



لجان الرفعات

ANATOMY

MORPHINE ACADEMY

MORPHINE
ACADEMY

Tissues

عَدْنَا وَالنَّوْرَ الْجَدِيدَ

1

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(2021)

A tissue is a collection of cells with a common embryologic origin that work together to perform specialized activity. In addition to the cells, a tissue contains the extracellular matrix [ECM] which's found between the cells.

← خلايا الخلايا

← ال Cells ما بينون لحاملها الماتع

- Body tissues can be generally divided into **4 main types** according to the ^①type of cells and the ^②amount and content of the ECM they possess.

← الاختلاف بناء على -

① نوع ال cells

② كمية و محتويات ECM

- The main types of body tissues are:

1. Epithelial tissue طلياني
2. Connective tissue نهام
3. Muscular tissue عضلي
4. Nervous tissue عصبي

Table 1: Types of tissues and their characteristics

ال (epithelial) هادبي لحاله لازم
يكون نسيجه (connective)

<i>Tissue</i>	<i>Nervous</i>	<i>Epithelial</i>	<i>Muscular</i>	<i>Connective</i>
<i>Cells</i>	Have intertwining elongated processes	Aggregated polyhedral cells	Elongated contractile cells	Several types of fixed and wandering cells
<i>Amount of ECM</i>	Very small	Small	Moderate	Abundant
<i>Main Function</i>	Transmission of nerve impulse	Lining, Secretion	Movement	Support, protection

تسجيات
Have
intertwining
elongated
processes

هافن أكثر نوع منتشر
بالجسم
Aggregated
polyhedral
cells
خلك يا متندرة الأفتعال

تسجلها كانه محدود
Elongated
contractile
cells

Several
types of
fixed and
wandering
cells
خلك يا متندرة
ويتنوعون

Amount
of ECM

Very small

Small

كمية معتدلة
Moderate

very much
Abundant

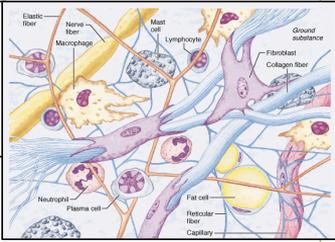
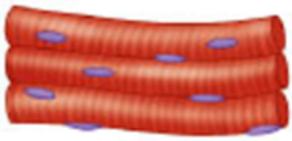
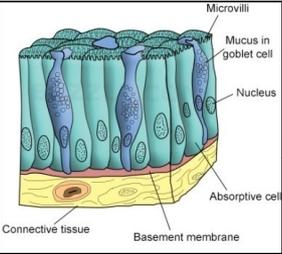
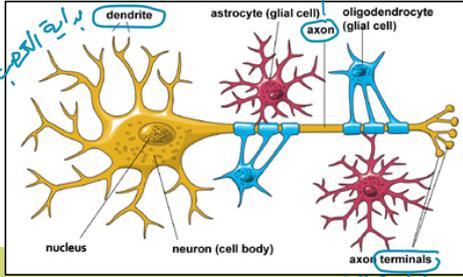
Main
Function

Transmission
of nerve
impulse
أطراف
Process
داخل ال
nerve
هو العصبون
axon

تبطين
Lining,
Secretion
إفرازات

مسؤولة عن الحركة
Movement

الرسم - الحماية
Support,
protection



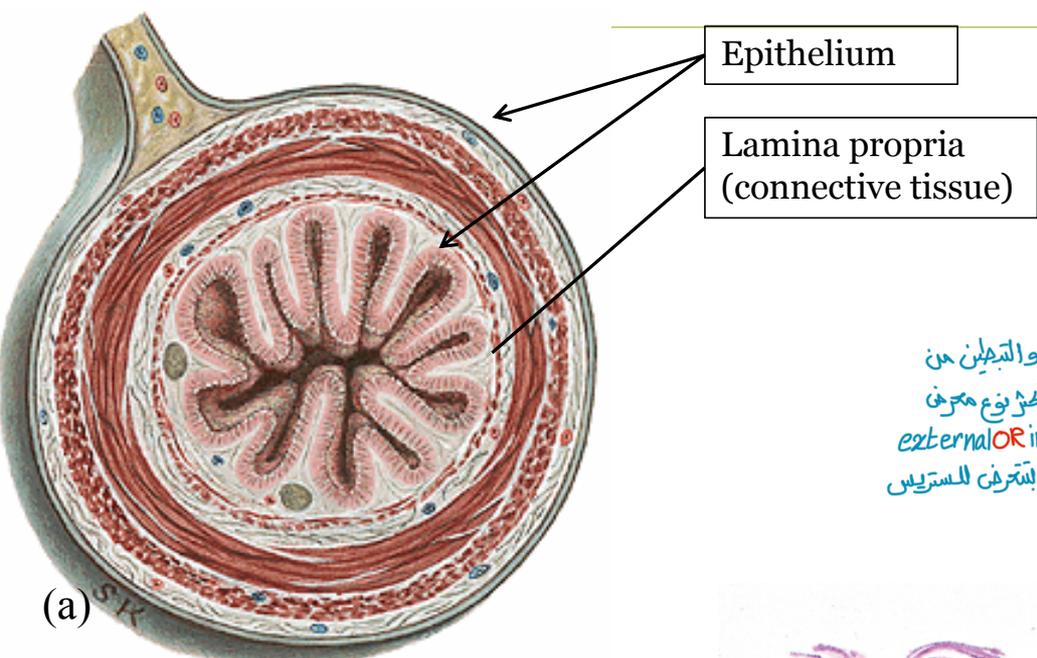


Fig.1: Characteristics of Epithelial tissue. (a) Cross section of small intestine. (b) Section through the skin.

بسبب التخليق من الخارج والتبطين من الداخل في الـ epith. فهي أكثر نوع متعرض للـ environment سواء external OR inter. فتحشان هيك هي أكثر وحدة بتعرض للمستريين فيتوت كيش وليجي غيرها

(a)

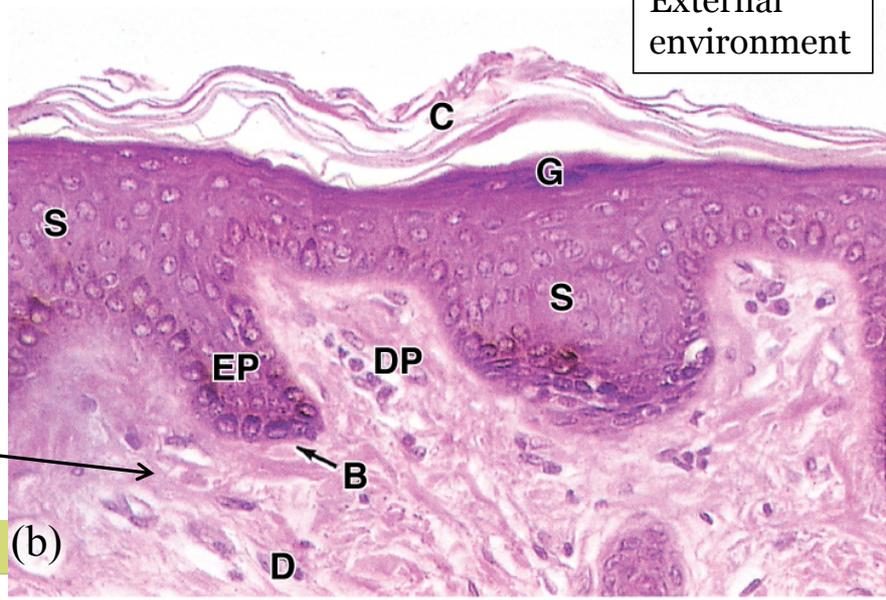
External environment

تمثيل

Epithelium = epidermis

connect. tissue. يحياقبل كل مادة. يبي فيها epith. تمثيل

Dermis (connective tissue)



(b)

Epithelial Tissue

• Epithelial tissues have the following characteristics:

- 1) Cover surfaces or line cavities.
- 2) Rapid turn-over (time from the birth of a cell till its death), because it's exposed to the external environment.
- 3) Formed of sheets of closely packed cells. مترابطة stacked
- 4) The cells are polar. هون من مقهور فيها قطبية وموجوب وسالب
- 5) The epithelium rests upon a sheet of extracellular matrix called the Basal Lamina. The epithelium, also, have a connective tissue layer under it. كل جهة من جهات الخلية سواء كان جهة علوية / جانبية ، كل جهة الـ structure مختلفة عن الثانية فالتالي كل الـ function مختلفة
- 6) **Epithelial tissues lack blood vessels.** They receive their nutrients from the underlying vascular connective tissue. ما فيه أوعية دموية

هنا وبين
البحصول على
nutrients ال
انما هي اوعية
دموية

بكون تحتها

Types of Epithelium

- Epithelium can be divided into two general groups:

1) Lining or covering epithelium

2) Glandular epithelium → Main function is secretion

لخل قاعدة للوان
لذا -

أي.. epithel.. مسؤول عن الـ secretion
للتسمية Glandular

الافراز

- However, some lining epithelial cells secrete (like those in the stomach) and some glandular cells are present between lining cells (like goblet cells of small intestine)

الامتصاص

هذه الطبقة المبطنة الى stomach من الداخل
لذلك تكون epith.. لديها مسؤولية عن lining
ليس بنفس الوقت هي مسؤولة عن افراز الـ acid
من في نوع من أنواع epithel cell تسمى goblet cell هي مسؤولة عن secretion
بما اعلا بيبي صغانتكم من خلال طبقات الـ lining

هذا

مممكن يكون هاي اخلايا المسؤولين
عن lining يكلوا secretion
و ممكن خلايا مسؤولين عن الـ secretion
يكلوا lining

Lining or covering epithelium

According to number of layers

Simple
(1 layer)

Stratified
(≥ 2 layers)

Pseudostratified
epithelium

According to shape of cell

Squamous

Cuboidal

Columnar

According to shape of cell in upper layer

Squamous

Cuboidal

Columnar

Transitional

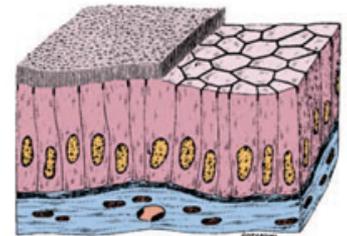
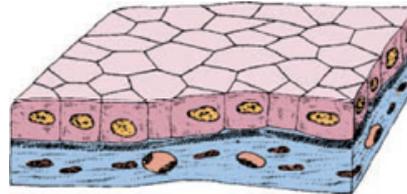
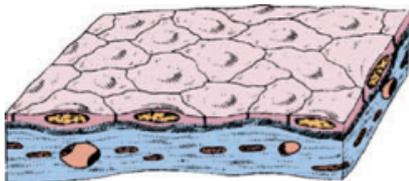
Keratinized

Non-
keratinized

Simple Epithelium

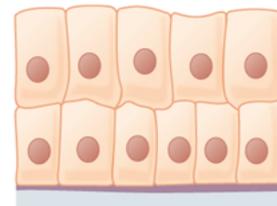
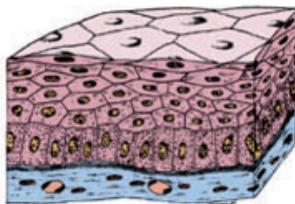
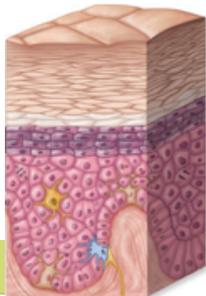
أكثر نوع من أنواع Epithelium انتشاراً

	Simple Squamous	Simple Cuboidal	Simple Columnar
Number of Layers	Single	Single	Single
Cells	Flattened squamous <i>مسطحة</i>	Cuboidal <i>مكعب</i>	Tall columnar <i>عمودي</i>
Location	<ul style="list-style-type: none"> Line <u>blood vessel</u> Line body cavities 	<ul style="list-style-type: none"> Line <u>renal tubules</u> Cover <u>ovaries</u> <i>بالمبايض</i> 	<ul style="list-style-type: none"> <i>Ciliated</i>: → <i>يعني على سطحه شعيرات</i> Uterine tube <i>Non-ciliated</i>: → <i>ما على سطحه شعيرات</i> Stomach
Function	<ul style="list-style-type: none"> Easy <u>passage</u> of substances <u>Secretion</u> <i>إفراز</i> 	<ul style="list-style-type: none"> Active transport Cover organs 	<ul style="list-style-type: none"> Secretion Absorption



Stratified Epithelium

	Stratified Squamous		Stratified Cuboidal	Stratified Columnar
	Keratinized	Non-keratinized		
Number of layers	Multiple	Multiple	Multiple	Multiple
Top-most layer	Squamous cells covered by keratin layer <i>شکل آخر طبقة من فوق</i> <i>طبقة عليا</i> <i>flat</i>	Squamous cells <u>not</u> covered by keratin layer <i>ما عليها</i>	Cuboidal	Columnar
Location	<u>Skin</u>	<u>Esophagus</u> <i>المريء</i>	Large ducts of salivary glands <i>موجود بالتجويف اللعابية</i>	Conjunctiva
Function	<ul style="list-style-type: none"> Protection Prevent water loss 	<ul style="list-style-type: none"> Protection 	<ul style="list-style-type: none"> Protection Secretion 	<ul style="list-style-type: none"> Protection Secretion



Transitional epithelium (Urothelium):

❖ The topmost cells of this stratified epithelium are dome-like (called *Umbrella Cells*).

المظليّة

❖ Location:

– Urinary bladder and ureters.
That's why it's also called *Urothelium*.

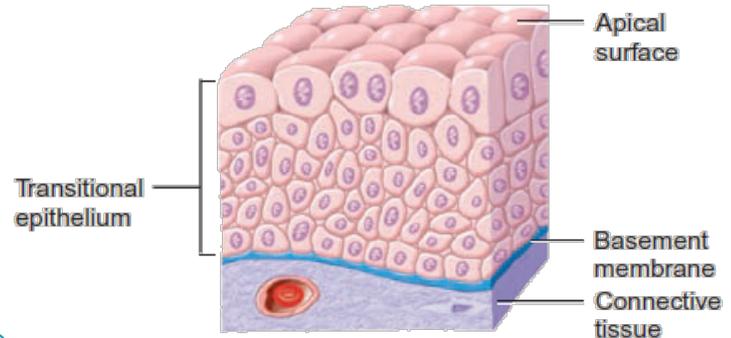


Fig.3: Relaxed transitional epithelium.

❖ The umbrella cells are dome-shaped when the bladder is empty. Once it's full, these cells will become flattened (hence the name transitional).

❖ Functions: Protection against the adverse effects of urine.
Allows the bladder to change size.

بترميمها لما يجير عننا بقدره stretch

Pseudostratified columnar ciliated epithelium:

- In this epithelium, the cells have different heights. All cells rest on the same basal lamina, but not all of them reach the surface. This makes the nuclei occupy different levels giving the epithelium a false stratified appearance, but this epithelium is, actually, simple

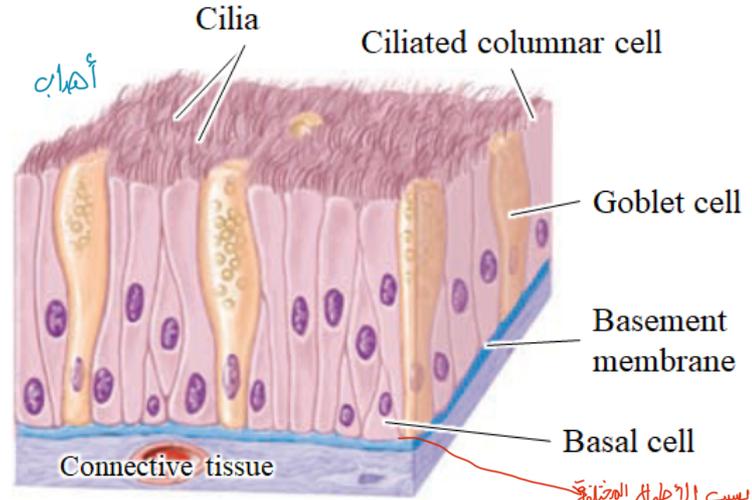


Fig.4: Pseudostratified columnar ciliated epithelium.

بسبب الارتفاعات المختلفة
التيها
مختلفة فانه يمكن
تسليقها عن 2 layers

- **Location:** الأنف الحنجرة القصبة الهوائية
Trachea, bronchi, and nasal cavity (that's why it's also called *Respiratory Epithelium*).
- **Functions:** Protection, secretion. Ciliary movement removes particles from the airway passages.

Glandular Epithelium

- Is an epithelium specialized for secretion.

Classification of glandular epithelium:

المسؤولين عن الـ secretion بقسمهم
بنائاً على 4 طرق :-

1) According to number of cells:

الأولى :- هل نوع الخلية المكونة لها
unicellular
multicellular

[?] Unicellular glands: formed of a single cell, like **Goblet cells** of digestive and respiratory tracts.

[?] Multicellular glands: formed of clusters of cells, like **salivary** and **sweat glands**.

2) According to presence of ducts:

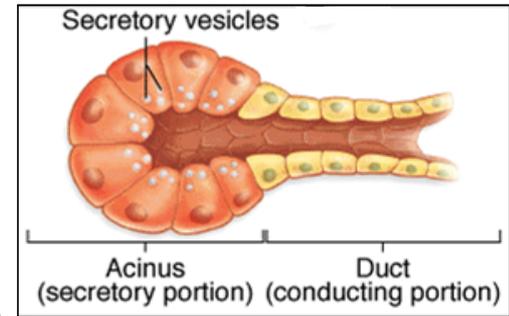
- [?] **Exocrine** glands: possess ducts that transfer the secretion to the outside of the body, like: salivary glands. *عند الحاجة الخردا لهما سواها duct مما هو ومن يتفرز انما لها؟*
- [?] **Endocrine** glands: they lack ducts. Their secretions are transferred to the target organs, usually, by blood. Example: Pancreatic Islets, Pituitary gland. *خامصة وتفرز للمدار*

3) Exocrine glands classified according to morphology of duct and

secretory portion:

المقسم الثالث ليجي عن Exocrine فقط
secret. port. & duct
انها

- [?] Each exocrine gland has a secretory portion that produces the secretion and a duct that carries this secretion.
- [?] The duct and the secretory portion could be branched or unbranched. *الجزء الذي يفرز يمكن يكون غير متفرع*
- [?] The secretory portion could be acinar (ball-shaped), tubular, or coiled. *الاشكال sec. p.*

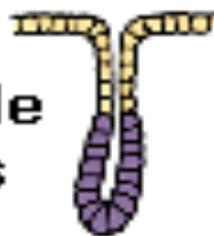


ملفوف

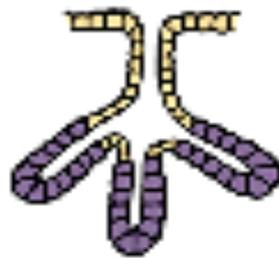
أنبوبي

Exocrine Gland Types

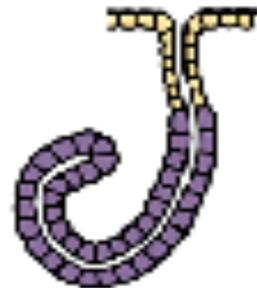
simple
types



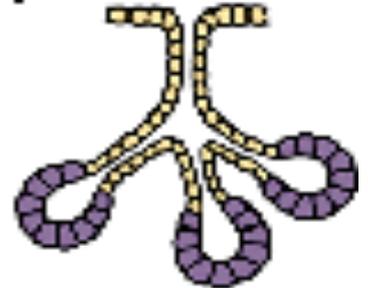
tubular



branched
tubular

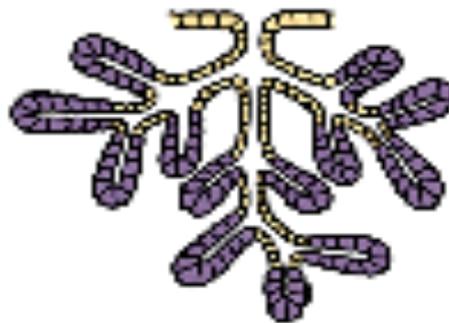


coiled
tubular

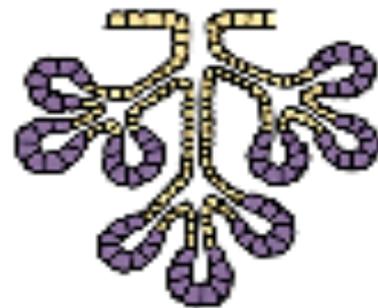


branched
alveolar

compound
types



tubular



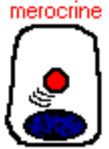
alveolar

4) Exocrine glands classified according to method of secretion:

التقسيم الرابع بناءً على طريقة الـ secretion

الطريقة الطبيعية

❑ Merocrine: only the product is secreted by exocytosis. As in salivary glands.



❖ Merocrine glands are either serous (excrete a watery solution) or mucous (excrete a thick solution).

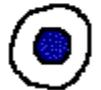
❑ Apocrine: the product and the apical part of the cell is shed. As in mammary gland.

هون بدل ما لتفجر لتعمل shedding
يعني لتفصل معها جزء من الخلية لتعبر هي والجزء زي المصوري



❑ Holocrine: the whole cell disintegrates and is shed with the secretion. As in sebaceous glands of the skin.

الغدد الدهنية
هون الخلية بتكل موراها لتفجر



Epithelial Cell Polarity

حكايا قبل
 characteristi..
 Polar
 صوبها وسال انفا كل جبهه
 الـها stru. مختلف
 diff. function.

Polarity means that various regions of a cell have specialized structural features because they perform different functions.

❖ Epithelial cells can be generally divided into 3 regions:

1. **Apical (Luminal) region:** close to the **lumen** of the organ.
2. **Lateral regions:** adjacent to other cells.
3. **Basal region:** lying on the basal lamina.

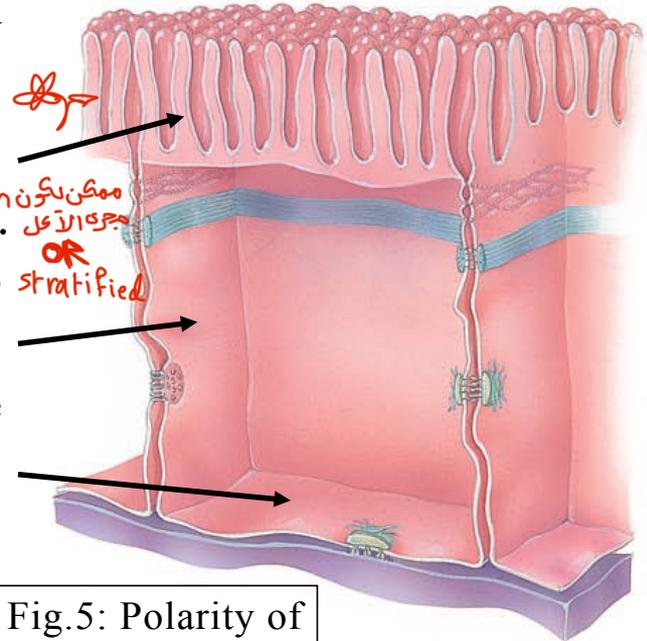


Fig.5: Polarity of epithelial cells.

الجزء العلوي
 الجزء الى بلزقها بالخلايا المجاورة
 الجزء الـ بلزقها مع lamina

يمكن يكون
 جبهه الاعلى
 OR
 stratified

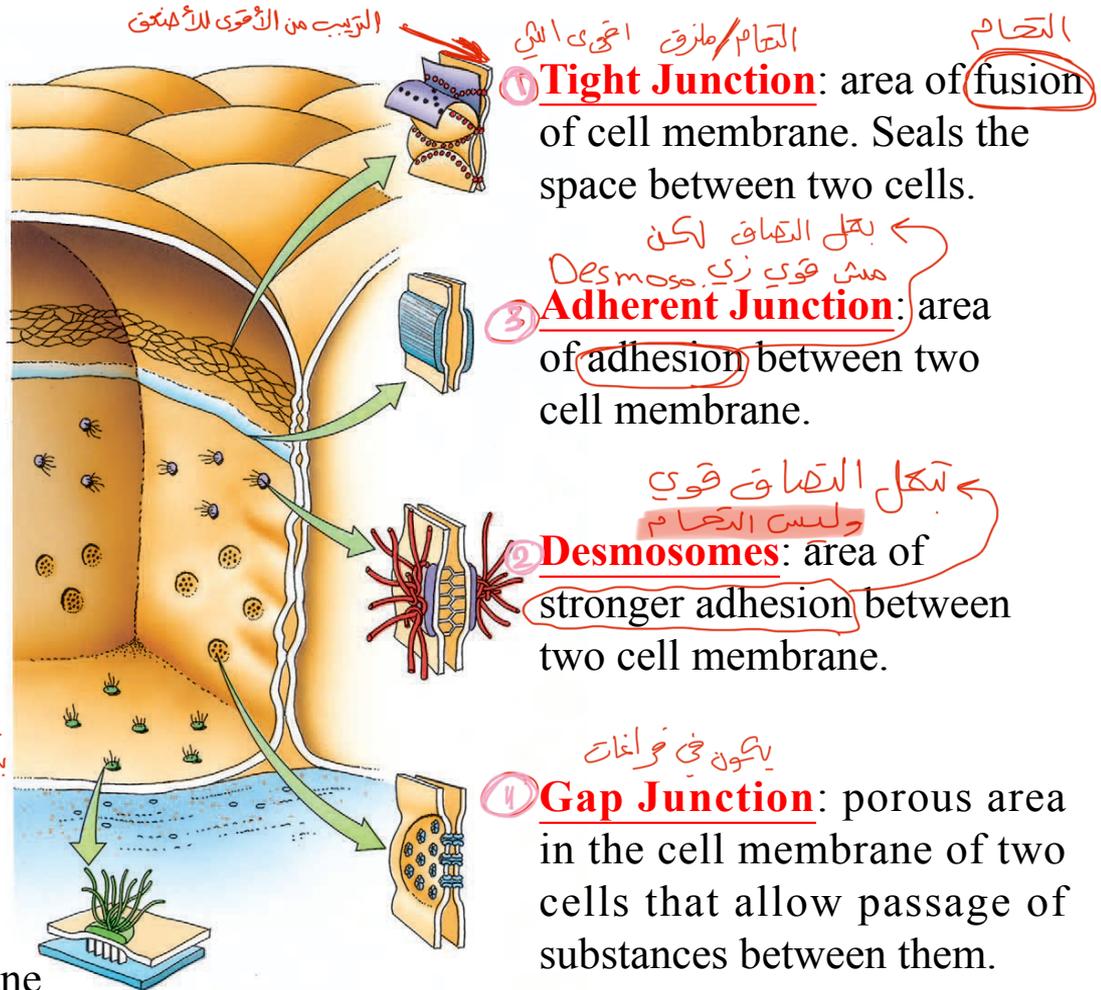
مع الخليه الى قمتها زي الـ skin او اي اسن stratified
 ↓
 لـ 2 or more layers

Cellular Junctions

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

عشان يكون في اتصال بينهم يارتبطوا ببعض فالتالي لازم يكون عندهم structure معينة قدامهم يارتبطوا بشوية فضول الـ structure؟؟

Hemidesmosomes:
area of adhesion between cell membrane and basal lamina.



Features of the apical surface of the cell

هو جزء الخلية العلوي

- **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.



Fig.6a: Microvilli of small intestinal cells

هذه هي البنية التي تسمى
الـ struct.

كله على الجزء العلوي

- **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.

هو جزء من الخلية

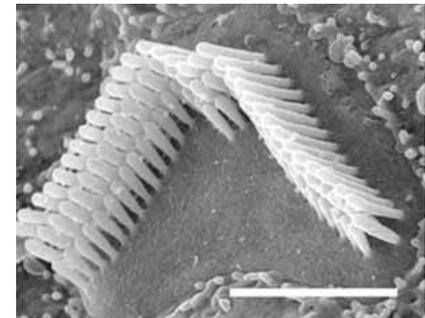


Fig.6b: Stereocilia of a hair cell

- **3) Cilia** عباره عن
شعيرات
- 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.

برهتو الهم لغت
ال - stractu

الخلية الحرة بيحي عليها
الحلوس cilia

- **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.

يتكون
الخلل من
cilia ال

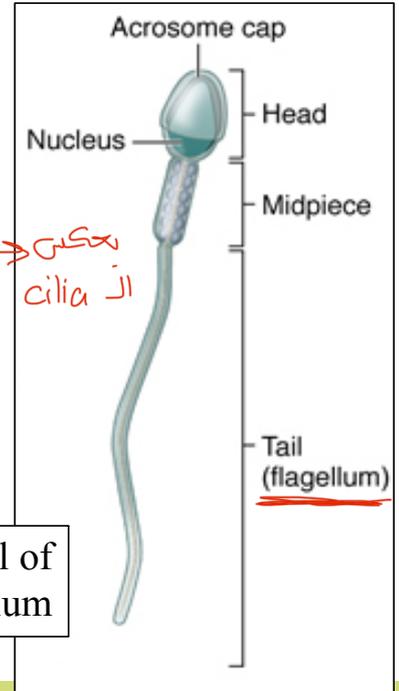
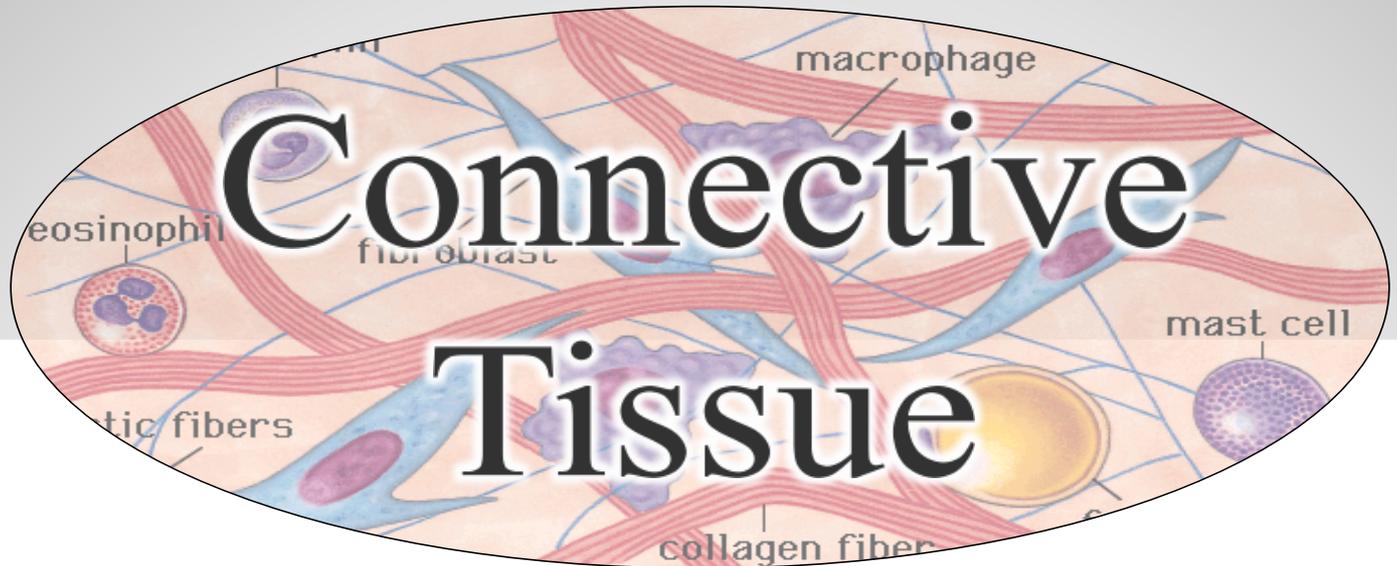


Fig.6c: Sperm. The tail of the sperm is a flagellum



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.

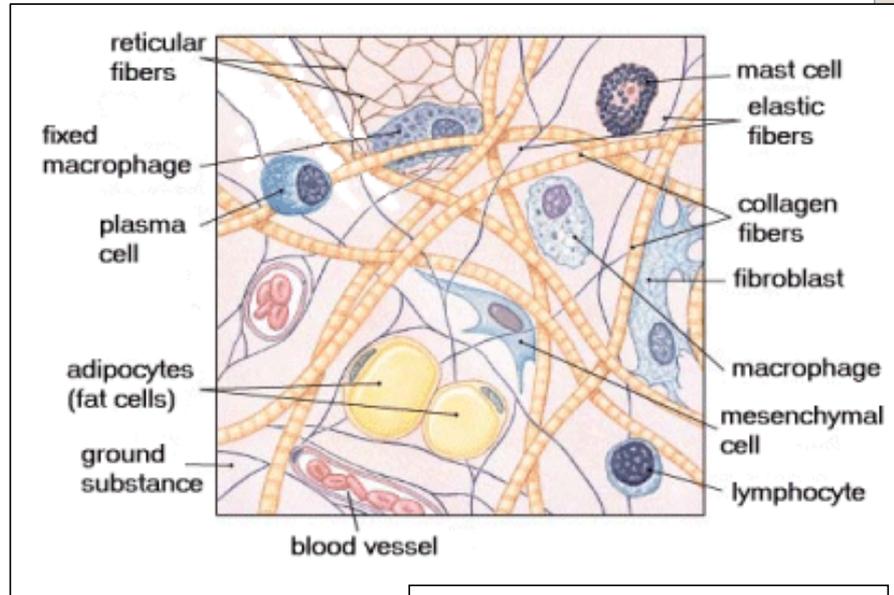


Fig.7: Components of CT.

Functions:

1. Provide form of organs.
2. Support of different organs \Rightarrow fatty tissue.
لأنه يكون تحت epith. movement electrical
3. Connect and bind different structures \rightarrow cartilage, bone.
حوري التي من مسؤول عن lining covering secretion
4. Provide a medium for diffusion of nutrients and waste products \rightarrow connective tissue proper, blood.
ظرف connective

The Cells Of The Connective Tissue

① *أهم خلية*

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

مسؤول عن إنتاج ال Fibers

- **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*).

نوية بارزة

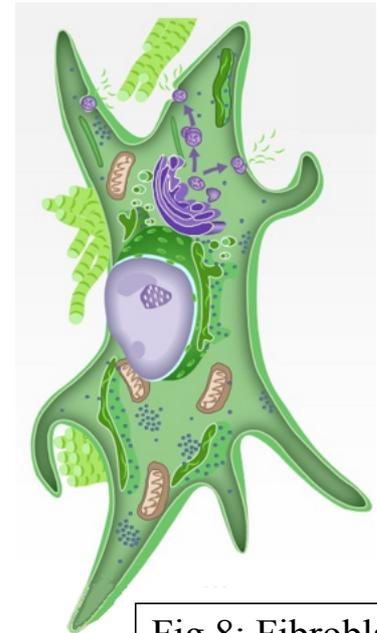
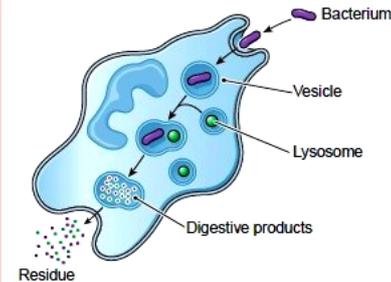
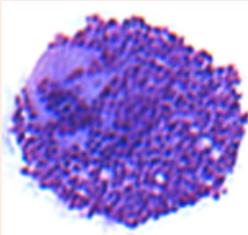
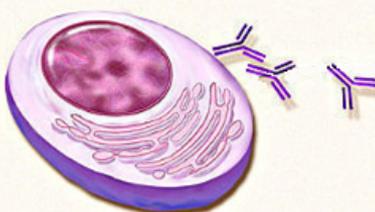


Fig.8: Fibroblast.

Cell	Important feature	Function
<p>الخلايا البلعمية عن البلعمة / الاتهام</p> <p>Macrophages</p>	<p>بفتح الحاء</p> <p>Cell surface has indentations and protrusions</p> <p>لوز</p>	<p>البلعة</p> <p><u>Phagocytosis</u></p> 
<p>Mast cells</p>	<p>Cytoplasm filled with dark staining secretory granules</p>	<p>افراز</p> <p>Secretion of <u>histamine</u> (allergy), heparin, and <u>others</u></p> 
<p>Plasma cells</p>	<p>Nucleus has alternating dark and light regions (clock-face appearance)</p>	<p>افرازيم</p> <p><u>Production of antibodies</u></p> 

✿ Extracellular Matrix ✿

connective tissue
نسيج أو نسيج
توصيل

Formed of:

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

- 1) Collagen fibers: give strength to the tissue.
بشكل قوة
3 أنواع
- 2) Elastic fibers: give elasticity to the tissue.
بشكل مرونة
- 3) Reticular fibers: form a net that surrounds the different parts of the tissue holding them together.
الهيكلية مع بعض
ترابط كل

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

Classification

Connective Tissue

Mainly in embryos

التقسيم الأحدث
لا adult

مركزية موحدة
OR

Adult

Embryonic

Proper

Supportive

Fluid

مرتبة بطريقة
OR

Loose

Dense

Bone

Cartilage

Blood

Areolar

Collagenous

Elastic

Hyaline

Lymph

Adipose

Irregular

Elastic

Reticular

Regular

Fibrocartilage

تاج له
تاج له

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

فصلها

Fibers من مترامين ج بعضي

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

تربط قوي

لشوا الاشي الى تحكم
بخلي تربط قوي OR فضفاضة Fibers

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

الكمية والترتيب تحلي
Dense اقل

مترامين ←

Loose Areolar Connective Tissue:

هذا النسيج موجود بالجسم

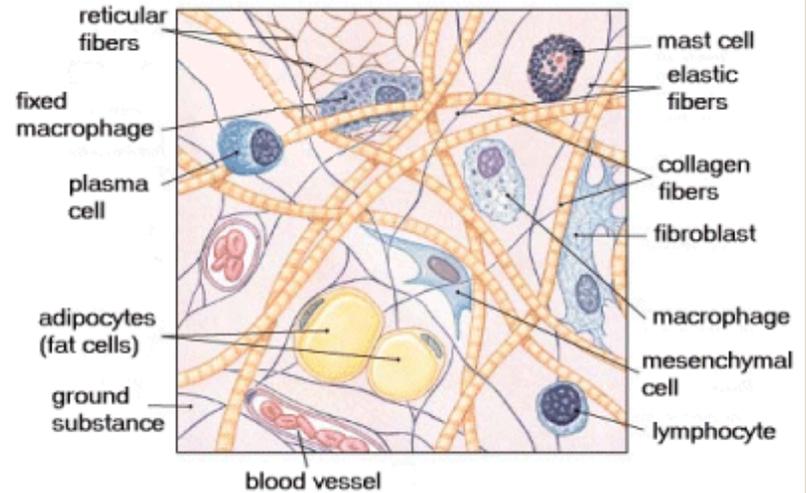
اول نوع من انواع ال loose

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

□ Features: تحتوي على كل انواع ال fibers (موجود بكميات 25)

- Contain all three types of fibers arranged loosely.
- All types of connective tissue cells (especially fibroblasts and macrophages) are present here. ①
- All these components are embedded in an abundant thick semi-fluid ground substance. ②
- It's highly vascular.

لكي كل ال الياف موجودة ولكن هسهسه ال اخره نوعين



اجزاء بصوره

Fig.9: Areolar connective tissue.

HA

هو ممكن يعني سؤال عن Packing mat.

① Areolar loose propeave adult

② Areolar Dense " " "

③ Areolar loose suppor. " "

عنه و علب

Found:

1. Under epithelia.
2. Around glands.
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.

لأنه موجود باعلى الأماكن
ونهاروا يسونه

كحشو (أي عشان يتكون
بأي مكان خارجي)

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

loose proper
جزء من

من خلايا على كمية

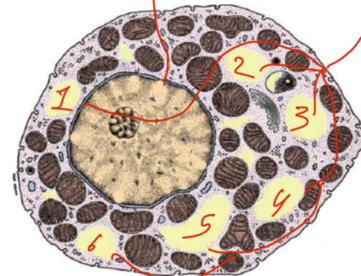
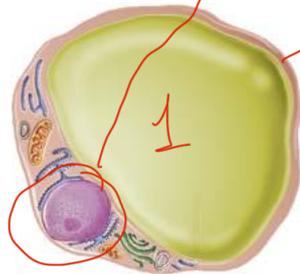
adult C.T (ظلياً) adipocytes كثيرة من (نفسه)

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> لونها البيض	Brown
Gross color	<u>White to yellow</u> (due to presence of fat) بين كونه الازرق الى فيها	<u>Brown</u> due to abundance of <u>blood vessels</u> → لسبب اللون
Main function	Storage of <u>energy</u>	Production of <u>heat</u>
Location	<ul style="list-style-type: none"> Present throughout life All over the body 	<ul style="list-style-type: none"> Abundant in infants Decrease with age → كلما الشيخوخة كبر عدد ما يقل In adults found in few areas

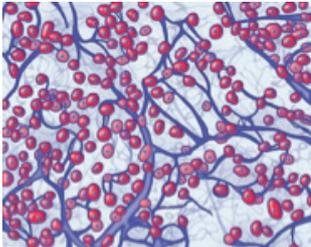
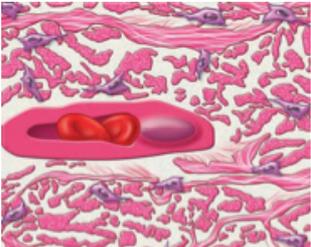
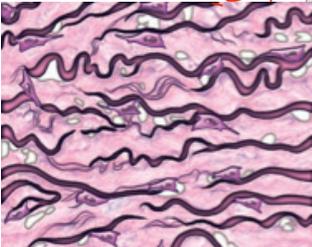
	White Adipocyte	Brown Adipocyte
Shape	Spherical <i>سائري</i>	Polygonal <i>مضلعه</i>
Size	<u>Larger</u>	Smaller
Fat droplet	<u>Single</u> (unilocular)	Multiple (multilocular)
Nucleus	Peripheral <i>طرفية</i>	<u>Central</u> <i>بالف</i>
Mitochondria	Numerous <i>كمية كبيرة</i>	Numerous



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

leptin ← white مسؤول عن انقاز هرمون ال
وهو مسؤول عن الشحور بالاشباع

Other types of connective tissue proper:

Type	<i>Loose</i>	<i>Dense</i>		
	<i>Reticular</i>	<i>Collagenous</i>	<i>Elastic</i>	
Fibers	Reticular	Irregular <small>فئير ال ترتيب غير منظم او غير</small> Collagen, passing in <u>all directions</u> <small>في جميع الاتجاهات</small>	Regular Collagen, passing in <u>one direction</u> <small>في اتجاه واحد</small>	Elastic
Function	Holds parts of organs together	Resists forces from all directions	Resists traction forces	Provides <u>elasticity</u>
Location	Lymph node, <u>spleen</u>	Dermis of <u>skin</u>	<u>Tendons</u> , <u>ligaments</u>	<u>Aorta</u> , <u>vocal cords</u> <small>احبال صوتيه</small>
				

Cartilage

- *Cartilage is a supportive type of connective tissue. Its ECM is of a firm consistency which can resist and bear mechanical stresses.*
- *Cartilage has no vascular or lymphatic supply. Nutrients and stimuli reach this tissue by diffusion from the nearby synovial fluid.*
- **Perichondrium:**
 - 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.



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.

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	<p>Most common:</p> <ul style="list-style-type: none"> • Articular surfaces of some joints • Cartilages of the nose and trachea • Thyroid and cricoid cartilages of the larynx • Costal cartilages • The epiphyseal growth plate 	<ul style="list-style-type: none"> • Auricle of the ear • Wall of external auditory canal • Auditory tube • Epiglottis and cuneiform cartilages of the larynx 	<ul style="list-style-type: none"> • Intervertebral discs • Pubic symphysis

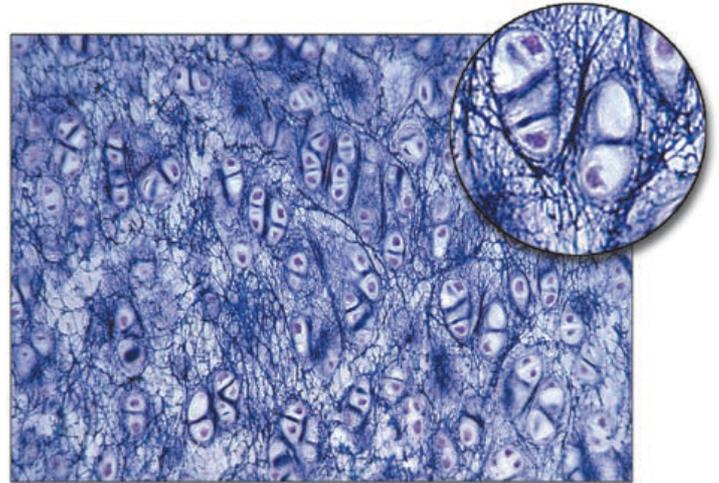
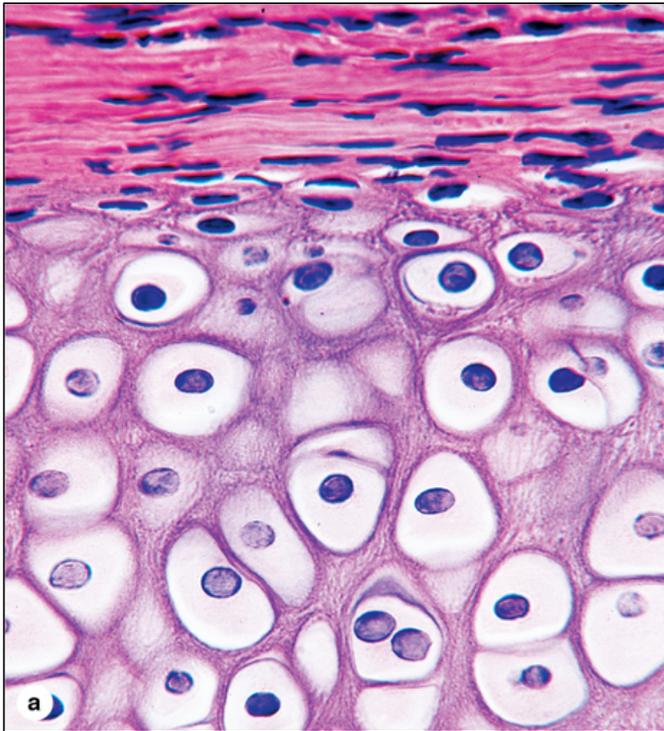


Fig.10: Left, hyaline cartilage. Above, elastic cartilage. Below, fibrocartilage.

