Tissues

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How is it all Connected?

- Cells = basic unit of life
- Cells come together to form TISSUES
- TISSUES come together to form ORGANS
- ORGANS come together to form SYSTEMS
- SYSTEMS come together to form US.
What is a TISSUE?

- "Layers or groups of SIMILAR cells with a COMMON function."

- Tissues are distinguished from each other because of differences in size, organization, and function.
4 TYPES OF TISSUES

- **Epithelial Tissues:**
- **Connective Tissues:**
- **Muscle Tissues:**
- **Nervous Tissues:**
EPITHELIAL TISSUES

- Sheets of cells
- Specialized contacts/cell junctions
- Connective tissue support
- Easily regenerates
- skin, lining of gut, mucous membranes
Classes of Epithelia

- **Simple**: just one layer or cell shape
- **Stratified**: multiple layers and cell shapes
### Simple Epithelia

<table>
<thead>
<tr>
<th>Type</th>
<th>Cell shape</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squamous</td>
<td>Squashed</td>
<td>Endothelium (lines blood vessels), mesothelium (serous lining of celom)</td>
</tr>
<tr>
<td>Cuboidal</td>
<td>Cubed</td>
<td>Walls of glands</td>
</tr>
<tr>
<td>Columnar</td>
<td>Columns</td>
<td>Lining of gut tube; sometimes with cilia like lining of uterine tube</td>
</tr>
<tr>
<td>Pseudo-stratified</td>
<td>Flat cells give rise to columns</td>
<td>With cilia in respiratory tubes to move mucous/particles out of lungs</td>
</tr>
</tbody>
</table>
Stratified Epithelia

- Squamous
  - epidermis

- Transitional epithelium
  - urinary structures--bladder
Simple squamous
- Lines blood vessels and air sacs of lungs
- Permits exchange of nutrients, wastes, and gases

Simple cuboidal
- Lines kidney tubules and glands
- Secretes and reabsorbs water and small molecules

Simple columnar
- Lines most digestive organs
- Absorbs nutrients, produces mucus

Stratified squamous
- Outer layer of skin, mouth, vagina
- Protects against abrasion, drying out, infection

Stratified cuboidal
- Lines ducts of sweat glands
- Secretes water and ions

Stratified columnar
- Lines epididymus, mammary glands, larynx
- Secretes mucus

(a) Most epithelial tissues line or cover surfaces or body cavities

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Features of Apical Surface of Epithelium

- **Microvilli:** (ex) in small intestine
  - Finger-like extensions of the plasma membrane of apical epithelial cell
  - Increase surface area for absorption

- **Cilia:** (ex) respiratory tubes
  - Whip-like, motile extensions
  - Moves mucus, etc. over epithelial surface 1-way

- **Flagella:** (ex) spermatozoa
  - Extra long cilia
  - Moves cell
EPITHELIAL TISSUES

- So if Epithelial tissues are on the body surface and surround the organs
- Protection:
- Secretion:
- Absorption:
- Excretion:
- Transports:
- Sensory:
EPITHELIAL TISSUES

- Epithelial Tissues are classified by the shape of their cells.
- There are 3 different epithelial tissue cell types
  1. **Squamous**: flattened cells
  2. **Cuboidal**: Cube-like cells
  3. **Columnar**: Elongated
The arrangement of these cells varies. There are two different ways to arrange Epithelial Tissues

1. **Simple**: one layer of cells.

2. **Stratified**: two or more layers of cells.
Can You Identify the Classes of Epithelium?

Quiz!!

A

B

C

D

E
Types of Epithelial Tissues

- There are eight different types of Epithelial tissues.
- When you refer to one type of Epithelial tissue you call it an Epithelium (this is the singular spelling).
- Example: Simple Squamous Epithelium
- What can you tell me about the name above based on what you just learned?
Glands: epithelial cells that make and secrete a water-based substance

- **Exocrine Glands**
  - Secrete substance onto body surface or into body cavity
  - Have ducts
  - E.G., salivary, mammary, pancreas, liver

- **Endocrine Glands**
  - Secrete product into blood stream
  - Either stored in secretory cells or in follicle surrounded by secretory cells
  - Hormones travel to target organ to increase response
  - No ducts
Connective Tissues

- **Comprise much of the body**
- **The most abundant type of tissue by weight.**
- 1. bind structures
- 2. provide support and protection
- 3. serve as a framework
- 4. fill spaces
- 5. store fat
- 6. produce blood cells
- 7. protect against infection
- 8. help repair tissue damage.
Connective Tissue: Blood

- 1. Cells suspended in fluid called PLASMA
- 2. Red blood cells: transport gases
- 3. White blood cells: fight infection
- 4. Platelets: cause blood clotting
- 5. Mast cells = release histamine that dilates capillaries = swelling and redness.
“Loose” connective tissues

- Adipose tissue mostly under skin and in mesenteries
- Reticular: organized 3-D network of fibers that support lots of cells
  - marrow, spleen, lymph nodes
Adipose tissue
Adipose Tissue

- These cells accumulate fat, they enlarge and their nuclei is pushed to one side.
- When they become too abundant they crowd out other cell types and form “adipose tissue”.
- Found: between muscles, around kidneys, behind eyeballs, surface of the heart, and around joints.
Connective Tissue: Loose

- binds the skin to the muscle tissue below
MUSCLE TISSUE
SMOOTH TISSUE
“Dense” Connective tissues

- **Irregular**
  - Thick fibers running in many planes
  - dermis, fibrous capsules around organs

- **Regular**
  - Aligned parallel fibers
  - Resists tension
  - tendon, ligaments, aponeuroses
  - Sometimes with elastic fibers
Compact Bone & Spongy (Cancellous Bone)

- Lacunae containing osteocytes
- Lamellae
- Canaliculi
- Osteon of compact bone
- Trabeculae of spongy bone
- Osteon
- Haversian canal
- Periosteum
- Volkmann's canal
Connective Tissue: Bone

- Most rigid connective tissue
- Internally supports body structures
- Very active tissue
- Heals much more rapidly than injured cartilage because of close access to a blood supply
Dense Connective Tissue
Dense Connective Tissue: tendons and ligaments

- Very strong and can withstand pulling forces.
- Binds body parts together
- Has poor blood supply and is very slow to heal.
Dense Connective Tissue: tendons and ligaments

- Cartilage: rigid, provides support, framework, attachments, provides a structural model for many developing bones.
- Contains a large volume of water
- This is why sprains, damage to tissue around joints, takes considerable time to heal.
3 types of cartilage

1. Hyaline: most common, tips of bones at joints, soft part of the nose, supporting rings of the trachea. Prominent in early development.

2. Elastic: more flexible, ears and larynx

3. Fibrocartilage: very tough, shock absorber, intervertebral discs, knees and pelvis.
Connective Tissue: Elastic

- found in the attachments between bones of the spinal column.

- Very rare in the body but are found in large arteries such as the aorta.
NERVOUS TISSUE

Diagram of a neuron showing:
- Dendrites
- Soma
- Axon
- Node of Ranvier
- Myelin Sheath
- Chemical Synapse