

Chapter 4: Organization and Regulation of Body Systems

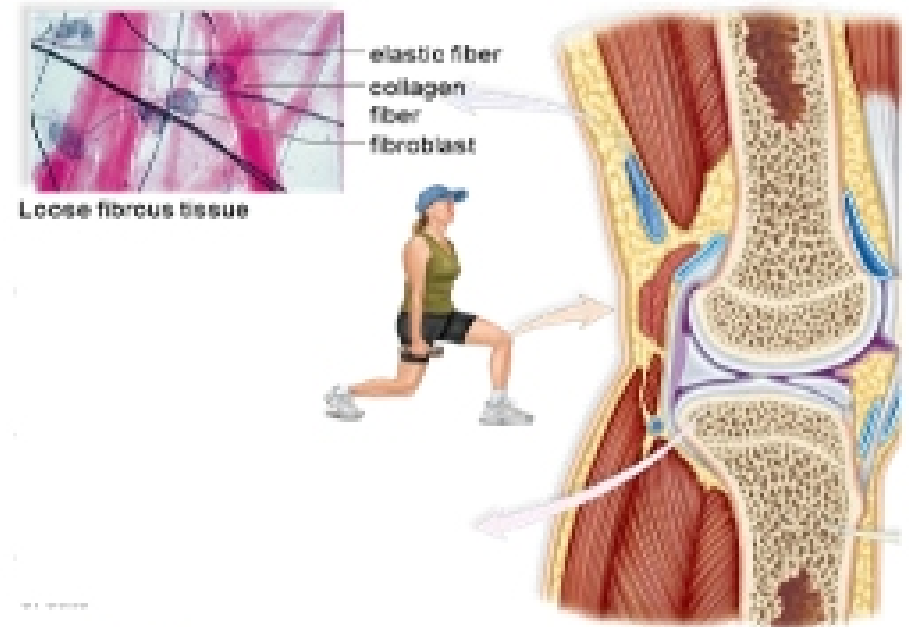
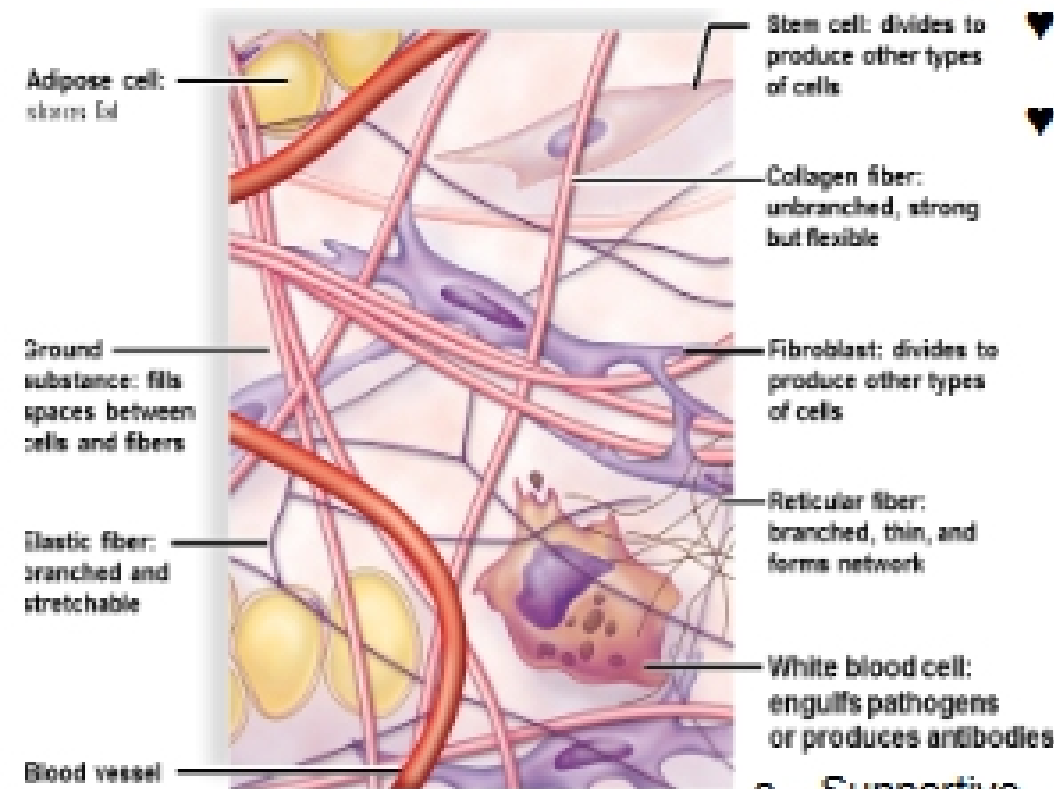
What is a tissue?

- A collection of cells of the same type that perform a common function.
- There are 4 major tissue types in the body.
 - Connective: It binds and supports parts of the body.
 - It has specialized cells, ground substance, and protein fibers.
 - Ground substance is non-cellular and ranges from solid to fluid.
 - Ground substance and protein fibers together make up the matrix of the tissue.
 - There are 3 main types of connective tissue:

o Fibrous

- There are 2 types: dense and loose, but both contain fibroblast cells with a matrix of collagen and elastic fibers.

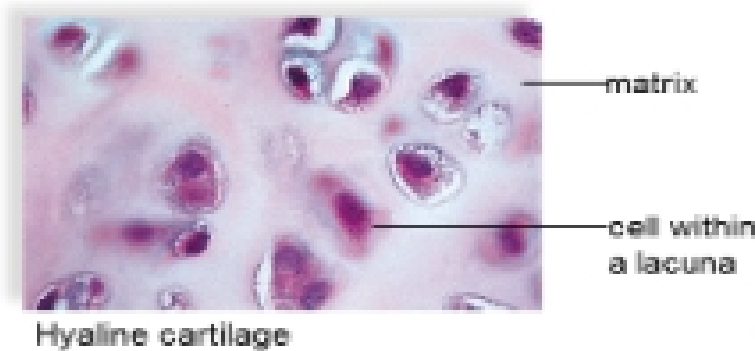
- ♥ Loose fibrous tissue is found supporting epithelium and many internal organs.
- ♥ Adipose tissue is a special, loose fibrous tissue where fat is stored.



o Supportive

- Cells are in chambers called lacunae.
- Matrix is solid but flexible.
- Example: Cartilage and there are 3 distinguished types of fibers.
 - ♥ Hyaline cartilage – fine collagen fibers. Location: Nose, ends of long bones, and fetal skeleton
 - ♥ Elastic cartilage – more elastic fibers than cartilage fibers. Location: Outer ear
 - ♥ Fibrocartilage – strong collagen fibers. Location: Disks between vertebrae
- Example: Bone (its solid and rigid matrix is made of collagen and calcium) and there are 2 distinguished types by the type of fibers.
 - ♥ Compact – made of repeating circular units called osteons which contain the hard matrix, living cells, and blood vessels. Location: Shafts of long bones
 - ♥ Spongy – an open latticework with irregular spaces. Location: Ends of long bones

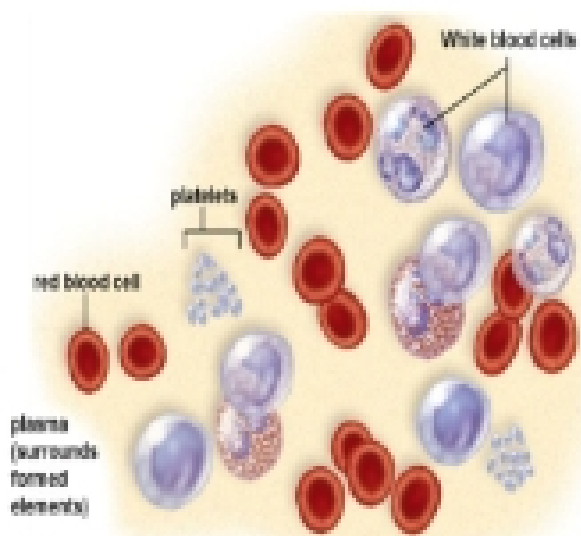
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o Fluid

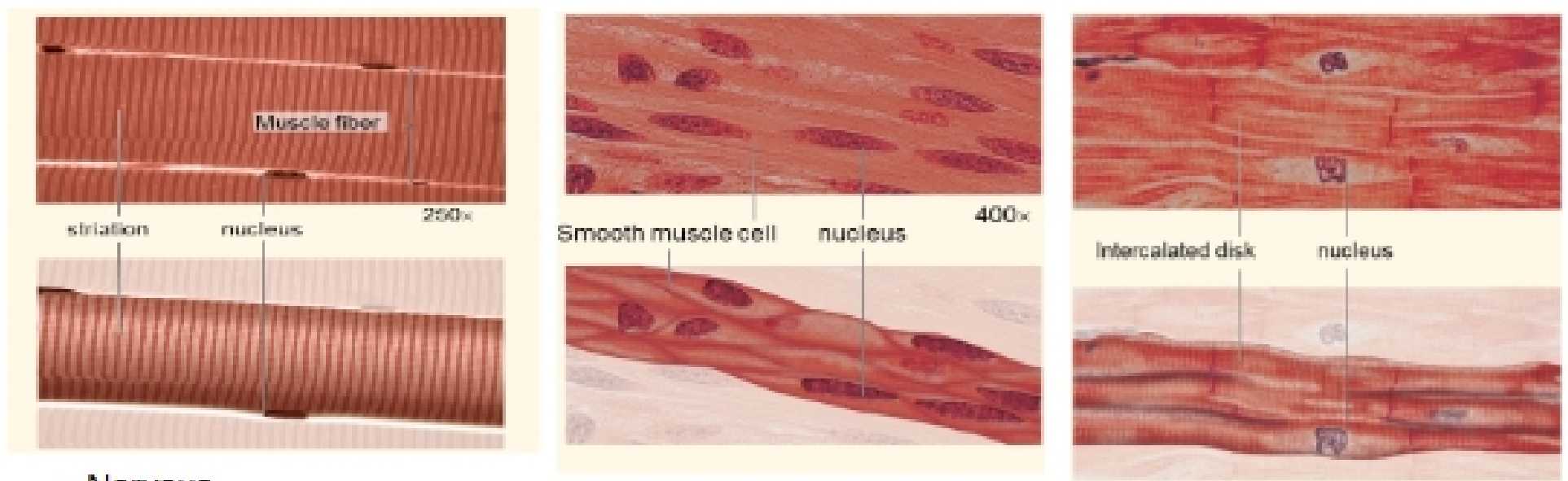
- Example: Blood; Made of a fluid matrix called plasma, contained in vessels and 3 cellular components that are called 3 formed elements:

- ♥ Red blood cells (erythrocytes) – cells that carry oxygen Red because of hemoglobin protein.
 - ♥ White blood cells (leukocytes) – cells that fight infection Production of antibodies
 - ♥ Platelets (thrombocytes) – pieces of cells that clot blood. Prevent loss of blood
- Example: Lymph; It's matrix is a fluid called lymph, contained in lymphatic vessels. White blood cells congregate in those lymph nodes.



– Muscular

- It allows for movement in the body.
- It is made of muscle fibers/cells and protein fibers called actin and myosin.
- There are 3 types of muscle tissue in humans:
 - o Skeletal:
 - Appearance: long, cylindrical cells, multiple nuclei, striated fibers
 - Location: attached to bone for movement
 - Nature: voluntary movement
 - o Smooth
 - Appearance: spindle-shaped cell with one nucleus, lacks striations
 - Location: walls of digestive organs and blood vessels
 - Nature: involuntary movement
 - o Cardiac
 - Appearance: branched cells with a single nucleus, striations with darker striations called intercalated disks between cells
 - Location: heart
 - Nature: involuntary movement



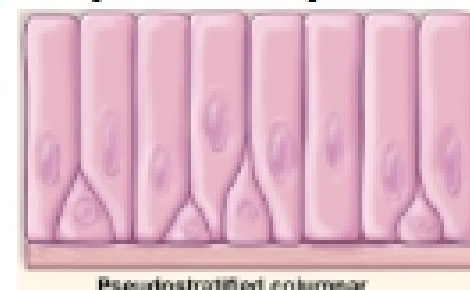
– Nervous

- It allows for communication between cells through sensory input, integration of data, and motor output.
- It is made of 2 major cell types:
 - o Neurons:
 - They are made of dendrites, a cell body, and an axon.
 - Dendrites carry information toward the cell body.
 - Axons carry information away from the cell body.
 - o Neuroglia:
 - They are a collection of cells that support and nourish neurons.
 - They outnumber neurons 9:1.
 - Examples are oligodendrocytes, astrocytes, Schwann cells and microglia.

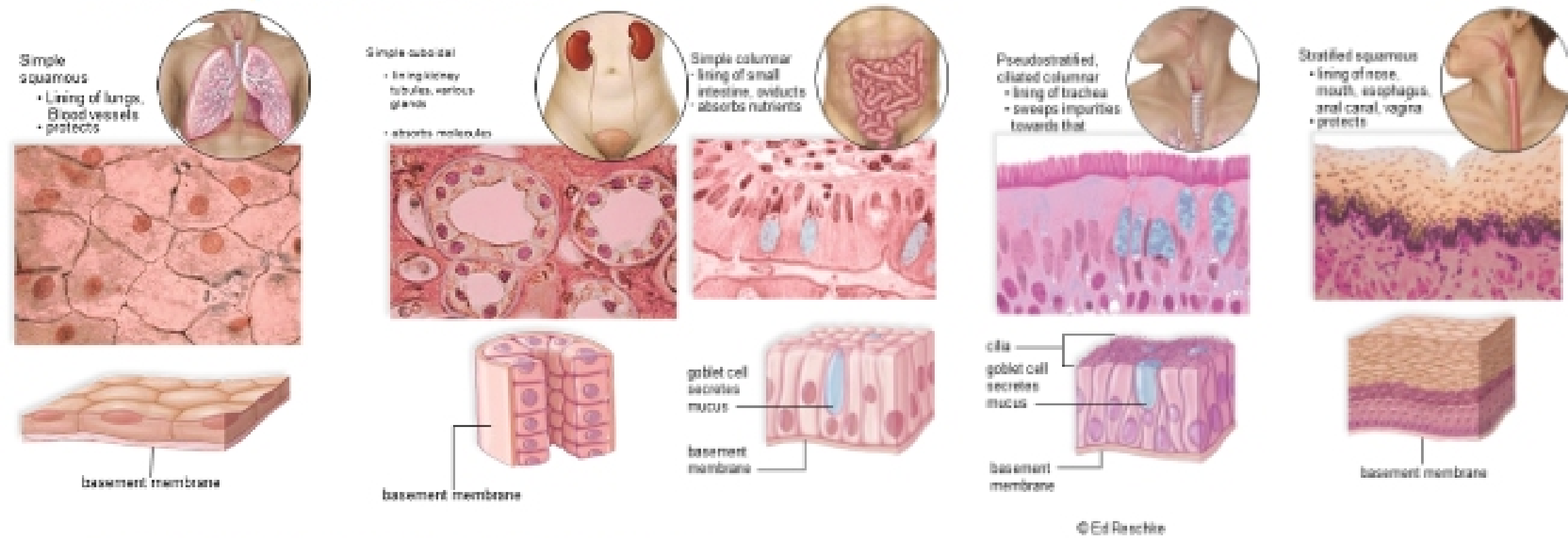
– Epithelial

- It is a group of cells that forms a tight, continuous network.
- It lines body cavities, covers body surfaces, and is found in glands.
- Cells are anchored by a basement membrane on one side and are free on other side.
- It is named after the appearance of cell layers and the shape of the cells.
- There is transitional epithelium that changes in appearance in response to tension.
- We name epithelial tissue by their shape and quantity of layers

- o Number of layers:
 - Simple (one layer of cells)
 - Pseudostratified (appears to have multiple layers but only has one layer)
 - Stratified (more than one layer of cells)
- o Shape:
 - Cuboidal (cube-shaped)
 - Columnar (column-shaped)
 - Squamous (flattened)



What does epithelial tissue look like?



Moving from tissue to organs and organ systems

- An organ is 2 or more tissue types working towards a particular function.
- An organ system is a combination of organs that work together to carry out a particular function.

Homeostasis

- It is the ability to maintain a relatively constant internal environment in the body.
- The nervous and endocrine systems are key in maintaining homeostasis.
- Changes from the normal tolerance limits result in illness or even death.
- The key mechanisms to maintain homeostasis are:
 - Negative feedback – the output of the system resolves or corrects the original stimulus.
 - The primary mechanism for maintaining homeostasis
 - Has 2 components: sensor and control center
 - Positive feedback – increases change in the same direction as the original stimulus.
 - An example is the secretion of oxytocin during birth to continually increase uterine contractions
 - Can be harmful such as when a fever is too high and continues to rise!

