions:** (1)binding/support (2) protection (3) insulation (4) transportation.

Characteristics of Connective Tissue

- Have common origin (*mesenchyme*)
- Varying degrees of vascularity (cartilage, dense connective, bone)
- Extracellular matrix: separates *living* from *non-living* material; bears weight, withstands tension, & endures *physical trauma*.

Structural Elements of Connective Tissue

Ground Substance

Unstructured materials fills space between cells and contains fibers;interstitial fluid,cell adhesion proteins

Fibers:

- *Collagen*- Thick,strongest, most abundant;high tensile strength.
- *Elastic*- Long, thin, elastin; where elasticity is needed (skin, lungs, and blood vessel walls).
- *Reticular*- Fine, collagenous fibers; support soft tissues.

Structural Elements of CT(cont'd)

• Fixed Cells

Fibroblasts, osteoblasts, chondroblasts, macrophages, adipocytes, melanocytes.

• Wandering Cells

Free macrophages, mast cells (histamine),microphages (neutro-,eosinophils).

Connective Tissue Proper

• Loose Connective Tissue

Areolar- Most widely distributed CT; supports and binds other tissues,reinforces organs, stores nutrients.

Adipose- Adipocytes predominate(90%), oil droplet occupies cell volume displacing nuclei; tissue vascularized; insulation & shock absorber.

CT Proper (cont'd)

- **DENSE CONNECTIVE TISSUE**

Dense regular-Parallel collagen fibers/ poorly vascularized; enormous tensile strength; found in tendons, ligaments.

Dense irregular:Irregularly arranged collagen fibers, found in dermis, fibrous coverings of kidneys, bones, cartilages, muscles, and nerves.

Supportive Connective Tissue

Cartilage

- Chondroitin sulfate
- Withstands tension & compression
- Flexible, avascular and lacks nerve fibers.
- Predominant cell types: chondroblasts, chondrocytes.

Supportive CT (cont'd)

Hyaline Cartilage

- Most abundant cartilage.
- Chondrocytes (1-10%) of cartilage vol.
- Located in nose, costal cartilages, tracheal rings,larynx, embryonic skeleton, and epiphyseal plates.

Elastic Cartilage

- Similar to hyaline; elastin fibers
- External ear and epiglottis

Supportive CT (cont'd)

Fibrocartilage

- Matrix dominated by densely interwoven collagen fibers
- Compressible & tension resistant.
- Intervertebral discs, pubic symphysis, meniscus.

Bone (Osseous tissue)

- Bone matrix similar to cartilage; more collagen fibers & inorganic salts (hydroxyapatites)
- Supports/ protects softer tissue; hematopoietic; vascularized
- Osteoblasts, osteocytes

Fluid Connective Tissue

- Blood
- Matrix: H₂O, salts, proteins (blood fibers evident during clotting)
- RBCs, leukocytes, platelets
- Transportation

Muscle Tissue

- *Highly cellular*
- *Vascularized*
- *Myofilaments (actin/myosin)*
- *Skeletal (striated), cardiac, smooth*

Muscle Tissue (cont'd)

Skeletal muscle

- Striated
- Attached to bones
- Somatic movements
- Large multinucleated myocytes
- Satellite cells-regenerative properties

Muscle Tissue (cont'd)

Cardiac muscle

- Exclusive to contractile walls of heart
- Contractions propel blood
- Uninucleate; intercalated discs
- Pacemaker cells establish regular rate of contractions (involuntary)

Muscle Tissue (cont'd)

Smooth muscle

- Striations absent
- Spindle shaped/central nucleus.
- GI and urinary tract, uterus, blood vessels.
Contract via *pacesetter cells*

Nervous Tissue

Neurons-Specialized for conduction; longest cells in body; poor regenerative properties.

- *Soma*
- *Axon*
- *Dendrite*

Neuroglia-Supportive framework for neural tissue (regulate interstitial composition & nutrient supply)

Integumentary System

Skin

3 regions

- Epidermis
- Dermis
- Hypodermis

Epidermis

- Keratinized stratified squamous

- 4-5 layers

Cell types

- Keratinocytes
- Melanocytes
- Merkel cells
- Langerhans' cells

Epidermal layers

- Stratum basale
- Stratum spinosum
- Stratum granulosum
- Stratum lucidum
- Stratum corneum

Dermis

- "Second" skin
- Fibroblasts, macrophages, mast cells, WBCs
- 2 layers: papillary, reticular
- Hypodermis
- Striae

Sweat/sebaceous glands

- Eccrine
- Apocrine
- Ceruminous
- Mammary
- Sebaceous

Nail structure

- Scalelike modification of epidermis
- Eponychium
- Hyponychium

Hair

- Filamentous strands of dead keratinized cells
- Produced by follicles
- Shaft projects from skin
- Root in skin
- Pigmented by melanocytes
- Arrector pili

Hair (cont'd)

- Distribution: entire body except palms,soles,lips,nipples, genitalia regions
- Hair types:vellus,intermediate,terminal
