ADIPOSE TISSUE

- Is a special type of connective tissue ,which adipose cells (adipocytes) predominates.

In men of normal weight ,represents 15-20% of the body weight
In women of normal weight ,it represents 20-25% of body weight.

- Adipose Tissue is **:**

☛ the largest repository of energy in the body (in the form of triglyceride).
☛ a very efficient storage tissue .
☛ sensitive to both nervous & hormonal stimuli .
☛ Subcutaneous layers of adipose tissue help to shape the surface of the body , it acts as shock absorbers ,chiefly in the soles & palms
☛ fills up space between other tissues & keep some organs in place .
☛ Secretes various type of molecules that may be carried by the blood to influence distant organs.

There are two types of adipose tissue

❶ Unilocular (common,or yellow) adipose T. ❷ Multilocular (brown) adipose T.

Unilocular adipose tissue·

- The color varies from white to dark yellow due to the presence of carotenoids dissolved in fat droplets of the cells.
- It is found in adult throughout the human body except for the eyelids ,the scrotum and the entire of external ear except for the lobules .
- Age and sex determine the distribution and density of adipose tissue .
- Its distribution is regulated by sex hormones and adrenocortical hormones
- The shape of cells are spherical to polyhedral ,they appear as a thin of cytoplasm surrounding the vacuole left by the dissolved lipid droplet .
- Unilocular adipose t. is subdivided into incomplete lobules by a partition of connective tissue containing a rich vascular bed and network of nerves.
- Reticular fibers supports fat cells and binds them together.

The functions of unilocular Adipose Tissue.

- Adipose cell can synthesize fatty acids from glucose, a process accelerated by insulin.

Insulin also stimulates the uptake of glucose into the adipose cells and increases the synthesis of lipoprotein Lipase

- **Leptin:** Is a protein made of 164 amino acid ,that produced by adipose cells .it

participates in the regulation of adipose tissue in the body .

- It acts in the hypothalamus to decrease food intake and increase energy consumption.

Histogenesis of Unilocular Adipose tissue

Mesenchymale tissue give rise to lipoblasts ,which have appearance of fibroblasts but are able to accumulate fat in their cytoplasm .The fat accumulate at week 30 of gestation .After birth, the development of new adipose cells is common around small blood vessels ,where undifferentiated mesenchym cells are found

It is believed during only a finite postnatal period , nutritional and other influences can result in an increase in the number of adipocytes, after that Do not increase in number

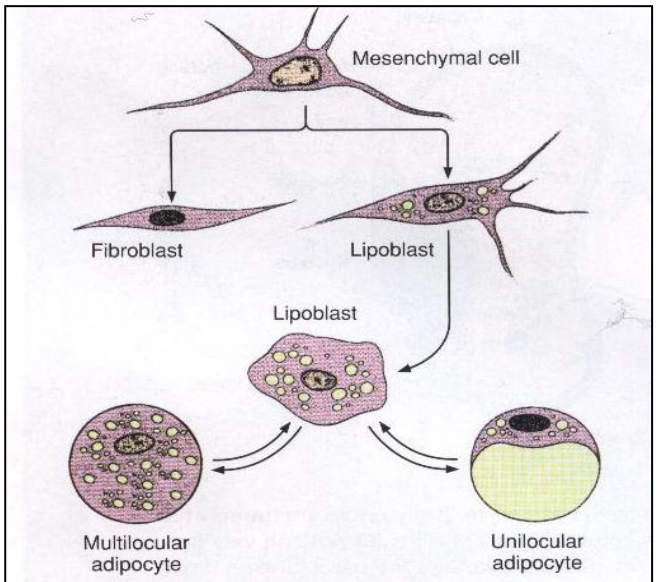

Figure 6–3. Development of fat cells. Undifferentiated mesenchymal cells are transformed into lipoblasts that accumulate fat and thus give rise to mature fat cells. When a large amount of lipid is mobilized by the body, mature unilocular fat cells return to the lipoblast stage. Undifferentiated mesenchymal cells also give rise to a variety of other cell types, including fibroblasts. The mature fat cell is larger than that shown here in relation to the other cell types.

Medical application

- **Obesity:** In adults may result from an excessive accumulation of fat in unilocular tissue , that become larger than usual (hypertrophic obesity)
- An increase in the number of adipocytes cause hyperplastic obesity
- Unilocular adi. can generate very common benign tumors called Lipomas .Malignant adipocyte – derived tumors (Liposarcoms) .

Multilocular (brown) adipose tissue

- The color is due to both the large number of blood capillaries and the numerous mitochondria in the cells
- It has a more limited distribution in the body .It is called (hibernating gland).
- In the human embryo and new born ,this tissue is encountered in several areas and remain restricted to these location after birth .
- It is important in the first month of postnatal life ,when it produces heat and protects the newborn against cold .It reduced in adulthood
- Cells are polygonal & smaller than cells of unilocular cells ,their cytoplasm contains a great number of lipid droplets of various size The tissues are subdivided by partitions of connective tissue into lobule.
- Cells of these tissue receive direct (Sympathetic innervations), While in Uniloculare nerve endings are found mainly in the walls of blood vessels; only few adipocytes are directly innervated.
- There is no formation of multilocular adipose tissue after births

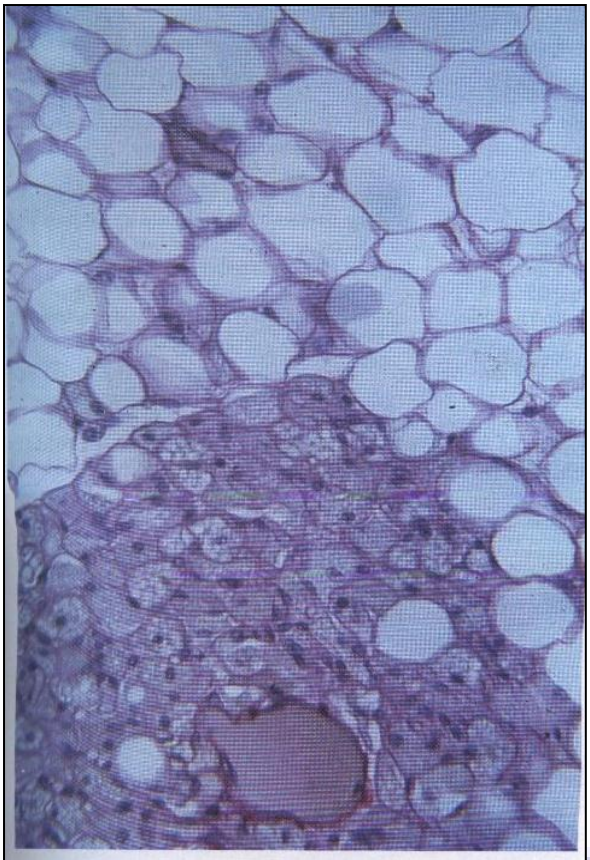

Figure 6–5. Photomicrograph of multilocular adipose tissue (lower portion) with its characteristic cells containing central spherical nuclei and multiple lipid droplets. For comparison, the upper part of the photomicrograph shows unilocular tissue. PT stain. Medium magnification.

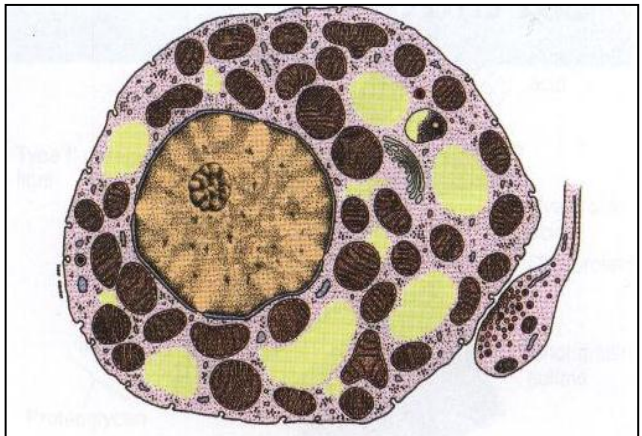

Figure 6–6. Multilocular adipose tissue. Note the central nucleus, multiple fat droplets, and abundant mitochondria. A sympathetic nerve ending is shown at the lower right.

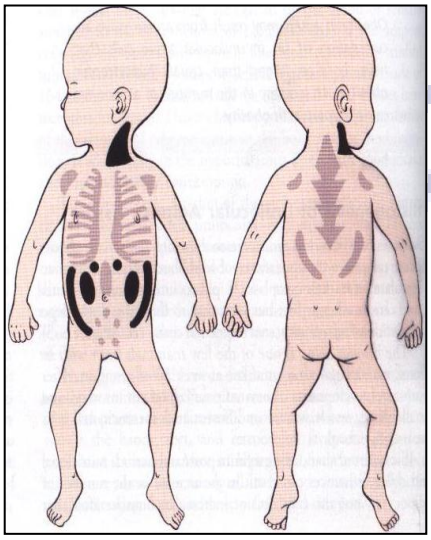

Figure 6–4. Distribution of adipose tissue. In a human newborn, multilocular adipose tissue constitutes 2–5% of the body weight and is distributed as shown. The black areas indicate multilocular adipose tissue; shaded areas are a mixture of multilocular and unilocular adipose tissue. (Modified, redrawn, and reproduced, with permission, from Merklin RJ: Growth and distribution of human fetal brown fat. Anat Rec 1974;178:637.)

The functions of multilocular adipose tissue

Produce heat ,because the mitochondria in cells of this tissue have protein called *Thermogenin* in their inner membrane .This protein permits the backflow of protons wormed blood circulates throughout the body ,heating the body& carrying fatty acids not metabolized in adipose tissue .

Histogenesis of multilocular adipose tissue

Multilocular adipose tissue develops differently from unilocular tissue The mesenchymal cells that constitute this tissue resemble epithelium before they accumulate fat .

Unilocular Adipose Tissue	**Multilocular Adipose Tissue**
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It is found in adult throughout the human body except for the eyelids ,the scrotum and the entire of external ear except for the lobules .	• It has a more limited distribution in the body .It is called (hibernating gland). • In the human embryo and new born ,this tissue is encountered in several areas and remain restricted to these location after birth
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