III. MUSCLE TISSUE

- VERY cellular, vascularized, innervation - VERY active tissue!
- Function = CONTRACTION ("shortening")
- Cells are called FIBERS; long, spindle-shaped cells that contain MYOFILAMENTS (myo = “muscle”, filaments = "threads"), which do the actual contracting.

  The myofilaments are made of the proteins ACTIN and MYOSIN.
- Muscle cells are EXCITABLE (conduct electrical current). Exciting them leads to contraction.

- 3 kinds of muscle tissue:

  A) Skeletal Muscle Tissue (STRIATED)
  - Attached to bones of skeleton, contraction causes movement by pulling on bones.
  - Multinucleated (“several nuclei”) and "striated" = characteristic banding patterns:
B) Cardiac Muscle Tissue

- Walls of the heart.
- Also exhibit striations, but cells are not long and parallel; instead, branching, short, uninucleated (w/single nucleus).

C) Smooth Muscle Tissue

- Cells = much smaller, spindle-shaped, no striations, uninucleated. Found in sheets surrounding visceral organs (among other places).

  * Act to move substances thru tubes using a special contraction called PERISTALSIS ("along the walls"), among other types of movement.
IV. NERVOUS TISSUE

- Makes up the NERVOUS SYSTEM (brain, spinal cord and nerves).

  * NERVOUS TISSUE = made up of several cell types.  
  MUCH MORE DETAIL LATER

- 2 kinds of basic cells:

  1) NEURONS - long, branching cells that conduct electrical current \((\text{i.e.- can have an Action Potential or AP})\)

  2) SUPPORT CELLS (Glial Cells) - Non-conducting cells that feed, support, and protect the delicate neurons.

    * Several kinds (detail later in the semester).

- NERVE: bundle of these cells (plus other cells, such as blood vessels).
V. FASCIA, EPITHELIAL AND CONNECTIVE MEMBRANES

Figure 3.21 The Fasciae

- See online videos and outline. You are responsible for this material. These notes do not follow exactly the videos, but represent a summary (I will be remaking these videos soon). Also notice that there is an OUTLINE OF THE VIDEOS THEMSELVES at the end of this section in your notes.

A) Superficial fascia

- Not really considered a “fascia” anymore, but it is an important structure. It is the “subcutaneous” or “hypodermis”. Compare this to the “Cutaneous” discussed later in “Epithelial membranes”.

- Superficial fascia is the lowermost layer of the skin in nearly all of the regions of the body and blends with the dermis layer.

- It consists mainly of loose areolar, and fatty adipose connective tissue and is the layer that primarily determines the shape of a body.
  
  * It serves as a storage medium of fat and water; as a passageway for lymph, nerve and blood vessels; and as a protective padding to cushion and insulate.

- Due to its elastic properties, superficial fascia can stretch to accommodate the deposition of adipose that accompanies both ordinary and prenatal weight gain.
  
  * After pregnancy and weight loss, the superficial fascia slowly reverts to its original level of tension.
B) Deep fascia

**NOTE: If these notes say “you will be learning about these”, you are not responsible for identifying them now!**

- This fibrous connective tissue surrounds the muscles, bones, nerves and blood vessels of the body.

  * It provides connection and communication in the form of aponeuroses, ligaments, tendons, joint capsules, and septa.

  * The deep fascia include the **“Connective tissue membranes” discussed in class: Synovial membranes of the joints.**

  * The deep fasciae envelop all bone (you will be learning about the periosteum and endosteum during the “Bone chapter”); cartilage (perichondrium), and blood vessels (you will be learning about the tunica externa of the blood vessels in A&P2)

  * It surrounds individual muscles, and also divide groups of muscles into “fascial compartments”. It is specialized in muscles (you will be learning about the epimysium, perimysium, and endomysium during the Muscle chapter)

  * It surrounds individual nerves (you will be learning about the epineurium, perineurium, and endoneurium in the Nervous system chapters).

- The high density of collagen fibers is what gives the deep fascia its strength and integrity. The amount of elastin fiber determines how much extensibility and resilience it will have.

- Deep fascia is essentially avascular but is richly supplied with sensory receptors. A high percentage of “muscle pain” arises from the deep fascia.
C) Visceral fascia

The visceral fascia include the other “Epithelial tissue membranes” discussed in class videos: Serosal, Mucosal, and Cutaneous.

- Visceral fascia (also called subserous fascia) suspends the organs within their cavities and wraps them in layers of connective tissue membranes.

  * Each of the organs is covered in a double layer of fascia called the serosal membrane; these layers are separated by a thin serous cavity.

  * The outermost wall of the organ is known as the parietal layer

  * The layer attached to the organ is known as the visceral layer.

- The organs have specialized names for their visceral fasciae (serosal membranes).
  * In the brain, they are known as meninges
  * In the heart they are known as pericardia
  * In the lungs, they are known as pleurae
  * In the abdomen, they are known as peritonea.

Visceral fascia is less extensible than superficial fascia. Due to its suspensory role of the organs, it needs to maintain its tone rather consistently. If it is too lax, it contributes to organ prolapse, yet if it is hypertonic, it restricts proper organ motility.
Outline for membrane and fascia videos

VIDEO #1: Fascia - interconnected series of soft CT structures
- surround:
  - bone
  - organs
  - nerves
  - BVs
  - etc.
- fibrous CT w/ epith
- purpose:
  - struct integrity
  - shock absorb
  - defense
  - involve tiss repair
- subdivided into 3 sheets:
  1. Superficial Fascia
     * under cutaneous
     * elastic properties, adipose deposition
  2. Deep
     * fibrous CT
     * surrounds musc's, bones, nerves, BVs, CNS, etc....
     * connects them. Tendons, lig's, joint cap's, etc....
     * includes meninges
  3. Visceral
     * suspends organs
     * serosal membranes
       - parietal & visceral
     * mesenteries - hold dig viscera in place w/ in abdom cavity

VIDEO #2: closer look at deep fascia (notice: none look at superficial in more detail)

- lig
- tendon
- apo
- periostum
- perichondrium
  * callofwer ear
  
  ligmaents
  tendons

VIDEO #3: more deep fascia - synovia membranes
  (around joints)
  See Articulation Videos for detail  Make a brief outline here!

VIDEO #4: Visceral Fascia
- cont. w/ superficial & deep
- CT & epi
- named after predominant tiss, although they all have Epi & CT

1. Epithelial Membranes - mostly epi
   * epidermis, dermis, hypodermis of skin
   * 3 types:
     A. cutaneous - epidermis cover stratified squam
     B. mucous - epi w/ loose CT (areo, adipo, ret)
       - wet layer
       - lamina propia: thickened, BV between mucosa layer & submucosa
     C. serous
       - compartmentalize, less friction, stop infection spread, hold organs
       - parietal, visceral layers, cavity in between AROUND organ
       - mesothelium, pleura (- isory), pericardium (- isory), peritoneum (- isory)
VI. TISSUE GROWTH, DEATH & REPAIR

A) Tissue Growth

- Terms to know:
  1. Hyperplasia = tissue growth through cell multiplication
  2. Hypertrophy = enlargement of preexisting cells muscle grow through exercise
  3. Neoplasia = growth of a tumor (benign or malignant) through growth of abnormal tissue

<table>
<thead>
<tr>
<th>Stem Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undifferentiated cells with developmental plasticity - “haven’t changed yet” and “can become other cells”</td>
</tr>
<tr>
<td>1. Embryonic stem cells</td>
</tr>
<tr>
<td>Totipotent (any cell type possible)</td>
</tr>
<tr>
<td>• source = cells of very early embryo</td>
</tr>
<tr>
<td>Pluripotent (tissue types only possible)</td>
</tr>
<tr>
<td>• source = cells of inner cell mass of embryo</td>
</tr>
<tr>
<td>• can become “several types” (all the different bone cells, etc.)</td>
</tr>
<tr>
<td>2. Adult stem cells (undifferentiated cells in tissues of adults)</td>
</tr>
<tr>
<td>Multipotent (bone marrow producing several blood cell types) - form all the blood cells type (RBCs, several types of WBCs, and osteoblasts)</td>
</tr>
<tr>
<td>Unipotent (only epidermal cells produced)</td>
</tr>
</tbody>
</table>

B) Tissue Death

1. Atrophy = loss of cell size or number disuse atrophy from lack of use (leg in a cast)

2. Necrosis = pathological death of tissue. Some related terms:
   (i). gangrene - Tissue Death. Serious and potentially life-threatening condition that arises when a considerable mass of body tissue dies (necrosis), Usually due to insufficient blood supply.
   (iii). infarction - death of tissue from lack of blood. Common ones:
   - Heart attack = myocardial infarct.
   - Renal (Kidney) infarct due to blocked blood flow.
   - Cerebral infarct from stroke.

3. Apoptosis = programmed cell death, after cell finishes its function. Cells shrink and are phagocytized (no inflammation).
C) Tissue Repair

- Three steps:

1. **Inflammation** - Severed blood vessels bleed and inflammatory chemicals are released.
   - Local blood vessels become more permeable, allowing white blood cells, fluid, clotting proteins and other plasma proteins to seep into the injured area.
   - Clotting occurs; surface dries and forms a scab.

2. **Organization** restores the blood supply - The clot is replaced by granulation tissue, which restores the vascular supply.
   - Fibroblasts produce collagen fibers that bridge the gap.
   - Macrophages phagocytes the cell debris.
   - Surface epithelial cells multiply and cover the granulation tissues.

3. **Regeneration** and/or **fibrosis**: permanent repair - the fibrosis area matures and contracts; the epithelium thickens.
   - If wound is narrow: A fully regenerated epithelium with an underlying area of scar tissue results.
   - If wound is deep, wide, irregular or if healing is disturbed: Scar tissue is laid down. Fibrous CT permanently replaces original tissue.

   This alignment of the collagen of scar tissue is usually of inferior functional quality to the normal collagen randomized alignment of the original tissue.

   Scarring is a natural part of the healing process. With the exception of very minor lesions, every wound (e.g. after accident, disease, or surgery) results in some degree of scarring.