

Epithelial Tissue

General Functions:

- Lines and covers organs
- Absorbs / secretes substances
- Gas exchange
- Protection

Special Characteristics:

- have an **apical surface** on top
- have a **basement membrane** below → fibrous “glue” that anchors tissue to underlying tissue
- has **no** vascular tissue (no blood supply)
- reproduce rapidly (rapid healing)
- are tightly packed together

Epithelial tissue is classified based on **layers** and **shape** of cells

simple = single layer
or
stratified = multiple layers

squamous = flat
or
cuboidal = square
or
columnar = column (rectangle)

Simple Squamous

Function: diffusion and filtration.

Location: Air sacs in lungs, walls of capillaries

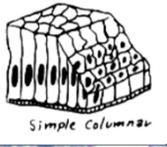
Simple Cuboidal

Function: secretion and absorption

(b)

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Simple Columnar

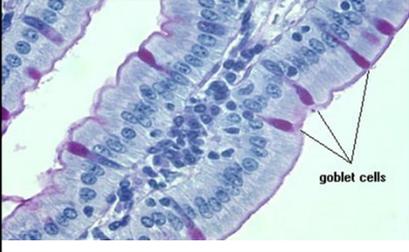


Function: secretion and absorption

Location: digestive tract and uterus

*Contains **goblet cells** to secrete mucus

*Can have microvilli → *extra absorption*



goblet cells

Pseudostratified Columnar

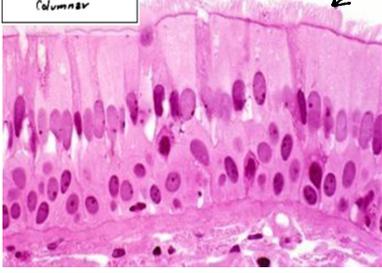


Single layer, nuclei are uneven which gives it a layered appearance

Can have goblet cells and cilia

Function: absorption, secretion

Location: lining air passages and tubes of the reproductive system



Stratified Squamous

- most common stratified tissue



apical surface

flattened cells worn away from top surface

flattened cells worn away from top surface

cells at base divide by mitosis

Function: protection

Location: skin, mouth, esophagus, anus



The ink of tattoos must be injected below the basement membrane.



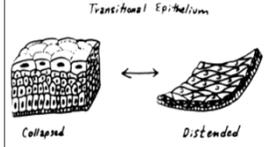
Transitional Epithelium

-- cuboidal cells

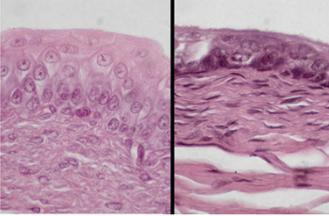
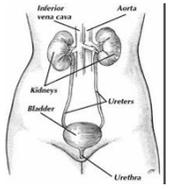
-- Stretchable ("distended")

Function: blocks diffusion (no leaking)

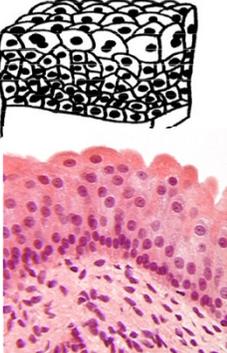
Location: urinary bladder, ureters, urethra



Collapsed Distended

Transitional Epithelium

Stratified Cuboidal
 -- usually only 2 layers
 Function: secrete / absorb
 Location: glandular ducts
 (Glandular Epith.)

Stratified Columnar
 -- apical layer is columnar
 Function: secrete / absorb
 Location: glandular ducts

Identify the tissues

A
B
C
D
E
F
G
H
I

A
B
C
D
E
F
G
H
I

B: Simple Squamous
 C: Simple Cuboidal
 D: Simple Columnar
 E: Pseudostratified Columnar
 F: Stratified Squamous
 G: Stratified Columnar
 H: Stratified Cuboidal
 I: Transitional

CATEGORIES OF CONNECTIVE TISSUES

Cell nucleus
 Collagen fibers
 Fibrous connective tissue (forming a tendon)
 Adipose tissue
 Cartilage-forming cells
 Matrix
 Cartilage (at the end of a bone)
 Central canal
 Matrix
 Bone-forming cells
 Bone
 Plasma
 Red blood cell
 Blood
 White blood cells
 Loose connective tissue (under the skin)
 Cell
 Collagen fiber
 Elastic fibers

Fibrous Tissue Cells (fibroblasts)

Fig. 1

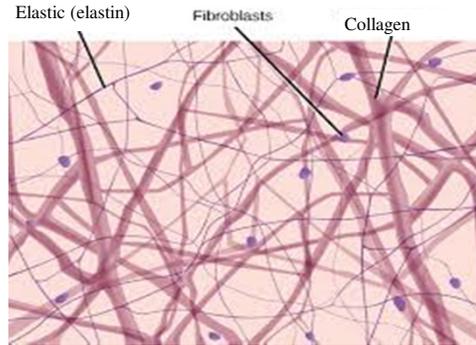
Other Cells that make up Connective Tissue

Blood cells (Red = erythrocytes; White = leukocytes)
 Fat cells (adipocytes)
 Reticular cells (reticulocytes)

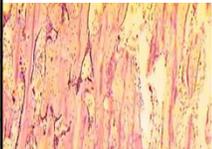
Connective Tissue General Characteristics:

- Most **abundant** tissues in the body; found throughout
- **Functions:** **Connects/Binds** structures together; **support**, **protection**, framework, stores **fat**, produces blood cells, fights infection, & helps repair tissue
- Made of various cells, **ground substance** (“glue”), & **fibers** (support) → all make up **“extracellular matrix”** → fluid and/or fibrous substance surrounding the individual cells
- *Most* have a good blood supply (vascularized)
- Reproduce **less often** than epithelial

Main types of Fibers in Conn. T.

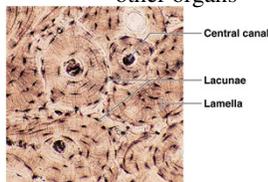
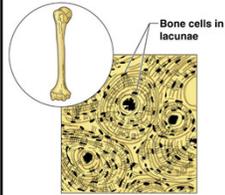


Bone Tissue (Osseous Tissue)



Made up of few cells → mainly composed of a matrix of calcified fibers

Function: protection & support other organs

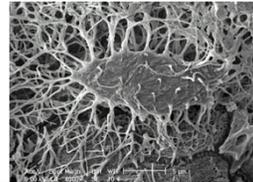
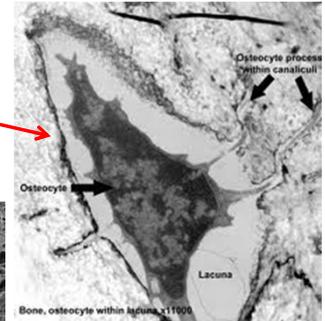
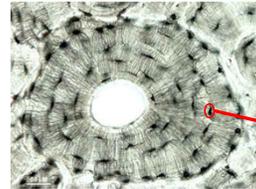


(a) Diagram: Bone

Photomicrograph: Cross-sectional view of ground bone (250x).

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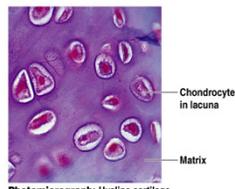
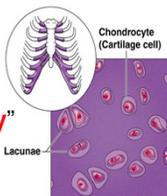
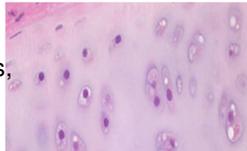
Bone Cells (osteocytes)



Hyaline Cartilage

Function: support, cushioning

Location: covers ends of bones, larynx (voice box), b/w ribs & sternum, fetal skeleton



(b) Diagram: Hyaline cartilage

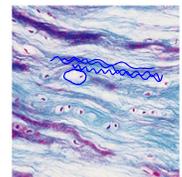
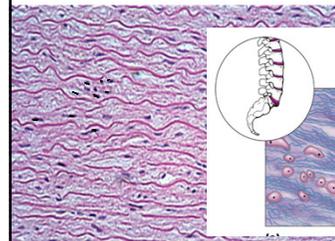
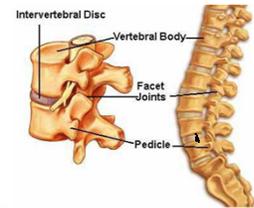
Photomicrograph: Hyaline cartilage from the trachea (400x).

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Fibrocartilage

Function: compression, cushioning

Location: b/w vertebrae



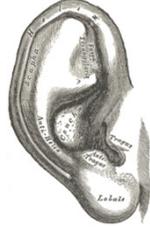
Elastic cartilage

Function: flexible support

Distinguishing feature: Cells are usually tightly packed



Location:
External Ear

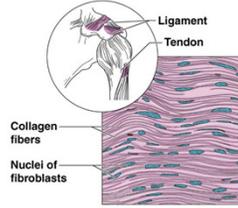


Dense/Fibrous Connective Tissue

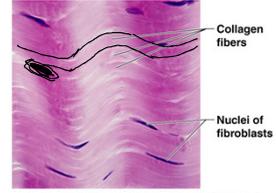
Function: support, protect

Location: between bones & muscles

Tendons = muscles to bones
Ligaments = bones to bones



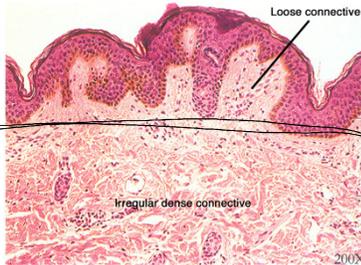
(d) Diagram: Dense fibrous



Photomicrograph: Dense fibrous connective tissue from a tendon (500x).

Dense Irregular Connective Tissue

Location: lower layer of skin (dermis); walls of tubular organs; white of eyes



Function: bind tissues together; allows movement of organs without tearing

* Notice that the collagen fibers are NOT parallel, as in Dense Regular tissue

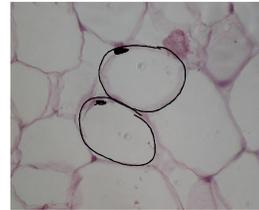
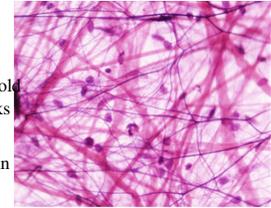
Loose Connective Tissues

Areolar →

-- Soft, pliable, "cobwebby"

Function: "packing" tissue, "glue" to hold organs together & hold in position, soaks up excess fluid

Location: around soft organs; under skin



← Adipose (fat)

-- large vacuole stores oil & pushes nucleus to the side

Function: insulation, protection,

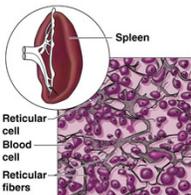
Location: beneath skin, eye sockets, surrounding organs, hips, breasts

Loose Connective Tissue (cont'd)

Reticular Connective Tissue

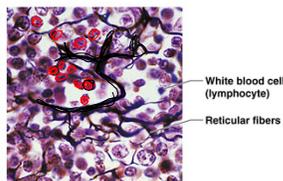
Function: internal framework of some organs (supports production of white blood cells)

Location: lymph nodes, spleen, bone marrow



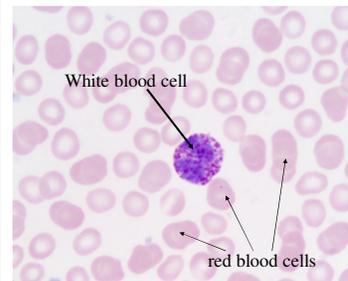
Reticular cell
Blood cell
Reticular fibers

(g) Diagram: Reticular



Photomicrograph: Dark-staining network of reticular connective tissue (400x).

Blood (Vascular) Tissue



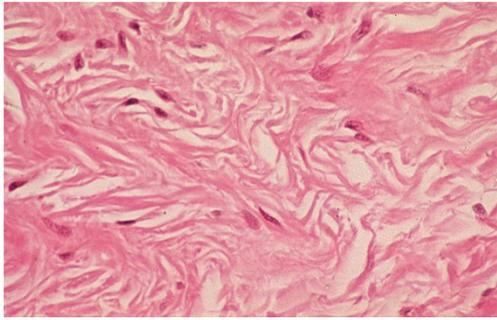
White blood cell

red blood cells

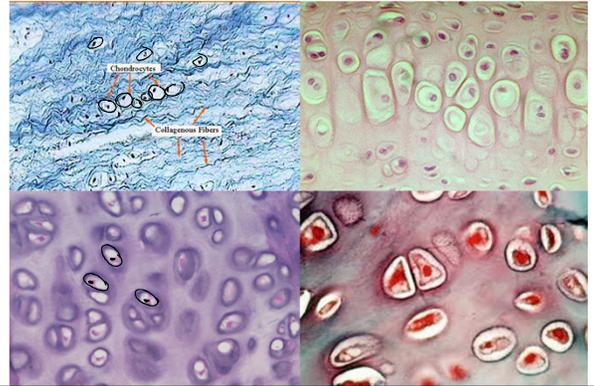
Function: transport gases & nutrients; produces matrix for clotting

Location: throughout the body

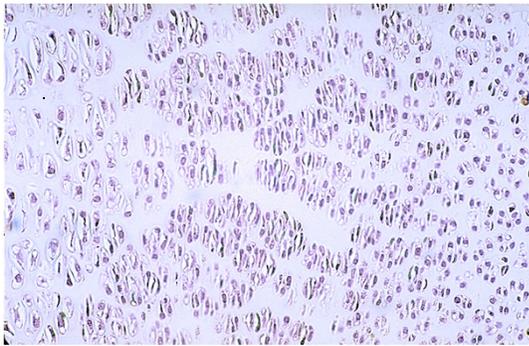
Dense / Fibrous **IRREGULAR** CT



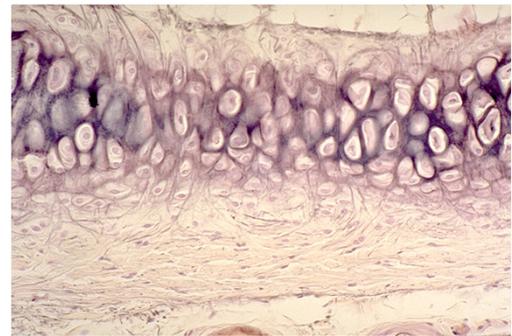
Cartilage Cells (chondrocytes)



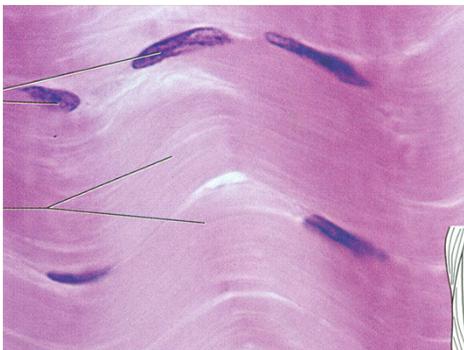
Hyaline Cartilage



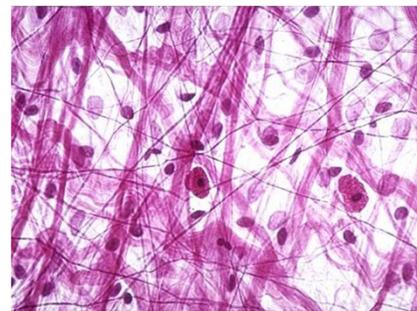
Elastic Cartilage



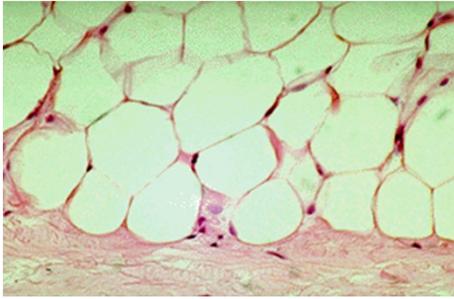
Dense / Fibrous **REGULAR** CT



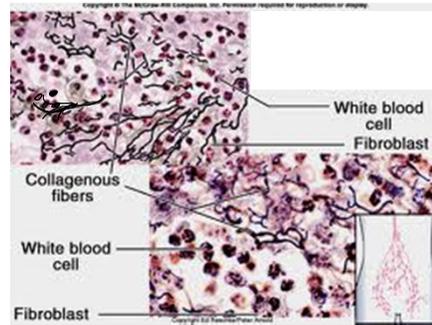
Areolar



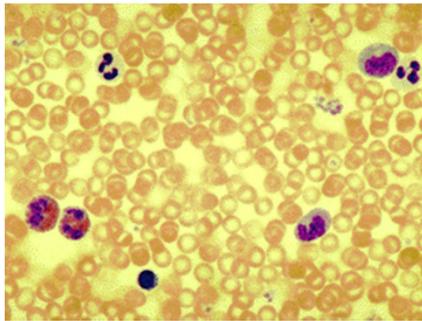
Adipose



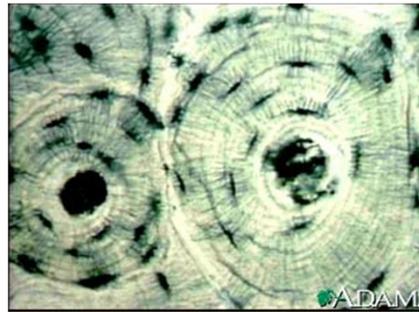
Reticular CT



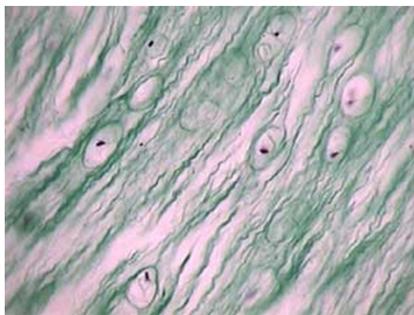
Blood



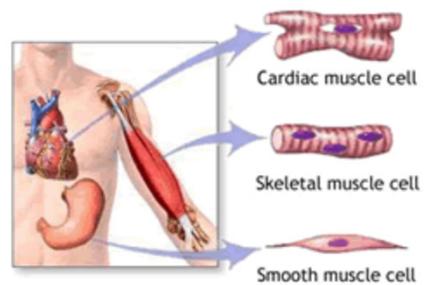
Bone

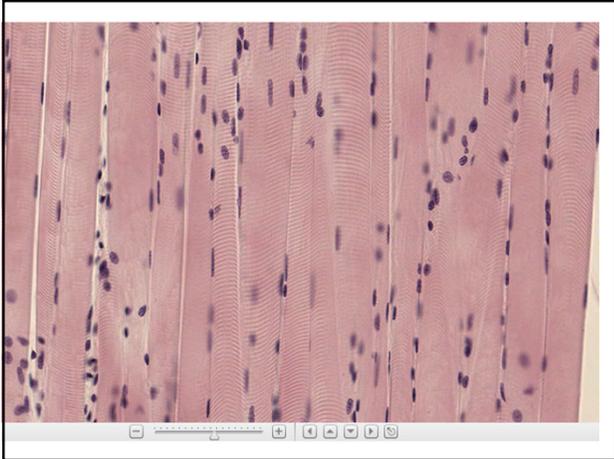


Fibrocartilage



Muscle Tissue



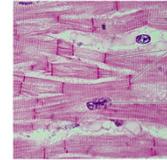
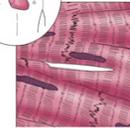
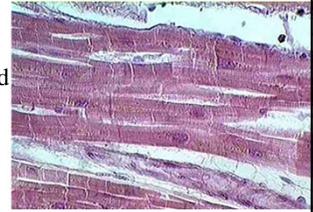


Cardiac muscle

-- cells are branched, uninucleate, with intercalated discs

Function: involuntary movement (heartbeat)

Location: only the heart



Intercalated disc
Nucleus

(b) Diagram: Cardiac muscle

Photomicrograph: Cardiac muscle (800x).

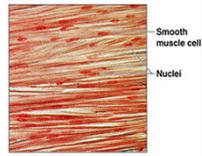
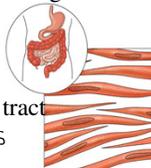
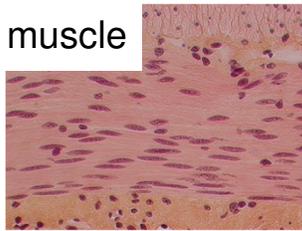
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Smooth (visceral) muscle

-- cells are non-striated, uninucleate, pointed

Function: peristalsis (movement of food through openings)

Location: digestive tract & artery walls



(c) Diagram: Smooth muscle

Photomicrograph: Sheet of smooth muscle (approx. 250x).

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Nervous Tissue

-- cells are called **neurons** → very long cells (some are 3 ft!) cushioned by **supporting cells**

Function: send/receive electrochemical impulses (irritability, conductivity)

Location: mostly brain & spinal cord, throughout body

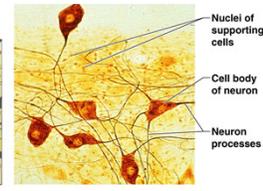
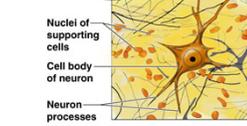
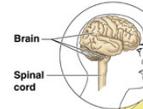


Diagram: Nervous tissue

Photomicrograph: Neurons (200x)

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Nervous tissue (spinal cord)

