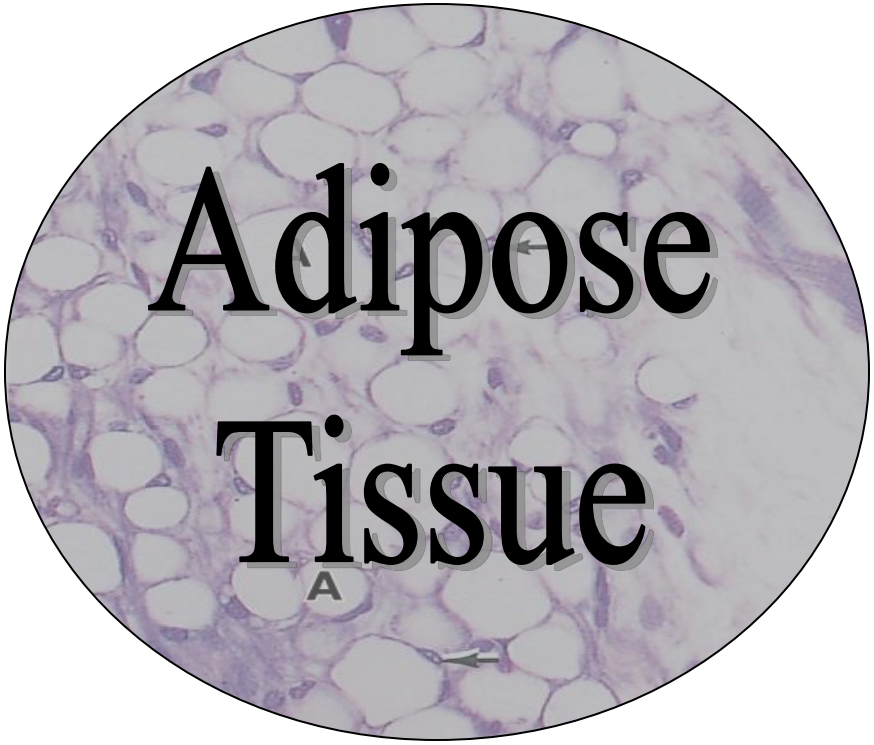
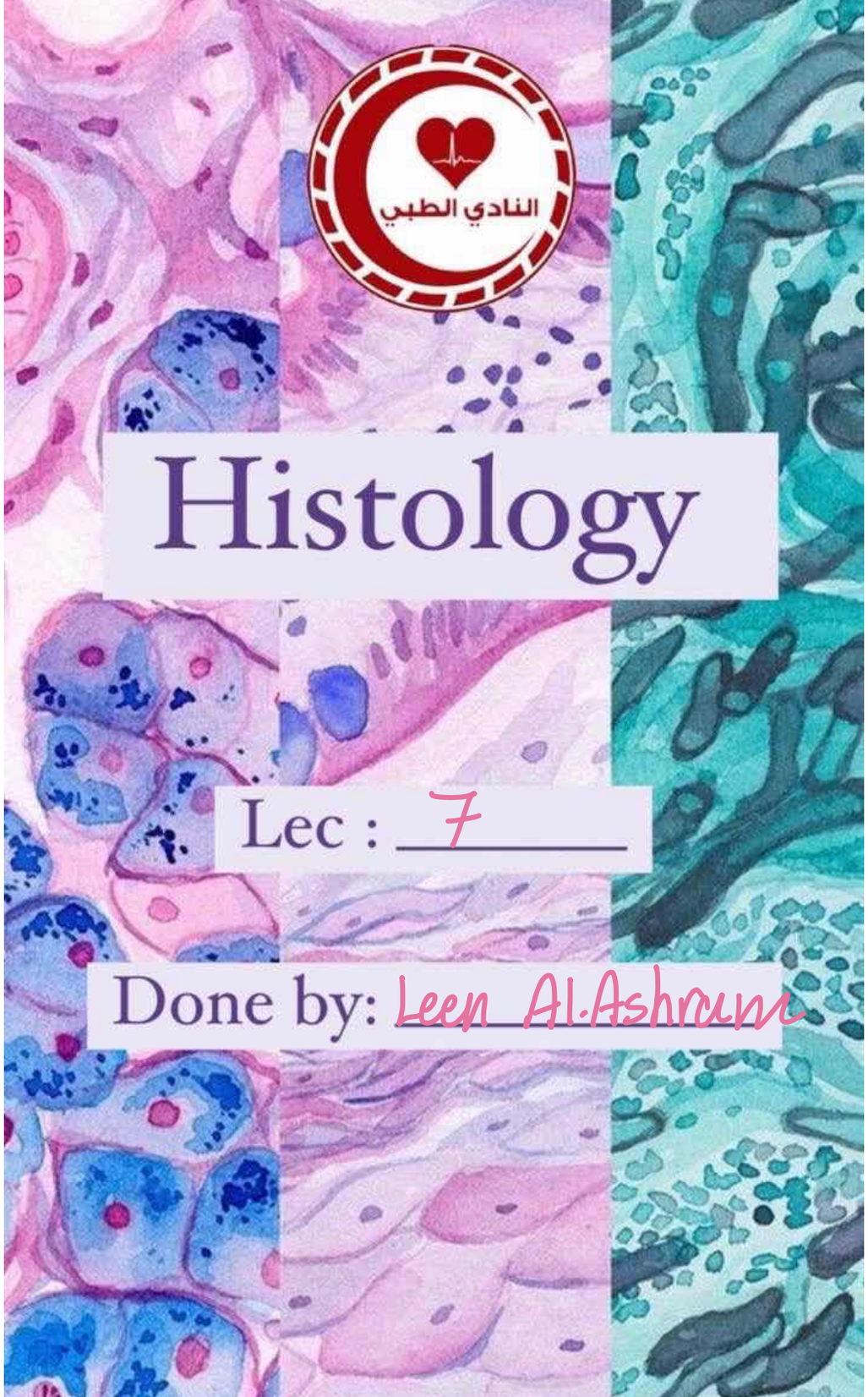

Adipose
Tissue
A



Histology

Lec : 7

Done by: Leen Al-Ashram

ADIPOSE TISSUE:

- Is a type of loose connective tissue in which adipocytes predominate. → But ECM is produced by fibroblasts
- It's present throughout the body.
- It constitute about 15-20% of the body weight of males with normal weight, and 20-25% of females body weight.
- It could ***White*** (WAT) or ***Brown*** *(BAT)*.

Functions of Adipose Tissue

1) Storage of energy in the form of Triglycerides.

2) Endocrine role by the release of certain hormones andType cytokines.

* subcutaneous fat acts as an insulator *

3) Insulator, because it's a poor conductor of heat.

4) Fills the large spaces between tissues and keeps some organs in place.

5) Subcutaneous fat helps shape the surface of the body.

6) Fat pads act as shock absorbers (palms and soles).

لما يوقع الإنسان لا إراديًا بمد يده ليسقط على كفيه؛ لحمايته.
هنا بتحتوي fat pads.

7) Warming of blood (brown fat).

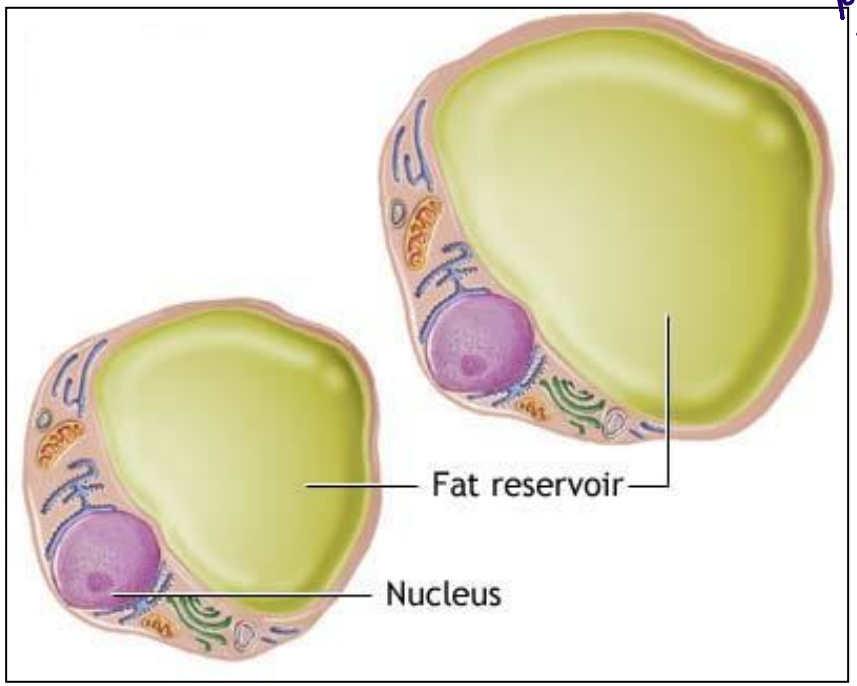
brown adipose tissue

White Adipose Tissue

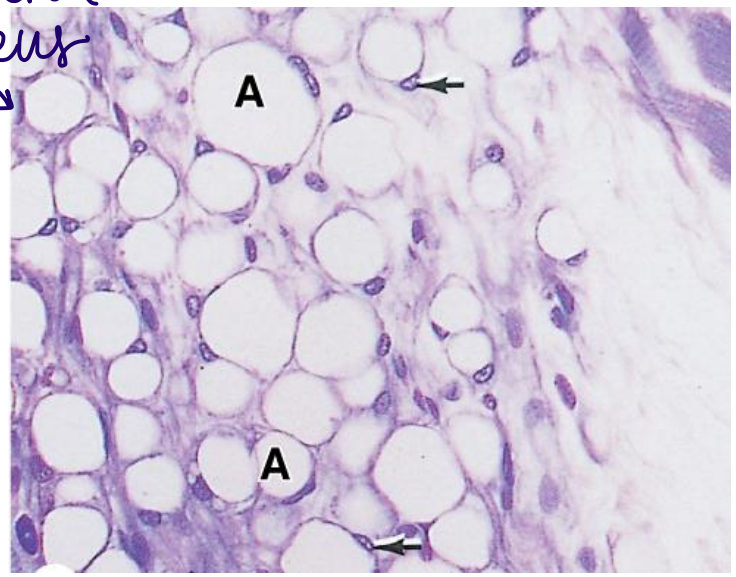
- Specialized in energy storage in white adipose cells.
  in the form of triglycerides
- Depending on diet, its color varies from white to bright-yellow.
- ***Features of white adipose tissue:*** * Don't Forget that: it has Abundant of Adipocytes,
  also:
1) Fibroblasts and macrophages are present in the tissue.
2) Reticular fibers form a network that supports individual adipose cells. → every cell is surrounded by adipose fiber
3) Divided by connective tissue partitions into incomplete lobules.
4) Highly vascularized. → all Adipose tissue are, to exchange energy with Blood

Histological features of White Adipocytes

1. Large spherical cells with a single large fat droplet (unilocular) → كل الـ fat متجمع في نقطة واحدة
2. Flattened nucleus on one side (pushed by the droplet).
3. A thin film of cytoplasm around the droplet containing well-developed SER (smooth endoplasmic reticula) and pinocytotic vesicles. → large amount
   ↳ It has a function of fat metabolism
4. Thicker cytoplasm around the nucleus containing several mitochondria, Golgi apparatus, polyribosomes, and poorly developed RER.
5. The droplets are surrounded by Vimentin intermediate filament.
   ↓ in epithelium, it is keratin
6. The cell is surrounded by a thin external lamina (similar to basal lamina).
   نفس الموقع والأجزاء



peripheral nucleus



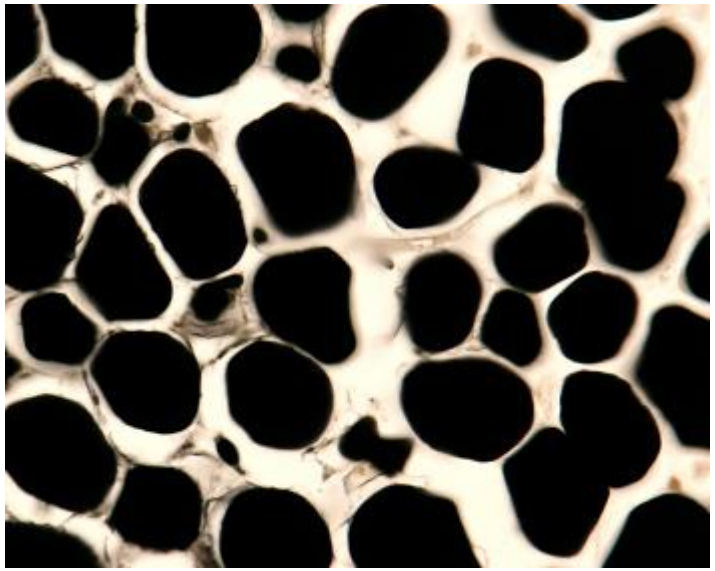


Fig.16: The image above shows the features of white adipocyte. Top-right, the image shows the typical appearance of fatty tissue in a routine preparation. Fat droplets dissolve during tissue preparation and the cell appears as a thin ring of cytoplasm with the nucleus projecting on one side (the ***signet-ring appearance***). Bottom-right, special stain was used to preserve the fat droplet.

of white Adipocytes (looks like a ring)

Clinical aspects of White adipose tissue :

white adipose tissue

*when we eat, part of the food is stored in Adipose tissue as energy

1) WAT secretes the hormone ***Leptin*** which is a '***Satiety Factor***' → Could obesity be treated by hormonal therapy?

"protective Factor"

*contains more fat

2) ***Adiponectin*** is released by adipocytes. The larger the adipocyte is, the less adiponectine it releases. This hormone protects against diabetes and other diseases.

3) ***Obesity is characterized by a state of chronic mild inflammation*** because WAT secretes several inflammatory factors → Could these be related to the cardiovascular or diabetic complications of obesity?

Obese → more adipose tissue → more cytokines released

Adipose tissue can be classified to 2 حسب مكانة وجوده

1) subcutaneous : under skin
تحت الجلد تقسم الاشي، اختلاف جيناتها فقط

2) visceral : related to the organ
* more dangerous * خرقة في الجهاز

4) Although histologically similar, visceral and subcutaneous WAT have different gene expression. The visceral WAT is more dangerous to health → Could obesity be treated by gene therapy?

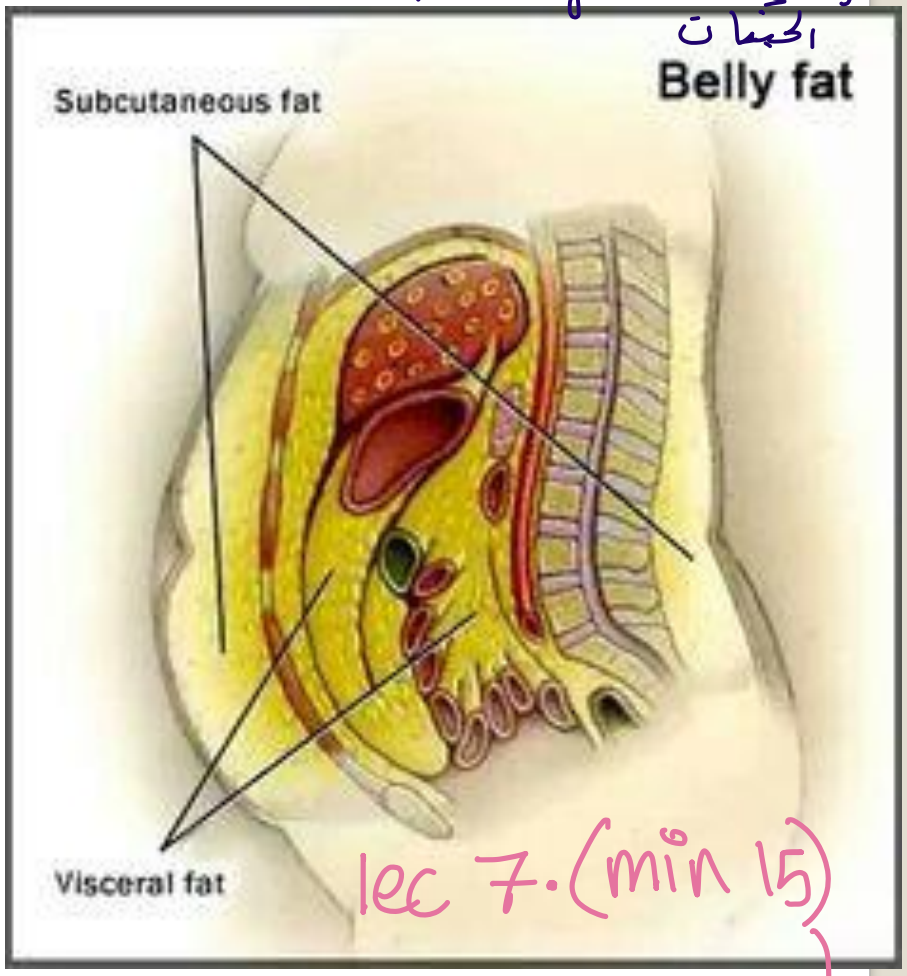


Fig.17: Subcutaneous and visceral fat.

lec 7. (min 15)

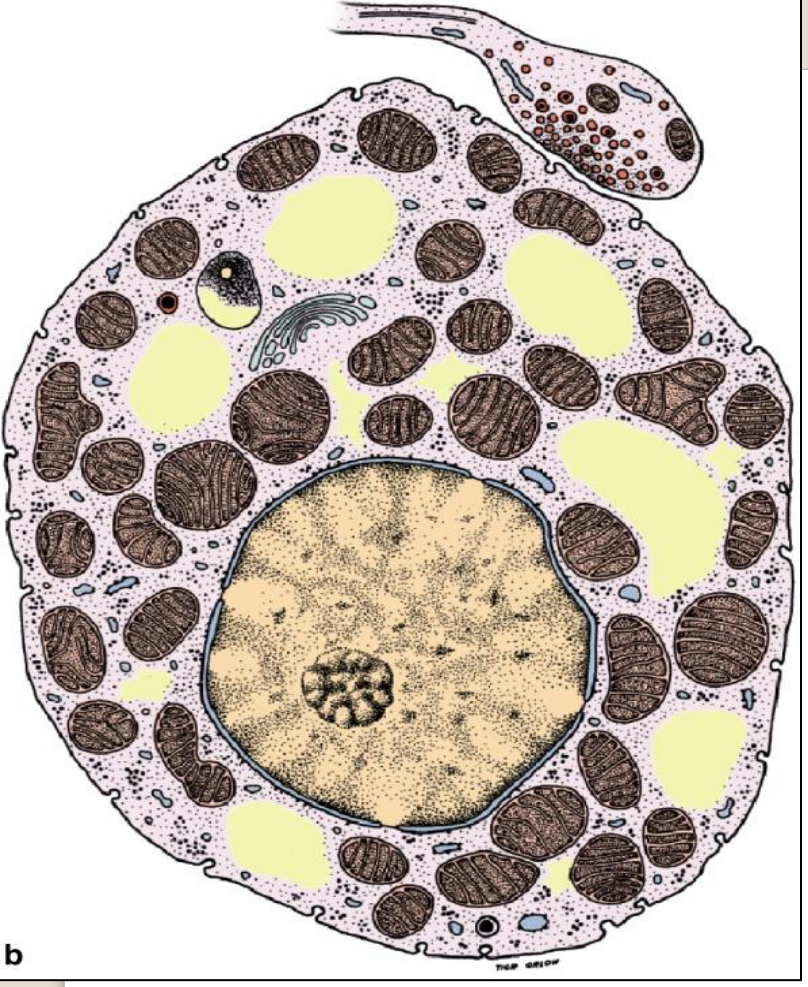
listen to the lecture

5) At birth, fat stores are already formed and distribution and density varies with age and gender & activation of the person

- *Obesity* in *adults* is *hypertrophic* (results from increase in size of the already present adipocytes). In *Children*, the obesity could be *hyperplastic* (increase in the number of cells) because new adipocytes can be formed from precursor cells that are still present at this age. Such obese children are liable to develop a more severe hypertrophic obesity because they have more adipocytes. → ***Treat/prevent obesity at an early age.***

Brown Adipose Tissue

- Specialized in heat production. (warm the body)
- Brown adipocytes are smaller than white adipocytes, polygonal, with multiple fat droplets (multilocular). They have numerous mitochondria and a central spherical nucleus.
- Cells arranged in an almost epithelial arrangement around a blood capillary. The tissue is divided into lobules by connective tissue partitions. (*closely packed*)
- The brown color is due to the (1) mitochondria and the (2) blood vessels.



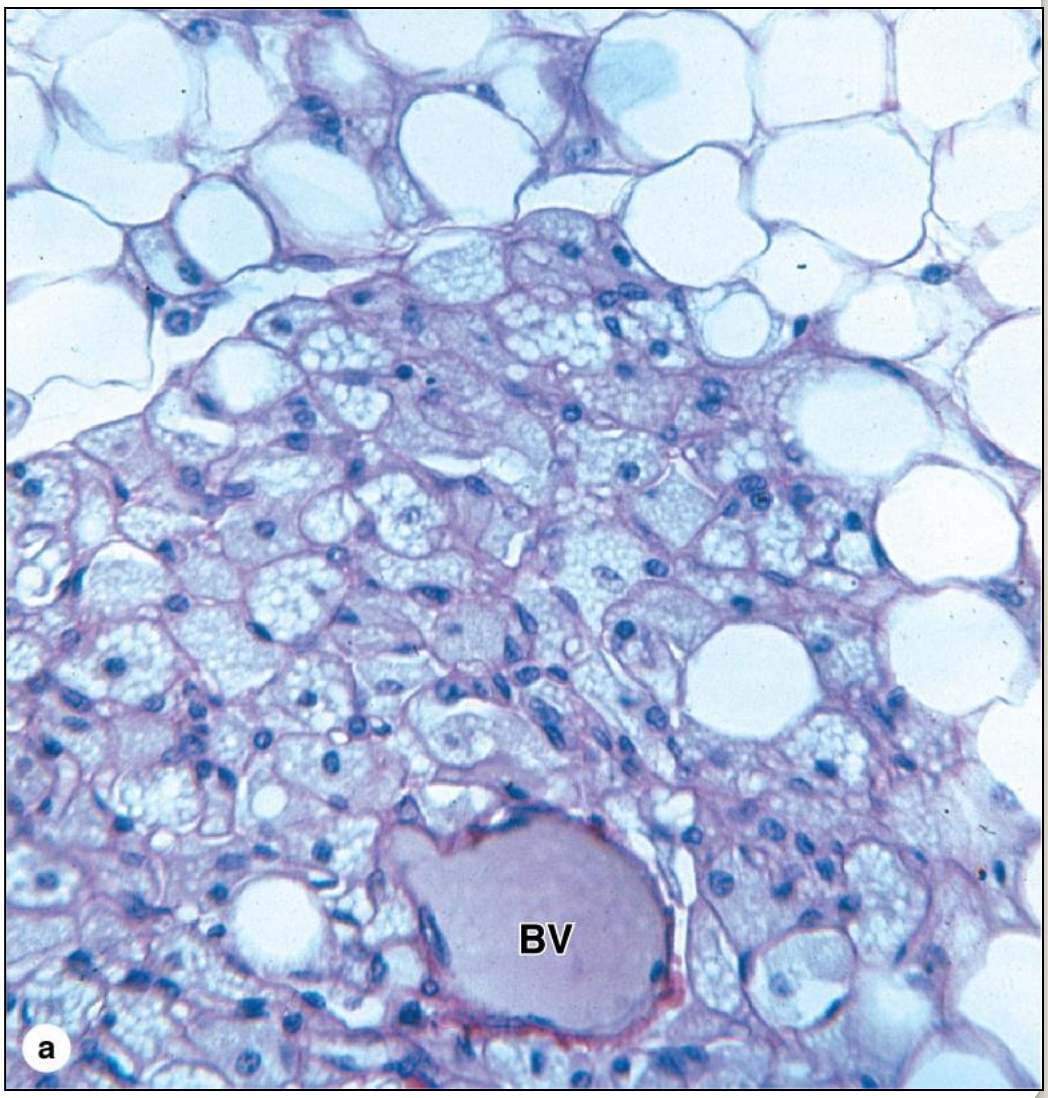
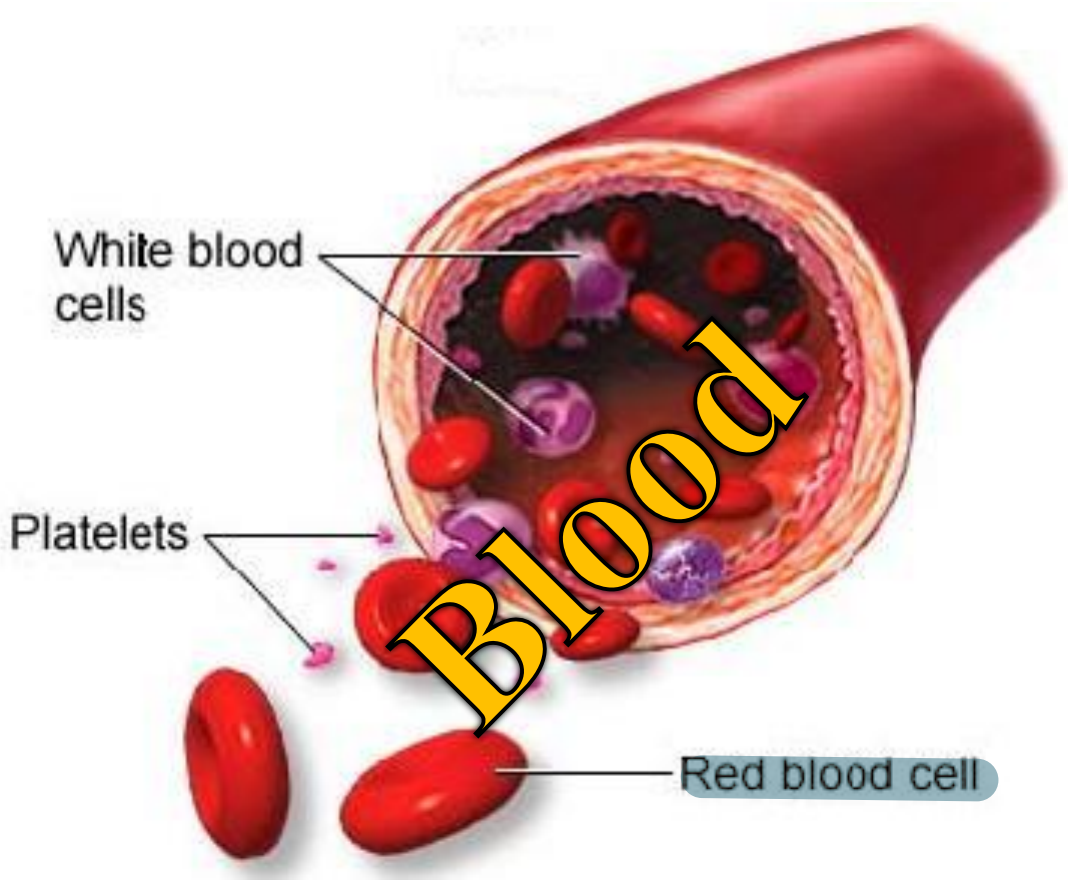


Fig.18: Above, a brown adipocyte, note the several small fat droplets. Right, brown adipose tissue, note how the cells surround a blood vessel (BV).

- At birth, brown adipose tissue is maximal for body weight. It then decreases with age.
- In adults, it's found in scattered areas especially *around the kidneys, the adrenals, the aorta, and in the mediastinum*.
- It increases during cold adaptation.


White blood cells
Platelets
Red blood cell
Blood

- Blood Is a fluid type of connective tissue characterized by having a liquid extracellular matrix (plasma) in which are dispersed the formed elements of blood: (1) Red blood cells (erythrocytes), (2) White blood cells (leukocytes) and (3) Platelets (thrombocytes).

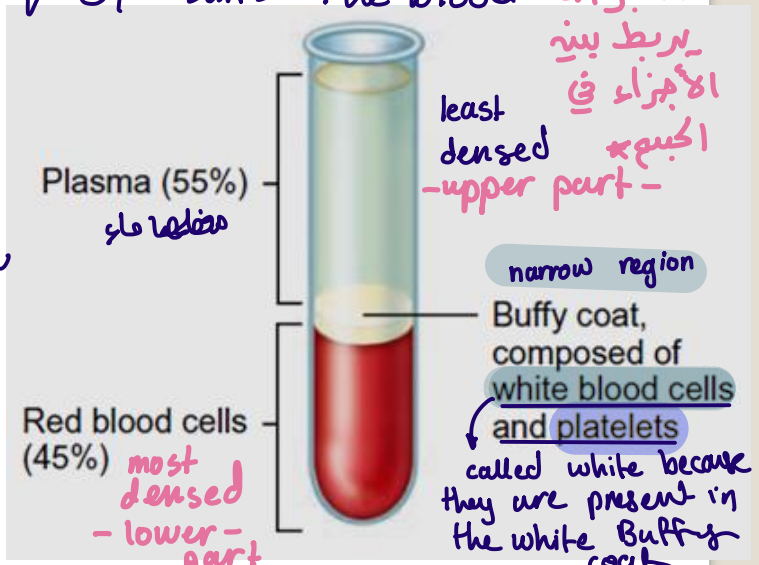


Fig.19: Appearance of centrifuged blood.

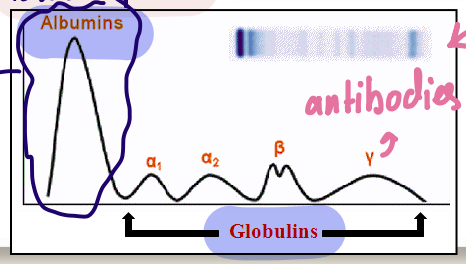
- Functions of blood:

1) *Transportation:* Gases, nutrients, waste products, hormones.
2) *Regulation:* pH, body temperature.
3) *Protection:* Clotting, white blood cells, proteins (antibodies).

Components of Blood

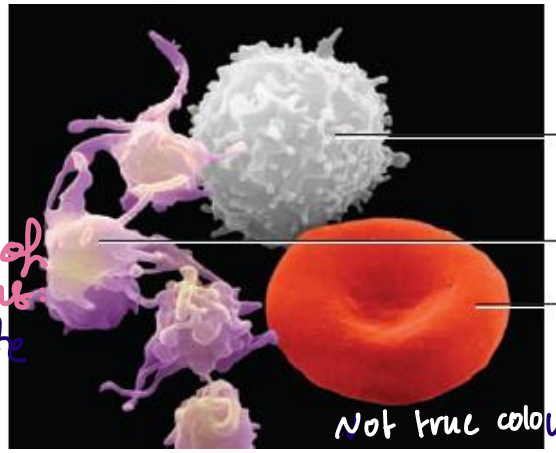
Blood

- **Plasma** — 55% of blood
  - Water — 91% of plasma
  - Solutes (mostly protein)
    - Proteins (Mostly Albumin) — most common type of proteins in Blood plasma
    - Other Solutes
- **Formed Elements** — 45% of blood
  - Red Blood Cells
  - White Blood Cells
  - Platelets



highest conc.

electroforesis of plasma proteins: a way to seperate component of the structure by its charge



Formed Elements of Blood

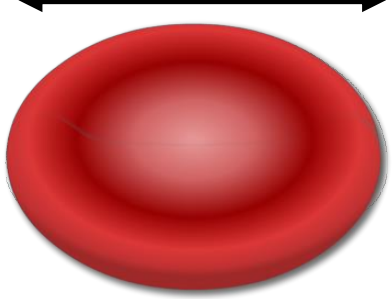
Erythrocytes (Red Blood Cells)

- The most abundant type of cell in blood
- *This cell is normally only present in blood inside the blood vessels.*

RBC

اذا تواجدت في الخارج؟ → هاي حالة مشه حلبيعية وهي ال Bleeding

على عكس ال WBC ممكن تتواجد برا بشكل طبيعي

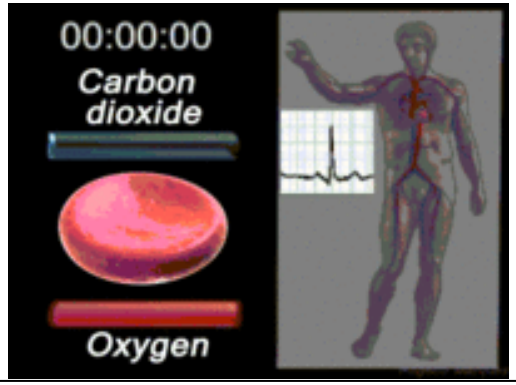


- Biconcave disc in shape. This increases surface area.
- Lack nucleus and other organelles. Cytoplasm is filled with the oxygen-carrying protein hemoglobin. Because it has no mitochondria, it doesn't use oxygen.

carries O_2

→ they depend on anerobic metabolism

- Strong, flexible plasma membrane. This allows the cell to change its shape without rupturing as it passes through narrow capillaries.



The flow rate in this animation has been tripled. An average cycle actually takes about 60 seconds.

- Life span about 120 days.

cycle: RBC passing exit from the heart, goes to the body return to heart

Functions of the red blood cells

1) The hemoglobin in the RBCs functions in the transportation of:
   - Oxygen – this is the main function of RBCs
   - CO_2
   - Nitric Oxide (NO) – this gas is a vasodilator that helps in increasing blood flow

2) Glycolipids in plasma membrane are responsible for ABO and Rh blood groups.

3) When RBCs are destroyed by some microorganism, they release substances that can kill the microorganism.

indired immune role.

زهايمر ما دكر الميد ت