

Connective Tissue

Connective Tissue

- includes things like bone, fat, & blood.

All connective tissues include:

1. specialized cells
2. extracellular protein fibers
} matrix that surrounds cells.
3. a fluid known as ground substance

Functions include:

- Establish a structural framework
- Transporting fluids from one part of the body to another
- Protecting delicate organs
- Supporting, surrounding and interconnecting other tissue types

Connective tissues come in 3 major types

1. Connective tissue proper
2. Fluid Connective Tissue
3. Supporting Connective Tissue

Connective Tissue Proper

- Connective tissue with many cell types and extracellular fibers in a syrupy ground substance.
- Some cells of CTP are involved w/repair, maintenance, and energy storage.
 - a. Fibroblasts
 - b. Adipocytes
 - c. Mesenchymal cells

- Other CTP cells are involved in defense and large repair jobs (these roam from site to site as needed)

- A. Macrophages
- B. Mast cells
- C. Lymphocytes
- D. plasma cells
- E. Microphages

- The number of cells and cell types within a tissue at any given moment varies depending on local conditions.

The Cell Population

A. Fibroblasts

- Most abundant cells in CTP
- Permanent resident of CTP (always present)
- Produce proteins to make the ground substance very viscous
- Also secrete proteins that make the fibers

B. Macrophages

- Large amoeboid cells
- Engulf & digest pathogens or damaged cells that enter the tissue
- Release chemicals that activate the body's immune system

C. Adipocytes

- Fat cells
- Typically contain a single enormous lipid droplet
- Other organelles squeezed to side of cell wall (resemble a class ring)

D. Mesenchymal cells

- Stem cells
- Respond to injury by dividing into daughter cells which differentiate into connective tissue cells

E. Melanocytes

- Synthesize and store the brown pigment melanin

F. Lymphocytes

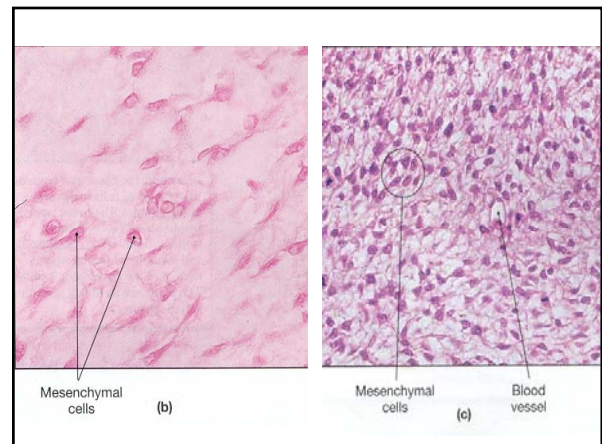
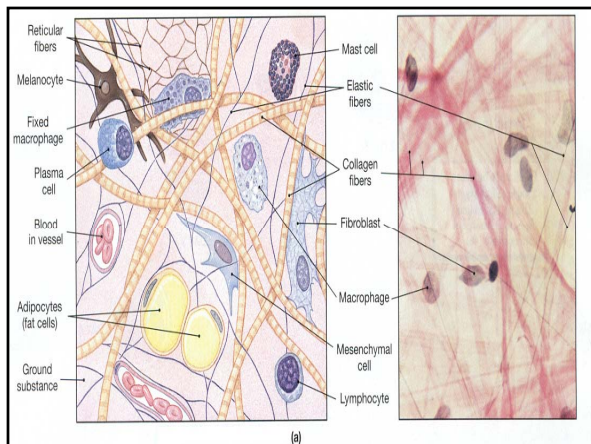
- Migrate through the body
- Some may develop into plasma cells (produce antibodies)
- Congregate where tissue damage occurs

G. Mast Cells

- Small mobile connective tissue cells
- Found near blood vessels
- Filled with histamine & heparin
- *released after tissue damage to promote inflammation

H. Microphages

- Neutrophils & eosinophils
- Phagocytic blood cells



Connective Tissue Fibers

A. Collagen

- Long, straight, unbranched
- Most common fiber in CTP
- Flexible, but greater tensile strength than steel
- Tendons are almost entirely composed of collagen fibers (connect muscle to bone)

B. Reticular Fibers

- Thinner than collagen and branched
- From interwoven network (tough but flexible)
- Can resist forces from many different directions
- Generally used for stabilizing the position of body part

C. Elastic Fibers

- Contain elastin (protein)
- Fibers are branched and wavy
- Rare but important (connect vertebrae, etc.)

Ground Substance

- Fills the spaces between cells
- Surrounds connective tissue fibers
- In CTP it's clear, viscous, and colorless (normally)
- The viscosity makes it difficult for pathogens to move through the tissue

CTP comes in two basic varieties

1. loose connective tissue
2. dense connective tissue

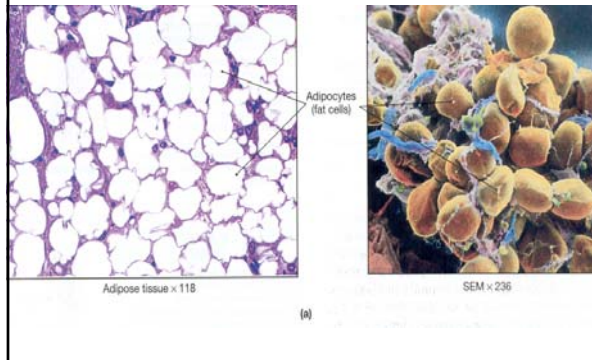
A. Loose Connective Tissue

- Also called areolar tissue
- “packing noodles” of the body
- Fills spaces between organs, providing cushioning
- Surrounds & supports blood vessels and nerves, and stores lipids
- Least specialized CT in the body
- Most of the volume is filled by ground substance
- Forms a layer that separates the skin from deeper structures

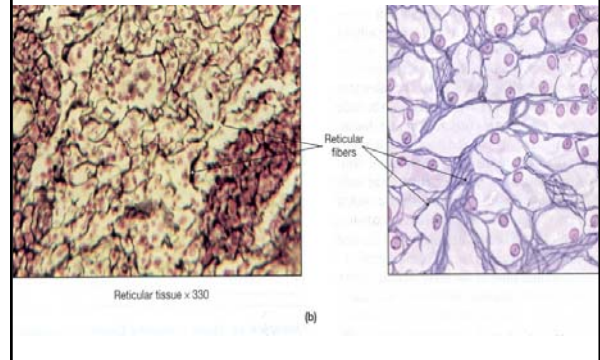
Two Specialized commonly found types of loose CT

1. **Adipose Tissue**
2. **Reticular Tissue:** found in liver & spleen making a 3D network which supports the functional cells.

Adipose



Reticular



Dense Connective Tissue

- Most of the volume filled by collagen fibers
- Known as collagenous tissue

Come in two types:

1. Dense regular (white fibrous) CT

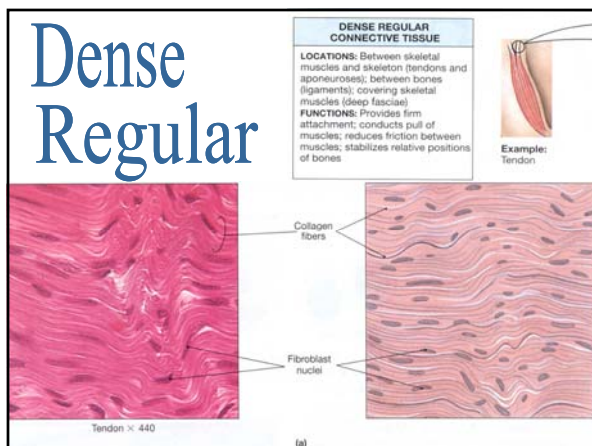
- Collagen fibers parallel to each other
- Packed tightly

i.e. - tendons (muscle to bone)

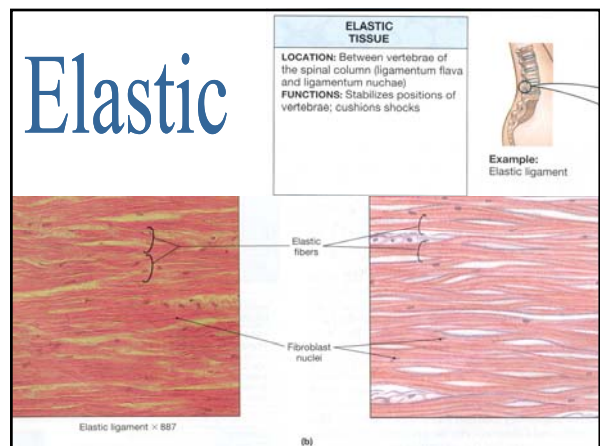
ligaments (bone to bone)

elastic fibers (underlay transitional epithelium, can withstand lots of stretching, also located in walls of blood vessels)

Dense Regular



Elastic



2. Dense irregular CT

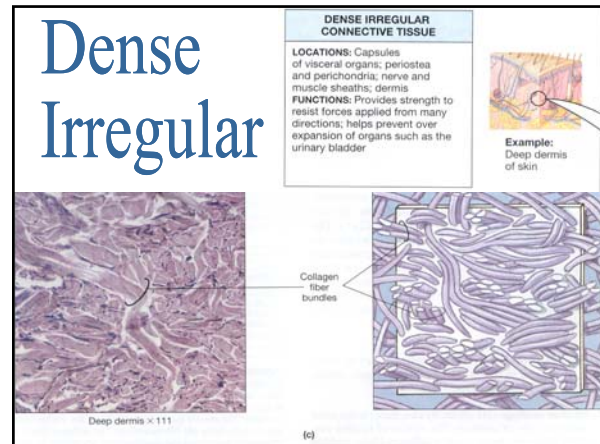
- Form interwoven meshwork
- No consistent pattern
- Provide strength/support to areas where stress is received from many directions.

i.e.- *gives skin its strength

*forms sheath around bones & cartilage

↓ ↓
Periosteum Perichondrium

*forms a layer around organs called a capsule



Fluid CT

- Blood & lymph contain a distinctive set of cells in a liquid matrix
- These contain many cells, but normally do not generate or contain insoluble fibers
- Plasma, Interstitial Fluid, & Lymph

Blood

- The cells and cell pieces are collectively known as formed elements
- The watery ground substance is called plasma.
- Tiny membrane covered packets of cytoplasm in the blood called platelets contain enzymes and special proteins that function in clotting.

A. RBC's or erythrocytes

- Almost ½ volume of the blood
- Responsible for transport of O₂ (and CO₂) in the blood

B. WBC's or leukocytes

- Include microphages (neutrophils, eosinophils, basophils, lymphocytes)
- Monocyte (macrophages)

