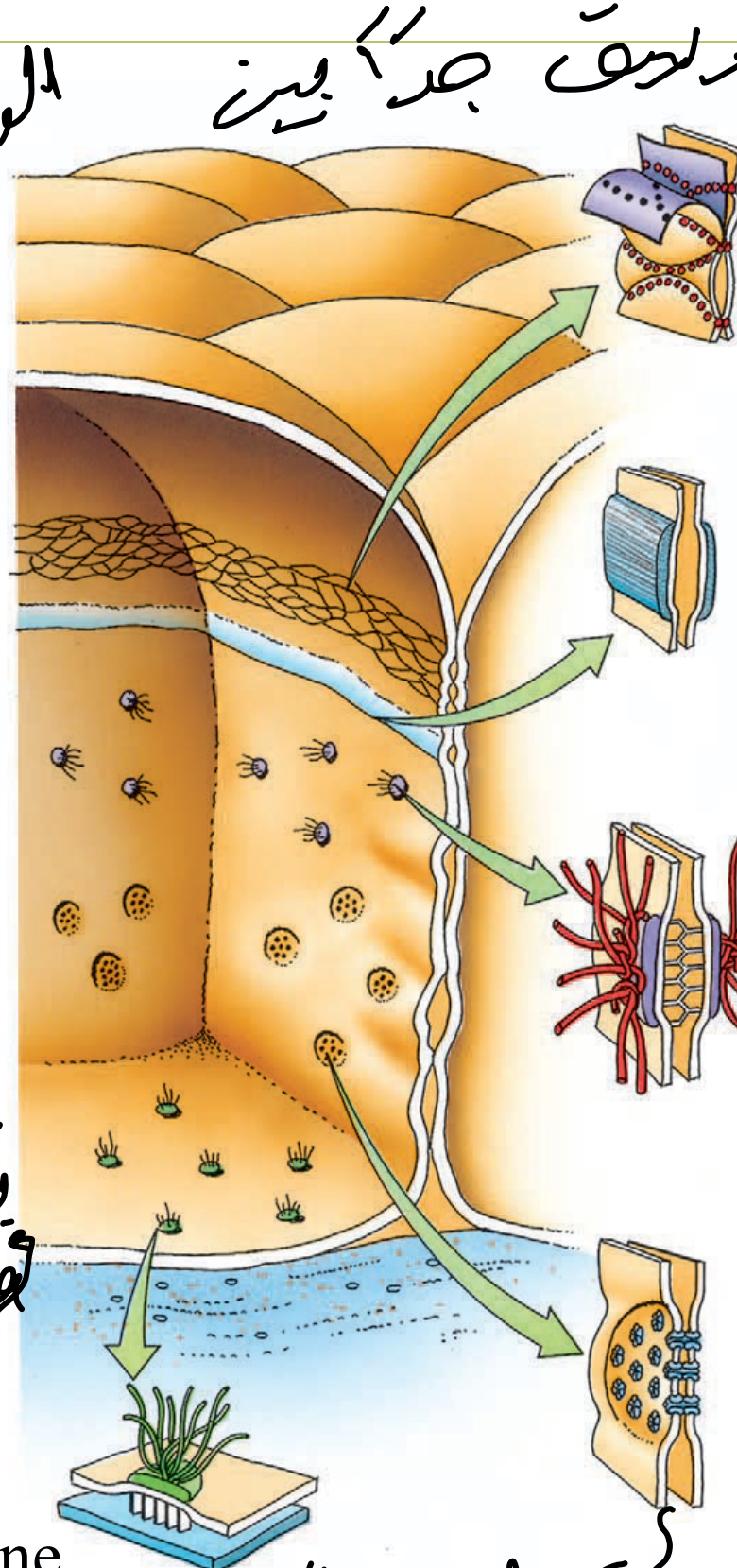


Cellular Junctions

- ❖ Cell-membrane structures.
- ❖ Located on the lateral and basal surfaces.

Hemidesmosomes:

area of adhesion between cell membrane and basal lamina.



epithelium
basal lamina

Tight Junction: area of fusion of cell membrane. Seals the space between two cells.

Adherent Junction: area of adhesion between two cell membrane.

Desmosomes: area of stronger adhesion between two cell membrane.

Gap Junction: porous area in the cell membrane of two cells that allow passage of substances between them.

Features of the apical surface of the cell

- **1) Microvilli (single = microvillus):**

- Finger-like cytoplasmic projections that are present in absorptive epithelium, most prominently in the small intestine. They increase the surface area.

Microvilli



Fig.6a: Microvilli of small intestinal cells

- **2) Stereocilia**

- They're similar in structure to microvilli; however, they're longer and less motile. They may act as mechanoreceptors as in the inner ear hair cells.

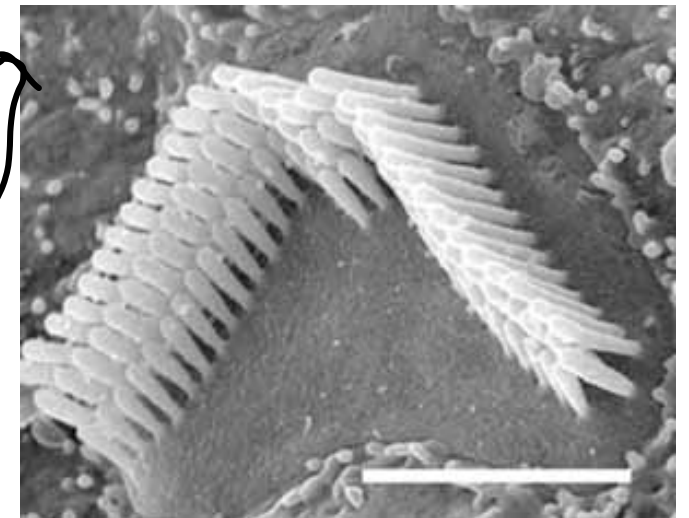


Fig.6b: Stereocilia of a hair cell

تتحرك مع بعض بنسب الاتجاه

- **3) Cilia**

- Thick, elongated, motile structures on the surface of some epithelial cells, like those of the trachea. There are, usually, many cilia on the surface of a single cell. They move in rhythmic fashion backwards and forwards removing fluids and debris in a certain direction.

respiratory system ←

- **4) Flagella**

- They're similar to cilia in structure but are much longer and, usually, only one flagellum is present on a cell. The movement of the flagellum is rotational. In humans, only sperms possess a flagellum.

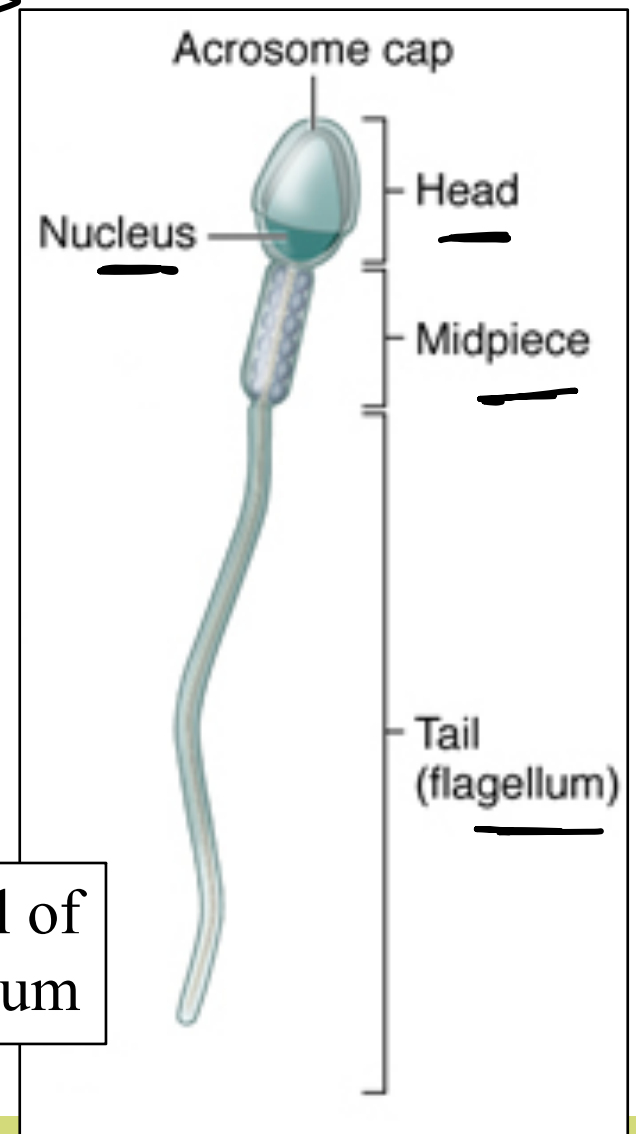
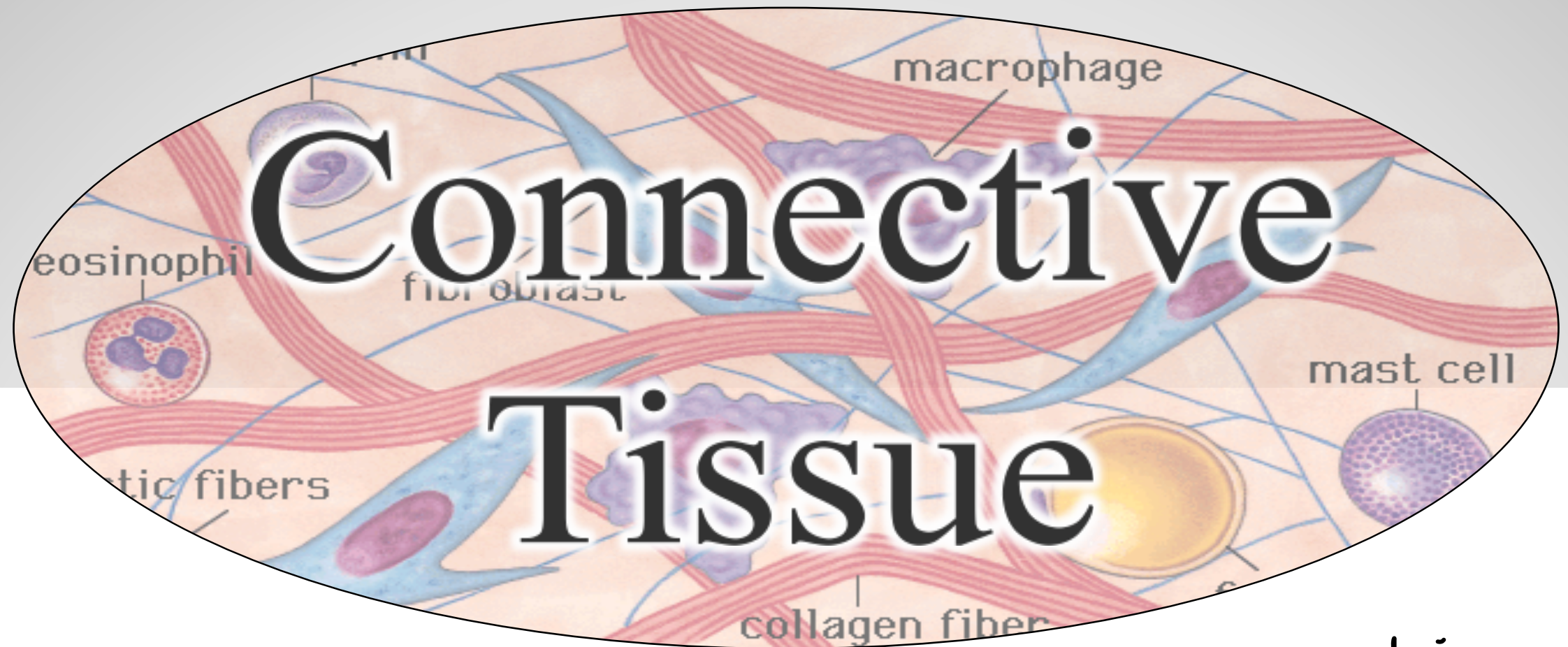


Fig.6c: Sperm. The tail of the sperm is a flagellum



connective tissue
 هي أنسجة رابطة بين الخلايا
 (ECM) يكوّن

Connective tissue (CT) is a type of body tissue characterized by the presence of an abundant extracellular matrix within which are dispersed different types of cells and fibers.

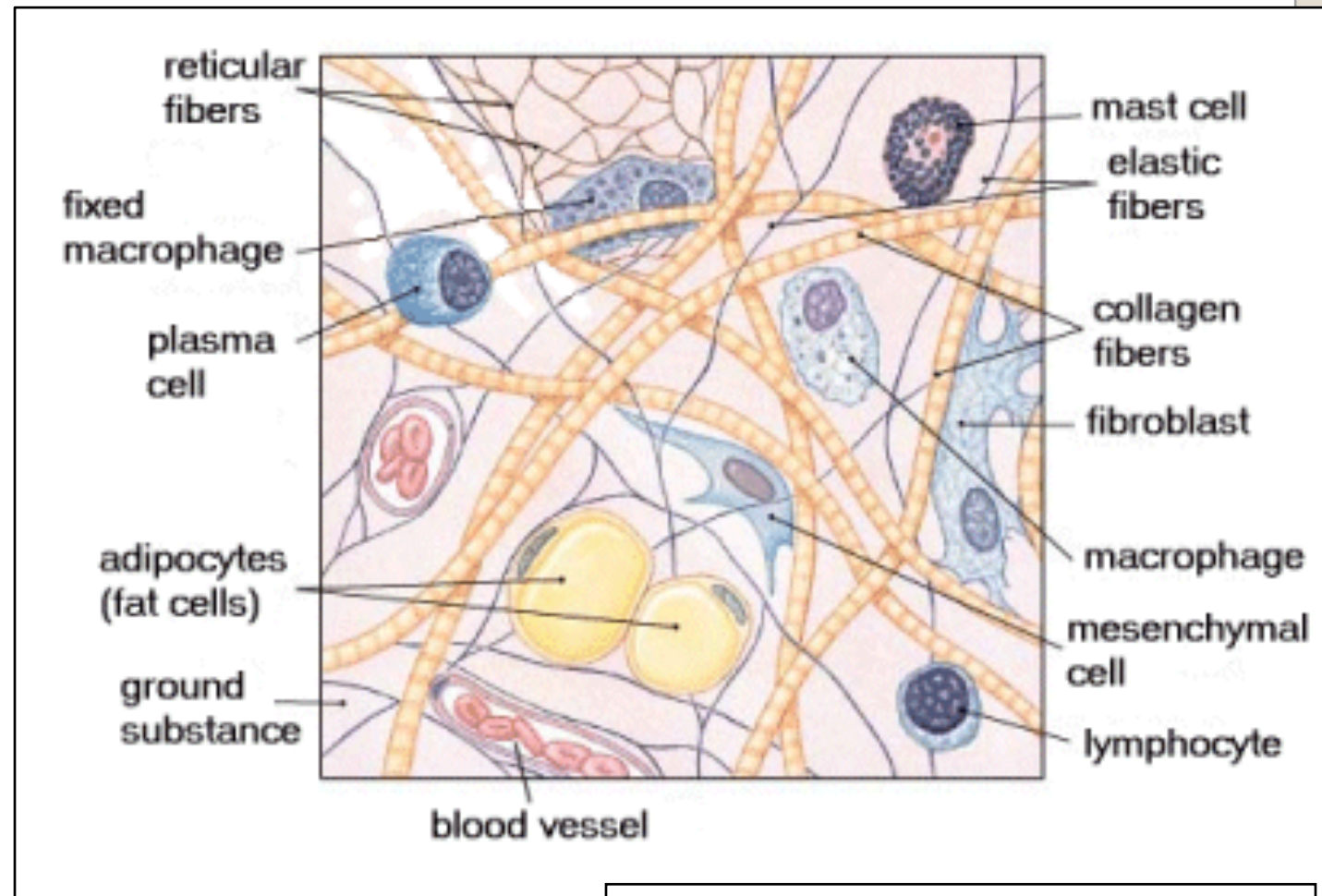


Fig.7: Components of CT.

Functions:

1. Provide form of organs. ⇒
2. Support of different organs → fatty tissue
3. Connect and bind different structures → cartilage, bone.
4. Provide a medium for diffusion of nutrients and waste products → connective tissue proper, blood.

توفر بيئة لتبادل
الغذاء و النفايات

The Cells Of The Connective Tissue

Fibroblasts – *most common type of cell in the CT*

- **Function:** *Synthesizes fibers and produces components of extracellular matrix.*

- **Main Features:**

- ✓ Abundant irregularly branched cytoplasm.

Large, pale-staining nucleus with a prominent nucleolus and a well developed rough endoplasmic reticulum and Golgi apparatus (features of protein producing cells).

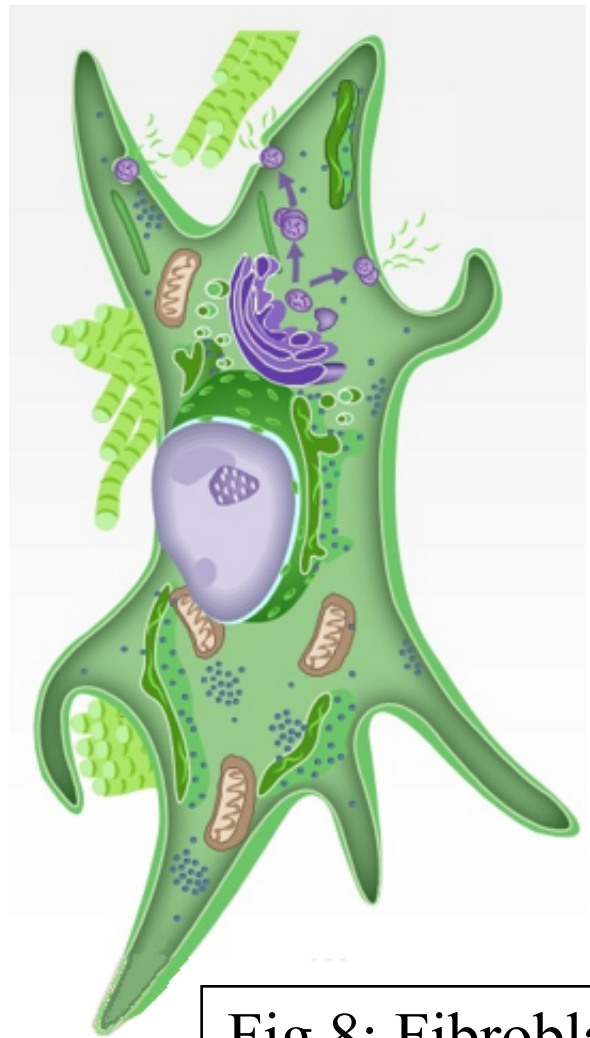
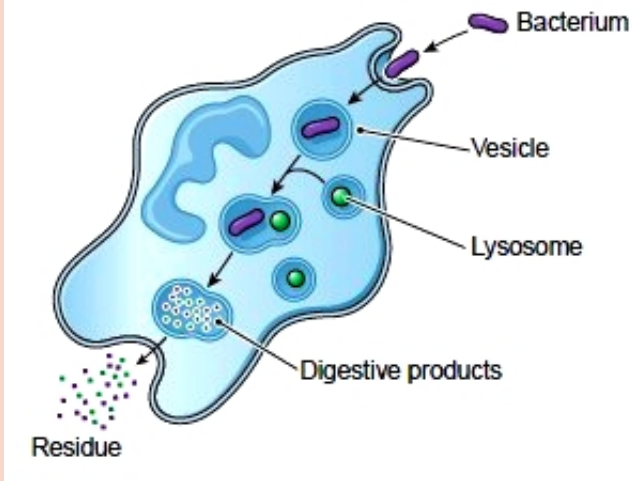
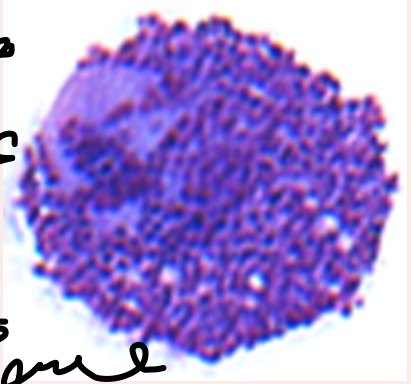
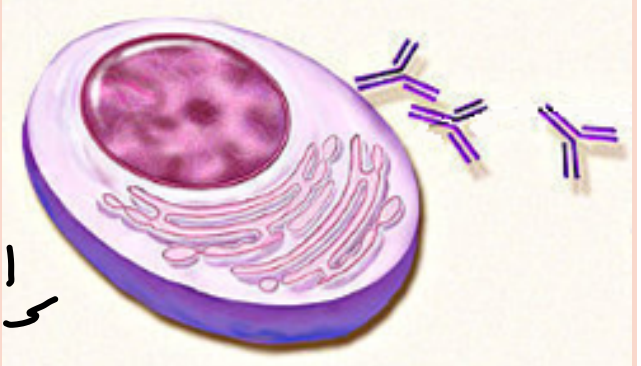


Fig.8: Fibroblast.

Cell	Important feature	Function
تجاويف <u>Macrophages</u> الباحية	Cell surface has indentations and protrusions نفوذات	Phagocytosis 
Mast cells فلايا برنية	Cytoplasm filled with dark staining secretory granules	Secretion of histamine (allergy), heparin, and others مُسَوِّد عند تحسس مسوكون عن الصبح 
<u>Plasma cells</u> لبحر الزااة واللة وسلها	Nucleus has alternating dark and light regions (clock-face appearance)	Production of antibodies وانتاج اجسام فلنا رة 

Extracellular Matrix

Formed of:

اللياف تتكون من
fibroblast هي
Protein وهي عبارة عن

A. Fibers: these are elongated protein structures and they include:

هي أطول نوع من fibers
مسؤولة عن القوة

1) **Collagen fibers:** give strength to the tissue.

يتعلق بقدرة

2) **Elastic fibers:** give elasticity to the tissue. ⇒

3) **Reticular fibers:** form a net that surrounds the different parts of the tissue holding them together.

مسؤولة عن ربط
tissue مع بعض

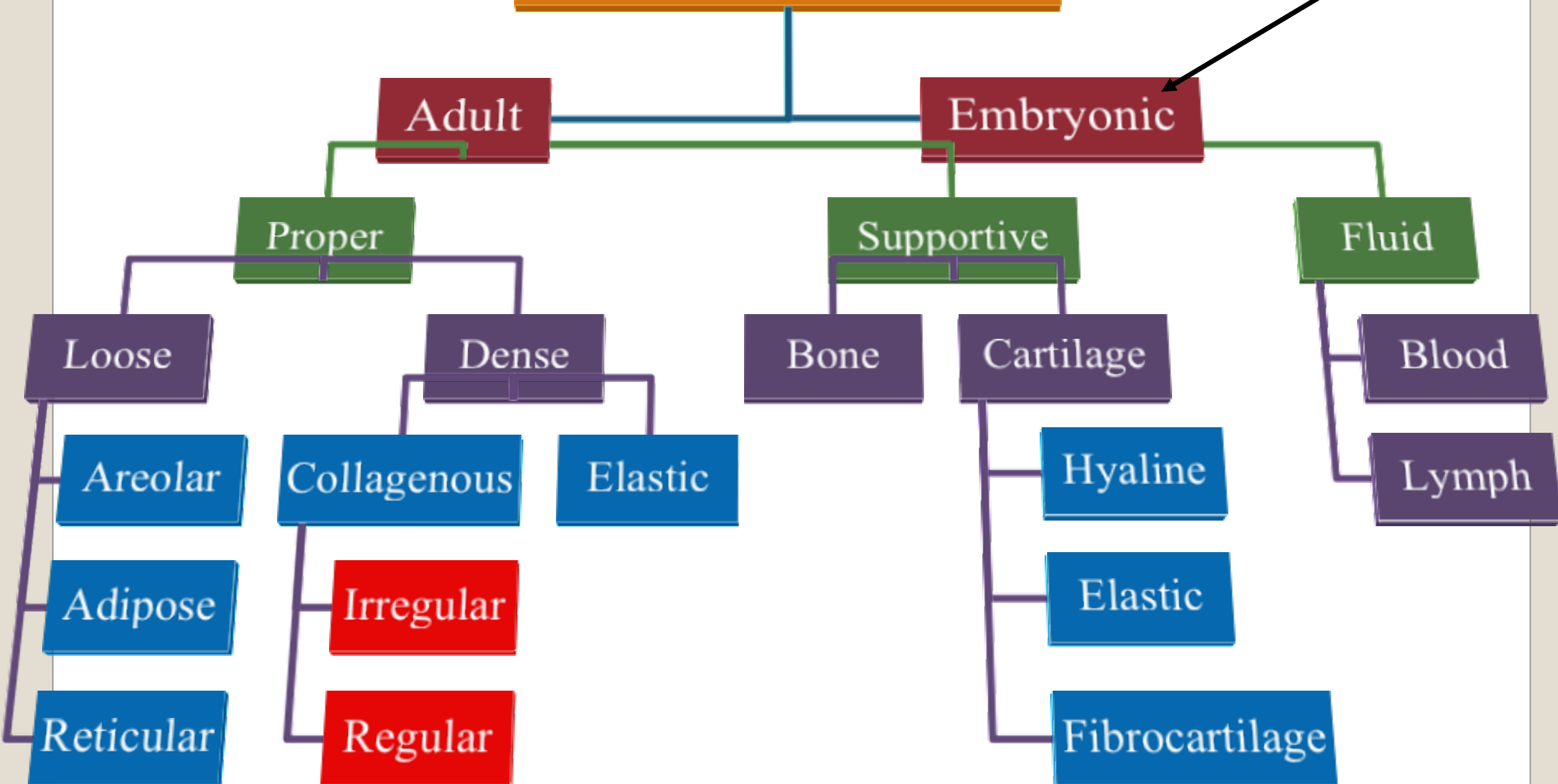
B. Ground substance: formed of various large molecules with water.

هي أطول جزيئات
connective tissue
and fibers
كبيرة
large molecule
with water

Classification

Connective Tissue

Mainly in
embryos



و تنقسم إلى Dens و loose وهو أول من الخلايا والكون
النسب للconnective tissue

□ **Proper connective tissue** is the connective tissue in which the cells that form the ECM is the fibroblast or cells derived from fibroblasts.

يعني كرايلا حسي حوي

□ **Loose connective tissue:** the fibers are loosely arranged forming a network.

ك كرايلا حوي حيد

□ **Dense connective tissue:** the fibers are numerous and densely packed.

عدها حيد كبير وعمر الة حيد
يعني

Loose Areolar Connective Tissue:

- ❑ A very common type of connective tissue. It gives some support to organs and tissues.

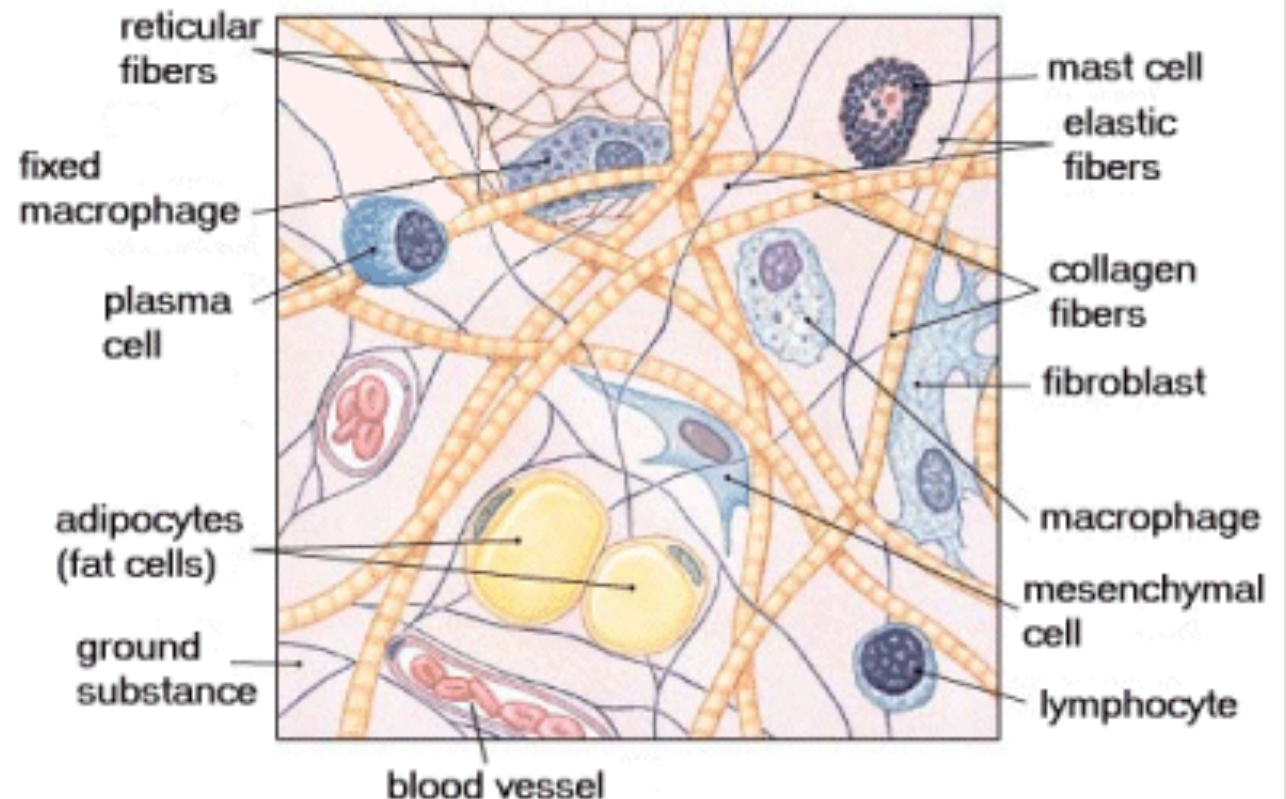
هو اُحد اہم تھیں و موہوٹ
یہ سہل ہوتا ہے

❑ Features:

- Contain all three types of fibers arranged loosely.
- All types of connective tissue cells (especially fibroblasts and macrophages) are present here.
- All these components are embedded in an abundant semi-fluid ground substance.
- It's highly vascular.

سہل ہوتا ہے نہ تھوڑا سا کھینچ کر

Fig.9: Areolar connective tissue.



تیسوے
epithelium سچی تہا basement
connective تہا

Found:

1. Under epithelia.
2. Around glands. غرہ
3. In the spaces between muscle and nerve fibers.
4. Around blood and lymphatic vessels.
5. It fills many small spaces making it the 'packing material' of our body.

سچی تہا حیات
lymphatic
بہ؟ تہا حیات
blood vessels
کا

Functions:

1. It gives organs their shape.
2. It is a medium for the diffusion of gases, nutrients, and waste product.
3. It is usually the first tissue where microorganisms and foreign particles enter the body; therefore, it's an important site for immune and inflammatory responses.

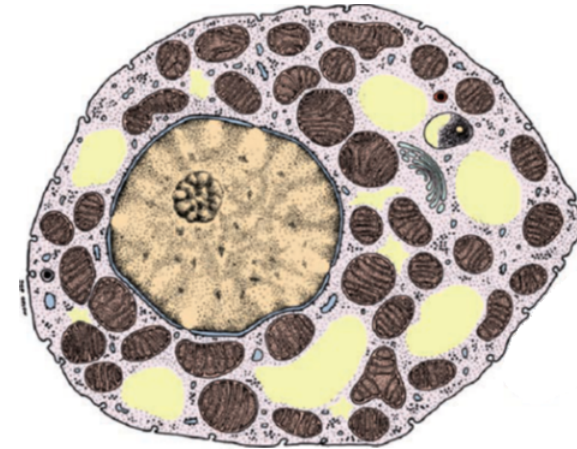
Adipose Tissue

- Is a type of loose connective tissue characterized by the abundance of a specific type of cells called adipocytes.
- It is of two types:

	<i>White Adipose Tissue</i>	<i>Brown Adipose Tissue</i>
Type of adipocyte	<u>White</u>	<u>Brown</u>
Gross color	White to yellow (due to presence of fat)	Brown due to abundance of blood vessels
Main function	Storage of energy	Production of heat
Location	- Present throughout life - All over the body	- Abundant in infants - Decrease with age - In adults found in few areas

موجود در تمام بدن و در تمام اوقات زندگی
 در تمام بدن و در تمام اوقات زندگی
 در تمام بدن و در تمام اوقات زندگی

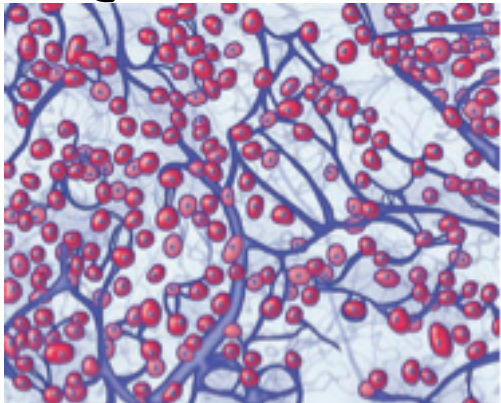
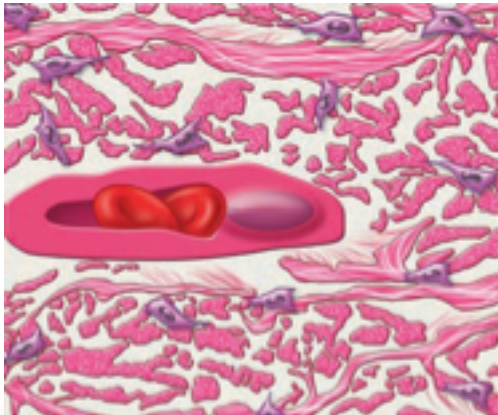
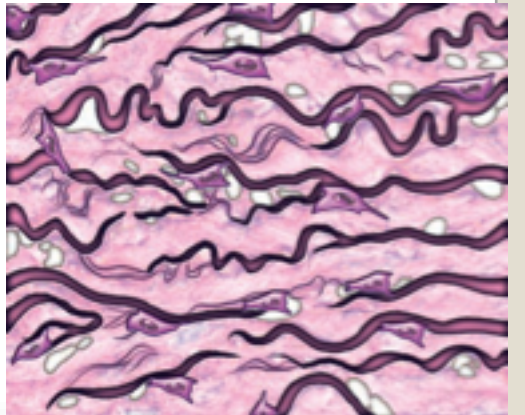
	White Adipocyte	Brown Adipocyte
Shape	Spherical دایری	Polygonal چندالائیضی
Size	<u>Larger</u>	<u>Smaller</u>
Fat droplet	Single (unilocular)	Multiple (multilocular)
Nucleus	<u>Peripheral</u>	<u>Central</u>
Mitochondria	Numerous	Numerous



- White adipocytes secrete the hormone Leptin, which is a satiety factor.

ہے ہتفرز کو خون Leptin دھو سوجھل کے
satiety داتا کی جیابی

Other types of connective tissue proper:

Type	Loose	Dense		
	Reticular	Collagenous	Elastic	
		Irregular	Regular	
Fibers	Reticular	Collagen, passing in all directions	Collagen, passing in one direction	Elastic
Function	Holds parts of organs together	Resists forces from all directions	Resists traction forces	Provides elasticity
Location	Lymph node, spleen	Dermis of skin	Tendons, ligaments	Aorta, vocal cords
				

تسوز في كل
اتجاه

Dense

اتجاه واحد

Collagenous

Elastic

Irregular

Regular

مرنة

تقاوم القوة من جميع
الاتجاهات

تقاوم قوة الجذب
واحدة

عقد
مصفوية

طحال

وتار

Tendons,
ligaments

ربطة

Cartilage

خفہ ریف

تعلیٰ سا صفا حوی

- *Cartilage is a supportive type of connective tissue whose ECM is of a firm consistency which allows the cartilage to bear mechanical stresses.*
- *Cartilage has no vascular or nervous supply.* Nutrients and stimuli reach this tissue by diffusion from the perichondrium or from the nearby synovial fluid.
- **Perichondrium:** *سینہ اعضاء*
→ Is a layer of dense/connective tissue that covers all hyaline cartilage (except in joints) and all elastic cartilage. It's richly vascular and contains collagen fibers and fibroblast cells.

حنجرة و القصبة الهوائية
↑
الكليتين

Functions of Cartilage:

1. Support of soft tissues, as in the larynx and trachea.
2. Acts as a shock absorber as in the intervertebral discs.
3. Hyaline cartilage is important for development and growth of bones before and after birth.

خلايا بطنية
أو عسريرة

Chondrocytes:

- ☐ Oval or round cells.
- ☐ Located inside spaces in the surrounding matrix called lacunae.
- ☐ Each lacuna may contain 1-8 chondrocytes.
- ☐ **Function:** production of the extracellular matrix of cartilage.

	Hyaline	Elastic	Fibrocartilage
ECM rich in	Hyaluronic acid	Elastic fibers	Collagen fibers
Arrangement of cells in lacunae	Clusters	Clusters	Axially
Perichondrium	Yes (except in joints)	Yes	No
Location	Most common: • Articular surfaces of some joints • Cartilages of the nose and trachea • Thyroid and cricoid cartilages of the larynx • Costal cartilages • The epiphyseal growth plate	• Auricle of the ear • Wall of external auditory canal • Auditory tube • Epiglottis and cuneiform cartilages of the larynx	• Intervertebral discs • Pubic symphysis

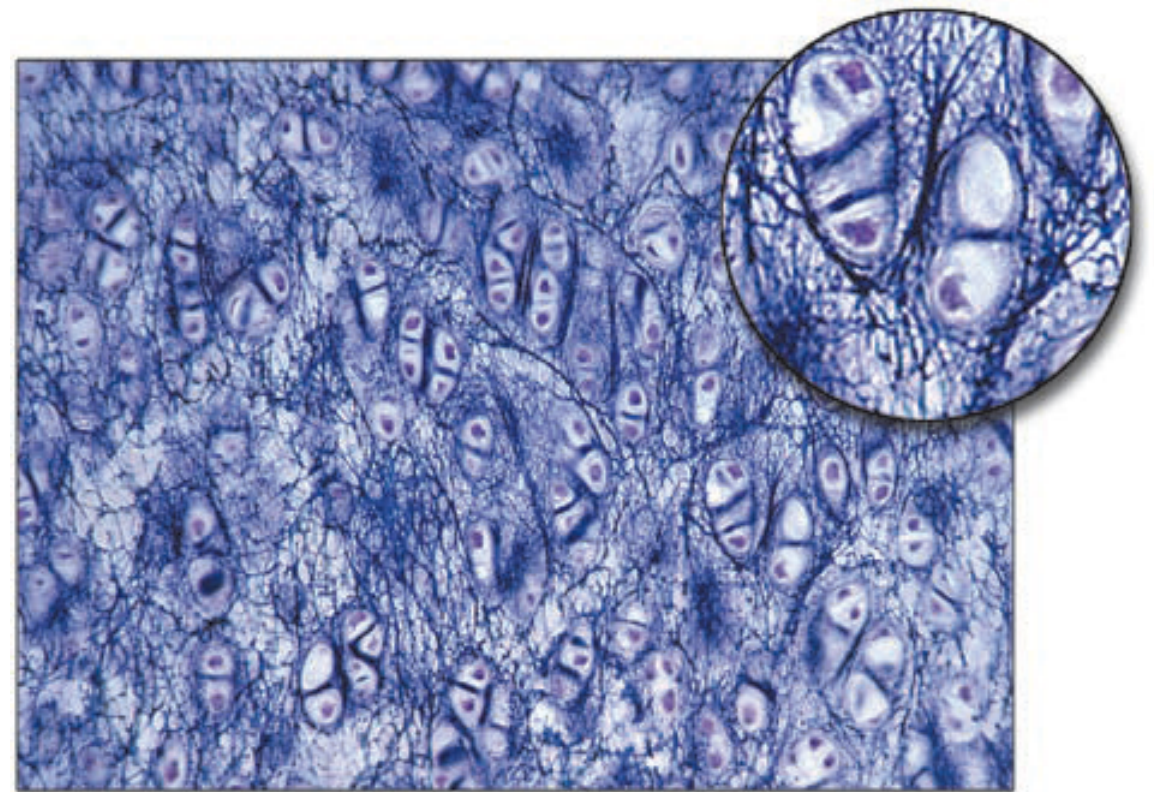
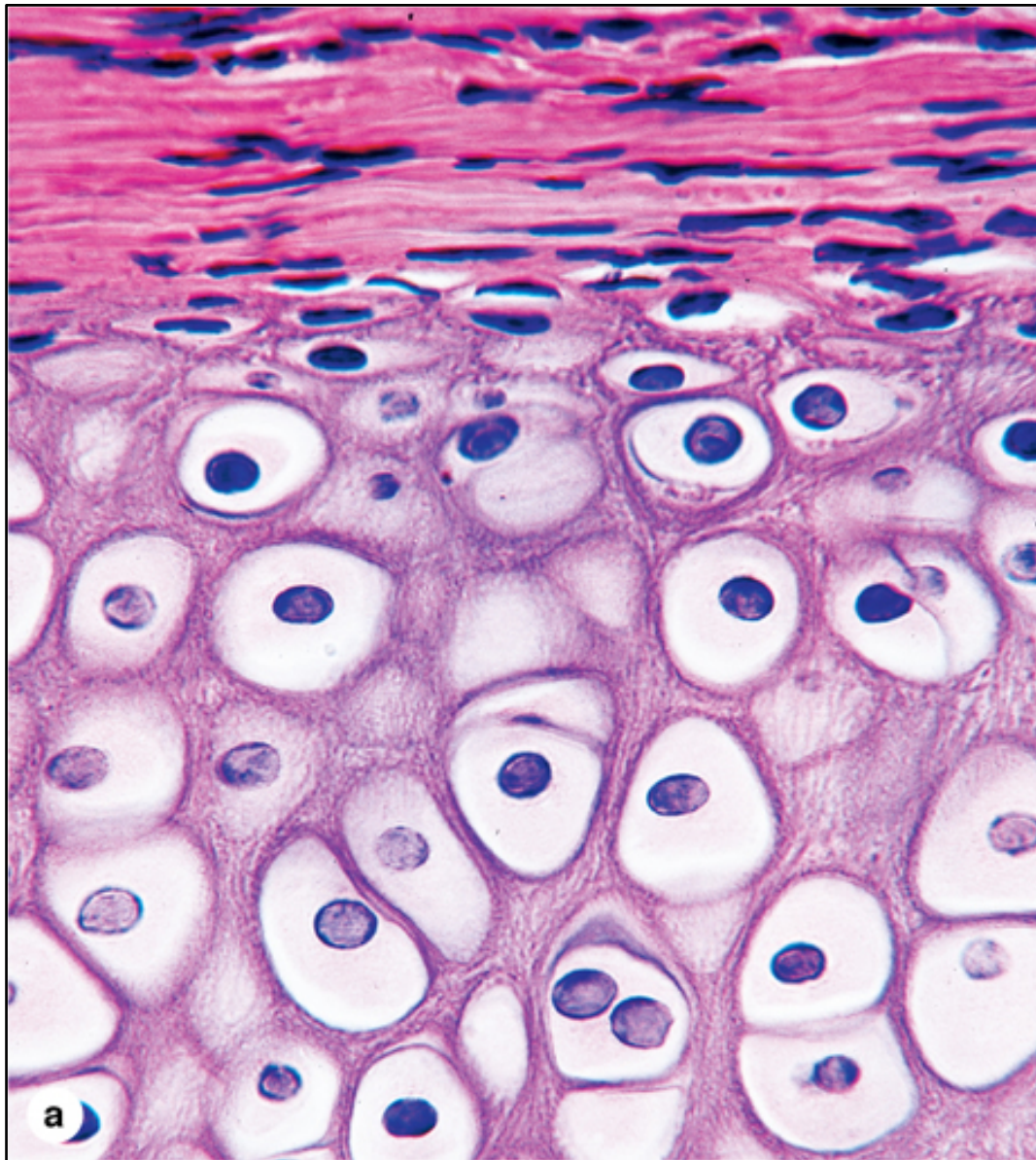


Fig.10: Left, hyaline cartilage. Above, elastic cartilage. Below, fibrocartilage.

