

Types of Tissue

Tissues and anatomy

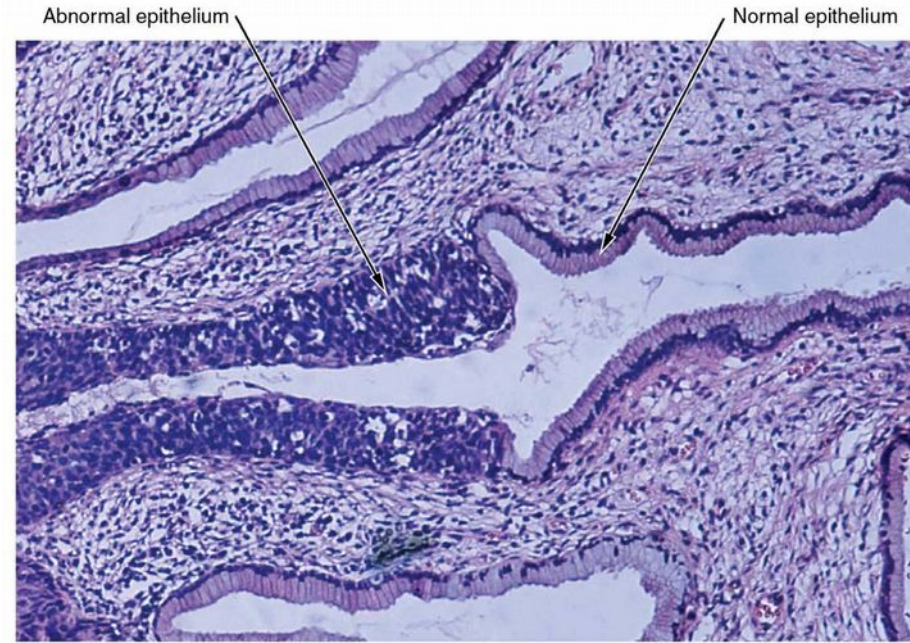
- anatomical features, organs, glands, etc. ... the entire body is composed of cells which are arranged into relatively few classifications of tissues (only 4 major types, many sub-types)
- while the function of tissues is largely covered in physiology, an understanding of tissues provides for a better understanding of the functional morphology (don't need to be an expert in histology to benefit)

What is a tissue?

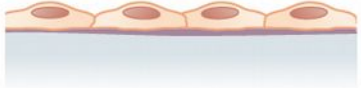
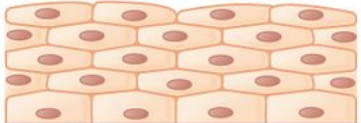

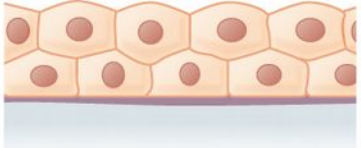
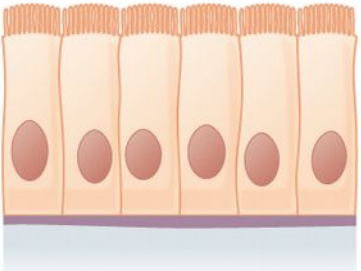

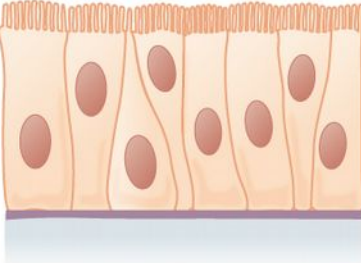
- **a tissue is an orderly arrangement of cells that perform a specific function**
- the cells contained by the tissue, and the structural arrangement of extracellular components dictate the function, **everything in the body is done by cells and cell products**
- to understand the functional morphology of organ systems, a basic understanding of the 4 main tissue types is needed
- **epithelial, connective, muscle and nervous tissues** are the broad classifications for body tissues (and enough for understanding anatomy ... sub-types are more important in physiology and pathology)

Epithelial tissue

- sheets of cells that cover surfaces or line cavities and passageways
 - cover exterior surfaces (skin)
 - line passageways (mucous membranes, sometimes referred to as endothelial tissue)
 - form many glands (sweat glands)

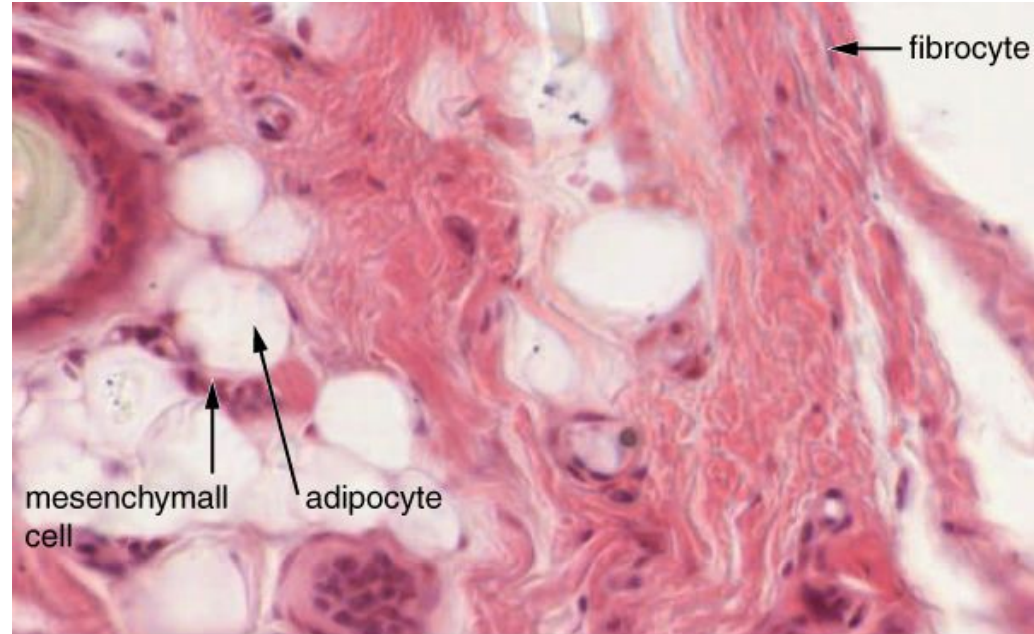


Types of epithelial tissue

	Simple	Stratified	
Squamous	 <p>Simple squamous epithelium</p>	 <p>Stratified squamous epithelium</p>	
Cuboidal	 <p>Simple cuboidal epithelium</p>	 <p>Stratified cuboidal epithelium</p>	
Columnar	 <p>Simple columnar epithelium</p>	 <p>Stratified columnar epithelium</p>	 <p>Pseudostratified columnar epithelium</p>

Connective tissue

- bind the cells and organs of the body together
- function in the protection, support and integration of the body's components (organ systems)
- examples include fat tissue, bone, tendons and blood
- very common tissue in the body (likely the most abundant)
- often abbreviated "CT"



Types of connective tissue

- Connective tissue proper = contains **fibroblasts** (activated fibrocytes with extensive extracellular matrix)
 - Loose → areolar, adipose, reticular (hypodermis, lymph nodes)
 - Dense → regular elastic, irregular elastic (tendons, cartilage)
- Supportive connective tissue
 - Cartilage → hyaline, fibrocartilage, elastic (surface of joints, intervertebral discs, outer ear)
 - Bone → compact bone, cancellous bone
- Fluid forms
 - Blood
 - Lymph

Side note on tissue membranes

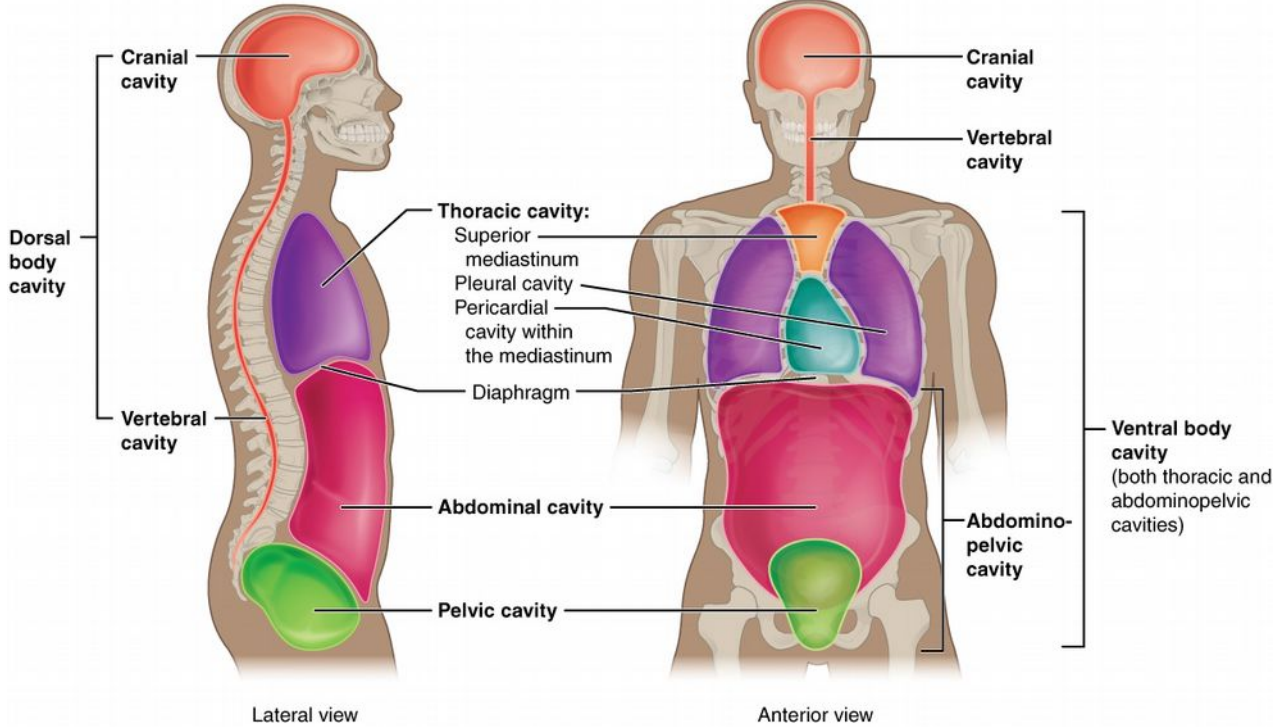
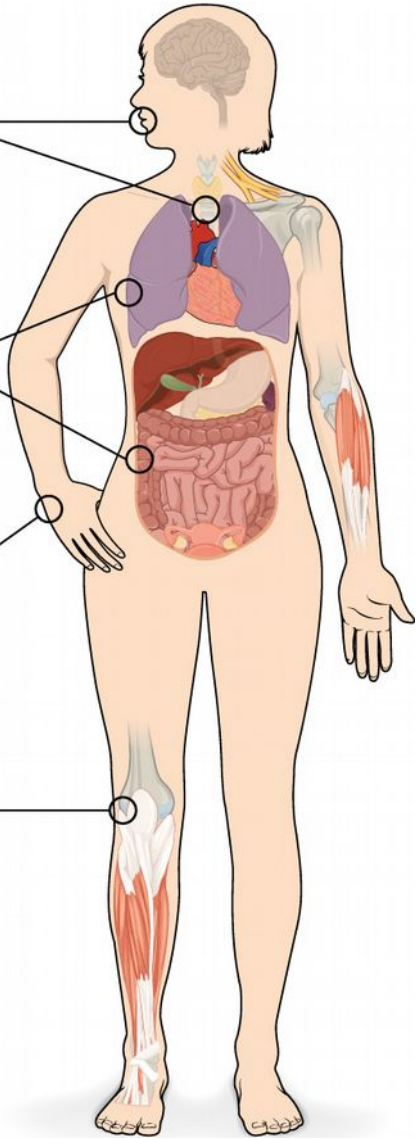
- don't confuse with cellular membranes (lipid bi-layer that surrounds a single cell)
- some are considered CT (synovial membranes), some are not considered CT (serous membranes), some have mixed tissue types ... minor point, terminology often used loosely, depends on presence or absence of endothelial layer (epithelium)
- **serous membranes** (serosa) are thin sheets of epithelial cells that line ventral body cavities (peritoneal, pleural and pericardial)
- **meninges** cover the brain and spinal cord
- **mucous membranes** line digestive, respiratory, urinary and reproductive tracts (tubes)
- **cutaneous membranes** cover the surface of the skin
- **synovial membranes** encapsulate movable joints

Mucous membranes line the digestive, respiratory, urinary, and reproductive tracts. They are coated with the secretions of mucous glands.

Serous membranes line body cavities closed to the exterior of the body: the peritoneal, pleural, and pericardial cavities.

Cutaneous membrane, or the skin, covers the body surface.

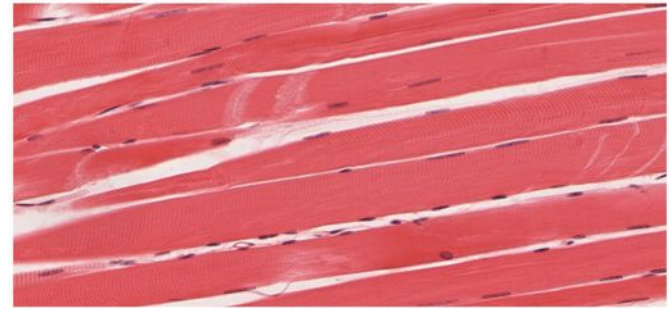
Synovial membranes line joint cavities and produce the fluid within the joint.



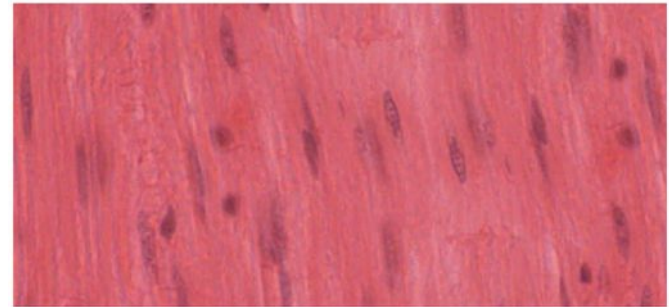
Serous membranes line the ventral body cavities ... thin sheets of tissue that secrete a serum-like fluid (provides moisture and lubrication for internal organs)

Muscle tissue

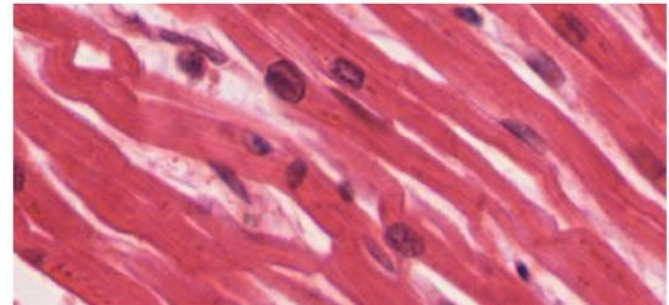
- contracts (shortens) in response to stimuli to provide movement
- stimuli may be voluntary or involuntary (sometimes a bit of both, such as the diaphragm)
- three main types → skeletal muscle (a), smooth muscle (b) and cardiac muscle (c)



(a)



(b)



(c)

Types of muscle tissue

- **Skeletal muscle**

- Attached to bones, make movement possible
- Striated (contains visible lines under microscope)
- Requires nerve impulses to function

- **Cardiac muscle**

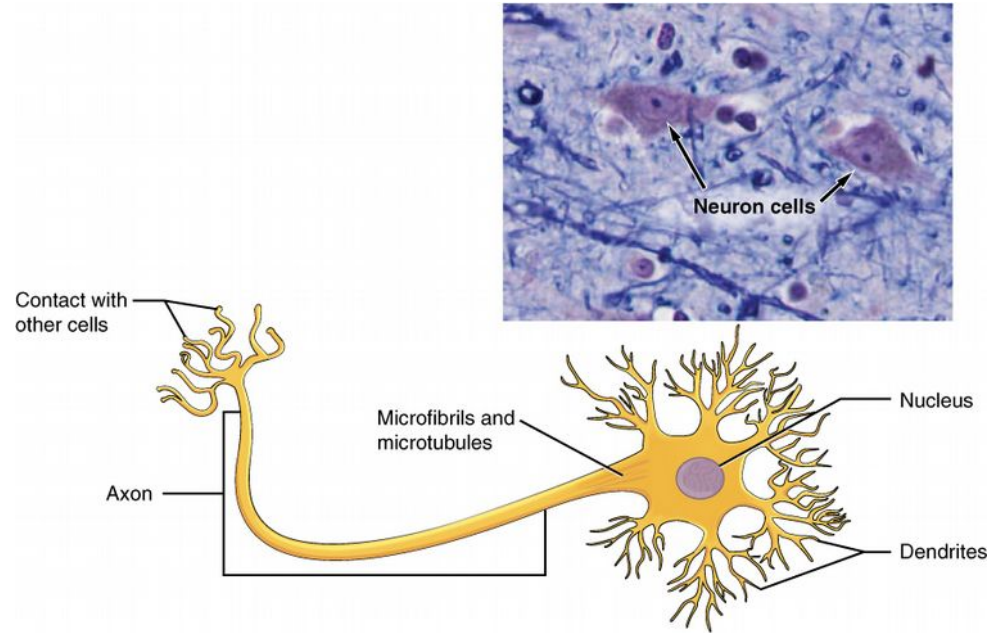
- Exclusive to the heart
- Striated, with branching cells
- Auto-rhythmic, can contract without nerve impulse (although nerves can increase the rate and contraction strength)
- Interconnected by intercalated discs (bundles of gap junctions for communication between cells)

- **Smooth muscle**

- Responsible for involuntary movement of internal organs (unconscious nerve impulses activate)
- Fusiform (spindle shaped, tapered at both ends) with no visible striations

Nervous tissue

- provides for the propagation of electrochemical signals along a nerve cell for communication between different regions of the body
- examples include the brain, spinal cord and peripheral nerves
- like muscle, nervous tissue contains “excitable” cells that can rapidly change the charge differential between the inside and outside of the cell (depolarize)



Nervous Tissue

- separated into the **Central Nervous System** (brain and spinal cord) and **Peripheral Nervous System** (everything else)
- functions include transmitting of signals to effectors in response to a stimulus (brain signals transmitted to muscles and glands)
- functions include transmitting signals from body to the Central Nervous System (perception)
- different functions are mediated by separate neural pathways (signals only go in one direction, often clustered by function such as tracts of the spinal cord)

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References

- Betts J, Desaix P, Johnson E, et al. 2017. Anatomy & Physiology. OpenStax, Houston, TX.