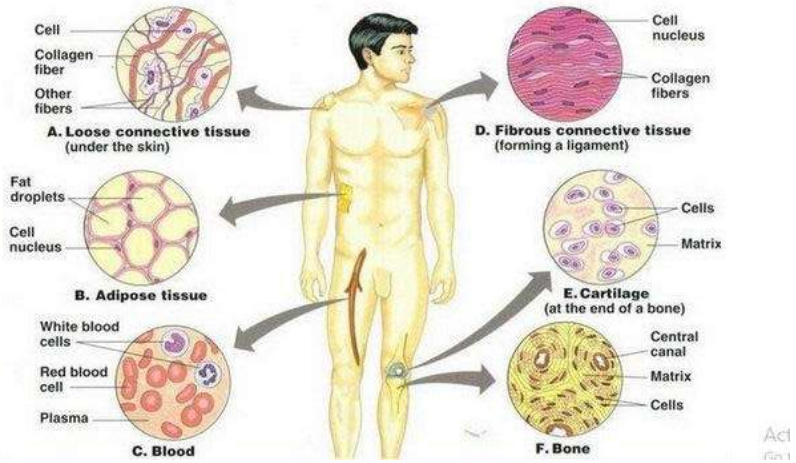
Connective tissue



Variétés tissulaires

Les tissus sont classés en :

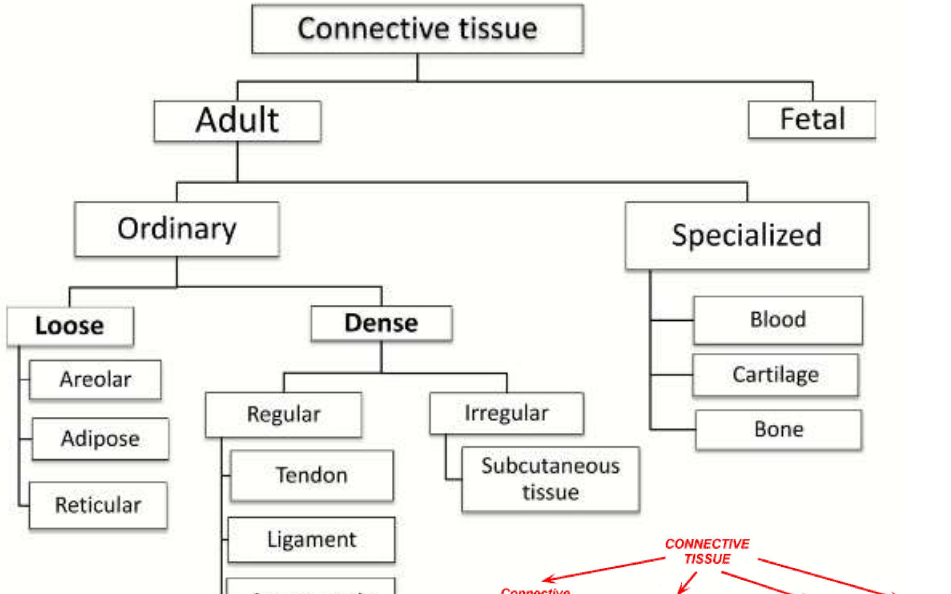
- **Tissus Epithéliaux** :
  - Revêtement
  - Glandulaire
- **Tissus Conjonctifs** :
  - Lâche
  - Fibreux
  - Adipeux
  - Réticulé
  - Tissus conjonctifs spécialisé :
    - Cartilage
    - Os
    - Sang
    - Tissu lymphoïde
- **Tissus Musculaires** :
  - Lisse
  - Strié squelettique
  - Strié myocardique
- **Tissu Nerveux.**

Introduction:

These are tissues with a high degree of polymorphism but with common points.

Whatever their anatomical location, they comprise the following **three basic components**:

1. **Cells**
2. **Fibers**
3. **Fundamental substance.**



1- Fibroblast

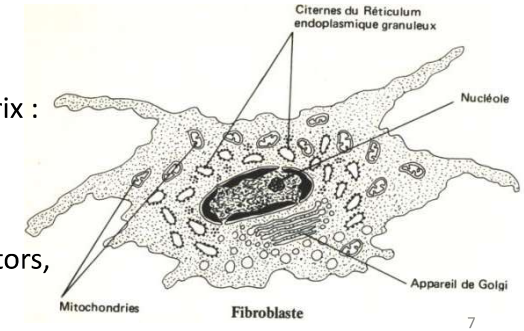
- They appear as star-shaped cells,

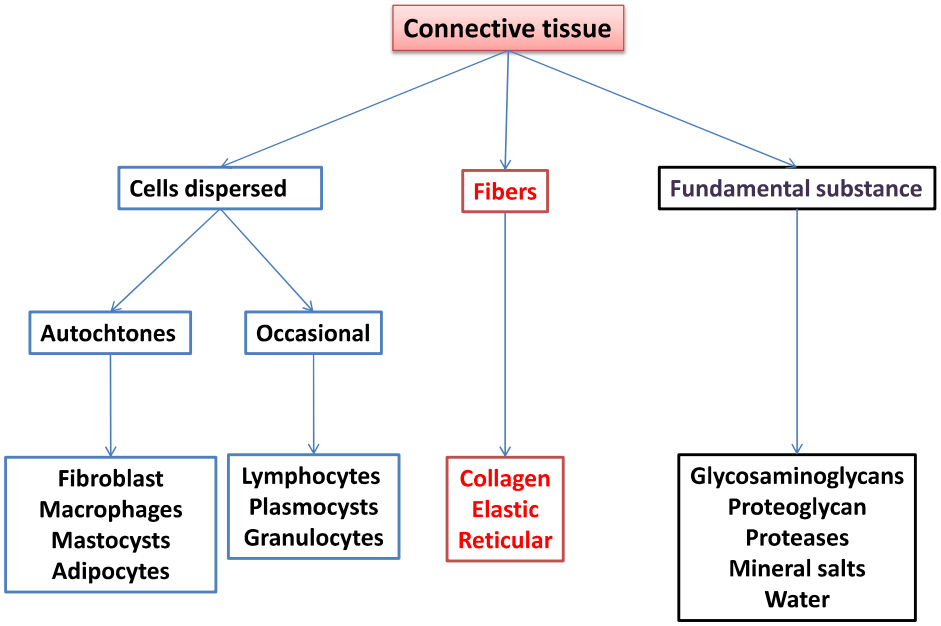
with more or less regular extensions.

- The nucleus is central, dense and elongated.
- The cytoplasm is very rich in organelles: RER, free ribosomes, mitochondria, Golgi apparatus.

Role :

fabrication of the extra cellular matrix : synthesis of
- fibres,
- fundamental substance
- and other compounds (growth factors, enzymes, ...).

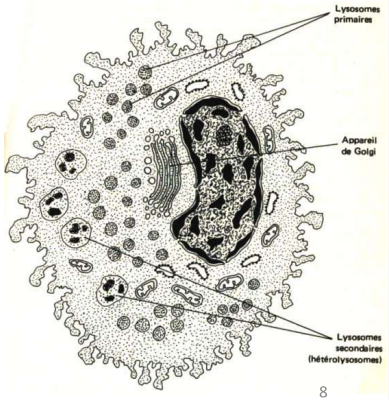




2- Macrophage

- Macrophages are large cells with a morphological aspect (size, shape of its nucleus) that varies greatly and depends on the activity of the cell.
- However, there are two constant characteristics:

1. The presence of lysosomes
2. Scalloped appearance, irregularity of the plasma membrane , provided with deep invaginations and pseudopods (mobility, an amoeboid movement).



Role: They assume a primary role in defence against aggressive agents

displacement & **phagocytosis**.

I- The elementary parts of connective tissue

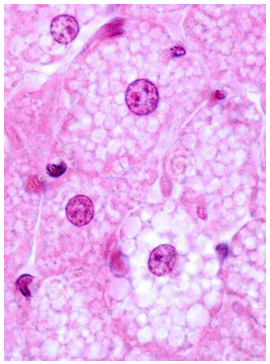
❖ A- THE CELLS

- There is a double population:

1) Certain ***autochtones cells*** that really belong to the connective tissue, they are produced locally and remain in the connective tissue that formed them (***fixed cells***).

2) On the other hand, other ***occasional cells*** come from other territories (***migratory cells***)

4- Adipocytes



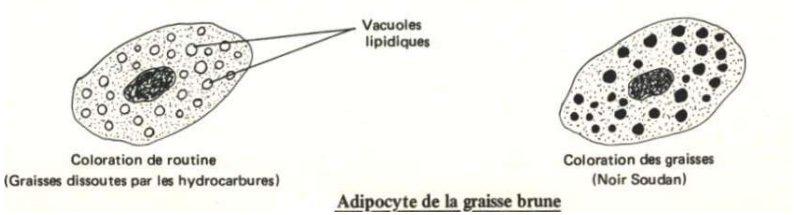
- **Brown fat adipocyte**:

this is a small cell, 20 µm in diameter.

It is filled with small fat vacuoles of various sizes, disseminated in all the cytoplasm.

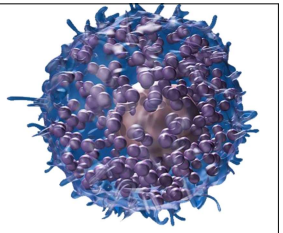
It is called a **multilocular adipocyte**.

This cell is very rich in mitochondria.



Adipocyte de la graisse brune

3- Mast cells



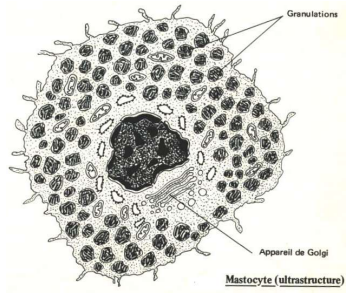
- These are mobile cells, roughly oval in shape, 20 µm in diameter, with small expansions (small villi).

The nucleus is rounded and central.

Cytoplasm characterised by the existence of numerous **secretory granules**.

The mast cell is involved, in fact, by its secretion:

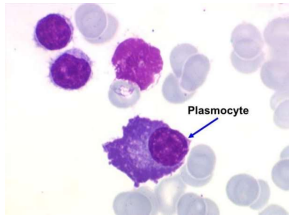
- Heparin (anticoagulant)
- Histamine (capillary vasodilator)
- Serotonin (stimulant of smooth muscle fibre contraction)



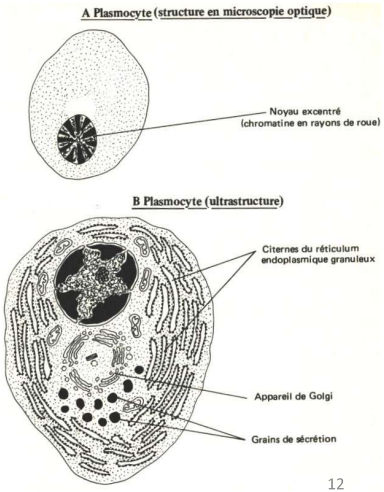
Mastocyte (ultrastructure)

These secretions play a role in immune reactions, vasoconstriction of vessels and coagulation.

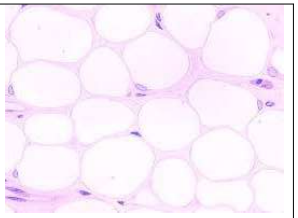
5- Plasmocytes



- Relatively rare in normal connective tissue (chorion of the respiratory and digestive mucosa).
- The plasmocyte is formed mainly in lymphoid organs where it is derived from the lymphocyte.
- It is an ovoid cell 15 µm in diameter, with an off-centre and spherical nucleus and a particularly important RER (very high basophilia).
- These cells have an intense protein synthesis activity.
- **Role**: synthesis of **antibodies** or immunoglobulins: agents of humoral immunity.



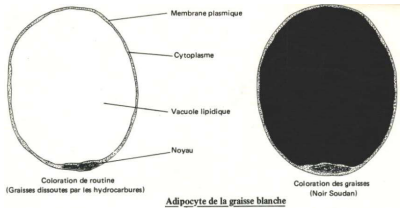
4- Adipocytes



- These are fixed elements.
- They are cells grouped together in clusters in the sense of fixing and elaborating fats.

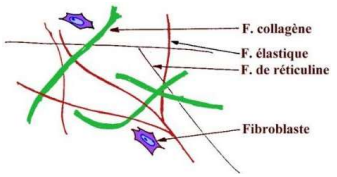
- **Two types are described:**

- **White fat adipocyte**: it is a huge cell, 100 µm in diameter, spherical or polyhedral; these cells are completely occupied by a huge vacuole and are a reservoir of triglycerides. They are called **unilocular adipocytes**.

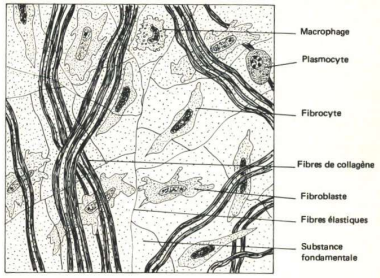


Adipocyte de la graisse blanche

1. Collagen fibers



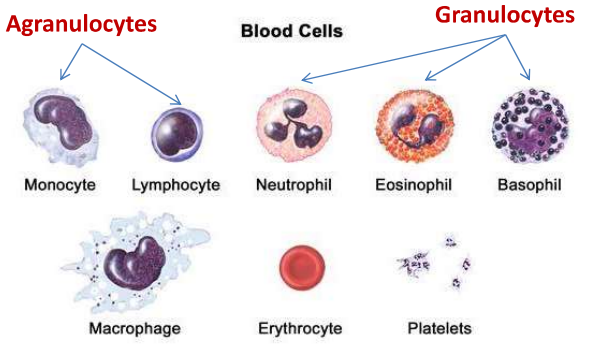
- The most *abundant* in connective tissue.
- They are *uncoloured* under the electron microscope, with a diameter varying from 1 to 10 microns.
- They are *grouped* in bundles (*faisceaux*), arranged parallel to each other, or are crossed but they never anastomose.
- They are *extensible* but *not elastic* and give the connective tissue its resistance.



Fibres can be recognised in connective tissue by their **undulating appearance**.

6- Monocytes, Lymphocytes, Granulocytes

- It is possible to find some of these elements normally in the connective tissue. We will see their morphology in relation to the study of **blood**.



- **Each fiber**,

bounded by a membrane or Henle's sheath,

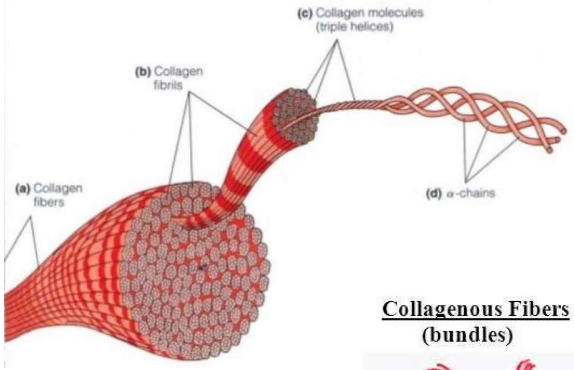
is made up of a group of **fibrils** joined together.

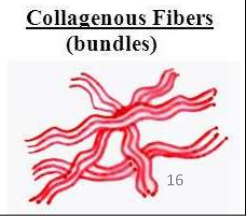
- **Each fibril** is made up of a grouping of **microfibrils** or **protofibrils**.

All the microfibrils of the same fibril also have their dark or light areas at the same level.

- Each **microfibril** is formed by the association of a number of **tropocollagen molecules**.

- The **tropocollagen molecule** is a glycoprotein. It is synthesised by the fibroblasts, which have all the necessary organelles.

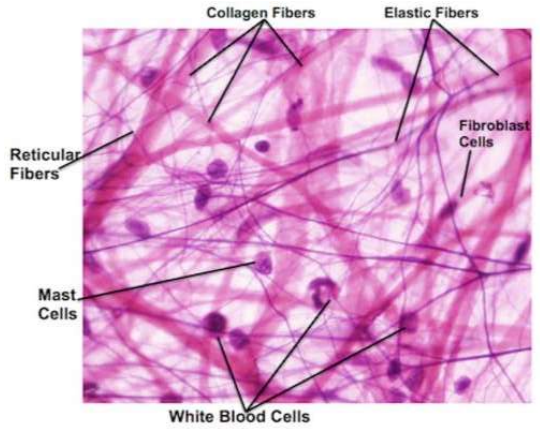




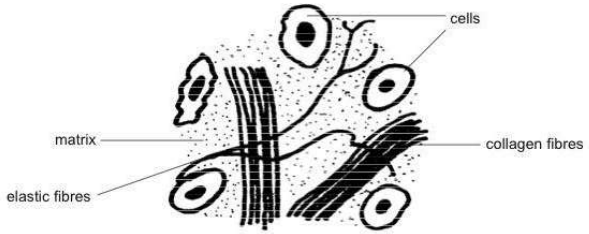
❖ B- FIBERS

There are three types of fibers:

1. Collagen fibers
2. Reticular fibers
3. Elastic fibers



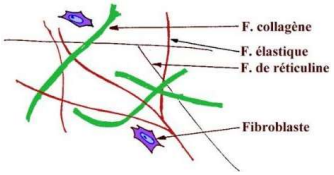
❖ C- FUNDAMENTAL SUBSTANCE



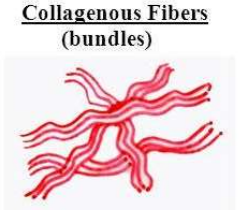
- This is a homogeneous, amorphous substance occupying the spaces between the fibers and the cells.
- It comprises permanent and non-permanent components.
- 1) PERMANENT COMPONENTS
  - ✓ proteoglycans, structural glycoproteins,
  - ✓ water
  - ✓ and mineral salts.
- 2) NON-PERMANENT COMPONENTS

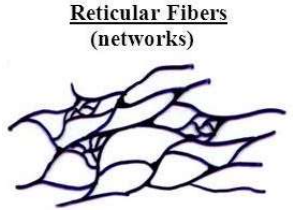
These are mainly **elementary molecular constituents**, which have diffused out of the vascular cavities and are intended to be taken up by the fibroblasts in order to synthesise the fibers and macromolecules of the fundamental substance.

2) RETICULAR FRIBERS



- They are generally fine,
- relatively irregular,
- thin collagen coated with glycoproteine
- and seem to anastomose to form more or less complex networks.
- The difference between reticular fibers and collagen fibers is simply the way in which the elementary fibrils are grouped.
- They are fibers which form an intense network of fibers.

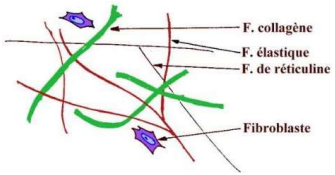




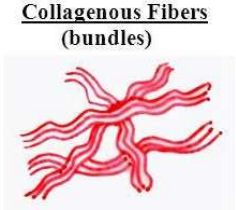
I- Types of connective tissue

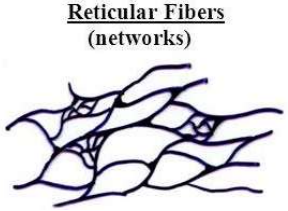
- Seven varieties of connective tissue can be defined, depending on the proportion of elementary constituents:
- - Loose connective tissue
- - Dense connective tissue
- - Adipose connective tissue
- - Reticulated connective tissue
- - Re-shaped connective tissue
- - Elastic connective tissue
- - Mucous connective tissue

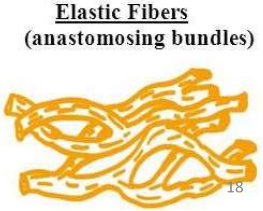
3) ELASTIC FIBRES



- They are resistant and extensible (stretchy).
- They have anastomoses and form networks.
- They are mainly made up of a protein called **elastin**.
- They are very abundant in the connective tissues of the skin, especially the face and neck.

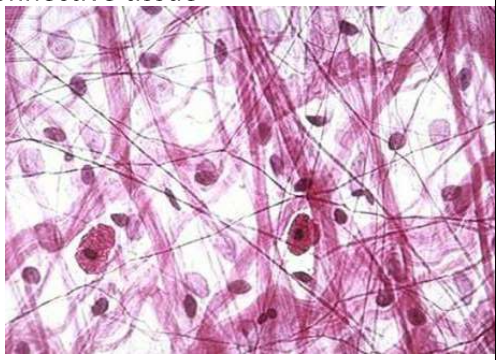






1. Loose connective tissue

Types: There are three types of loose connective tissue



1.1. Areolar connective tissue

1.2. Adipose connective tissue

1.3. Reticular connective tissue

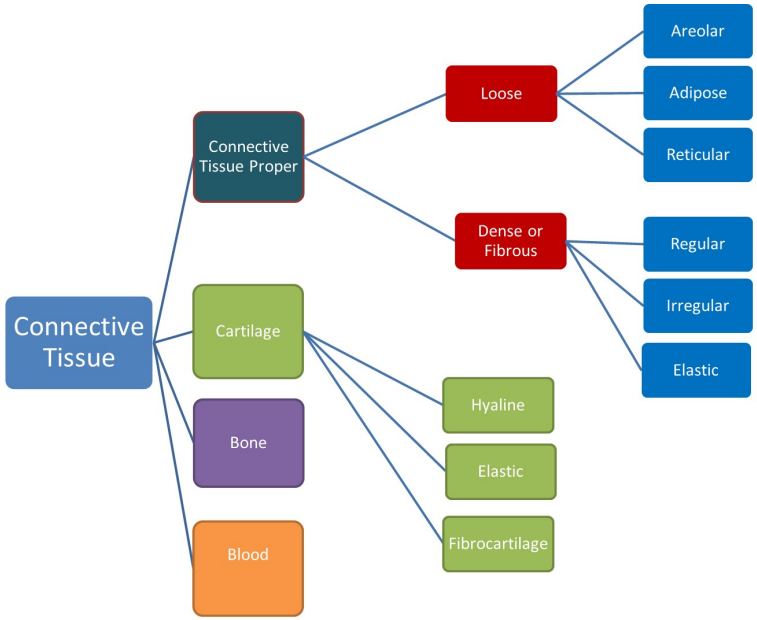
1.1. Areolar connective tissue

It is found in the skin and mucous membranes, where it binds the skin or membrane to underlying tissues such as muscles.
It is also found around blood vessels and internal organs where it links and supports them.

Il se trouve dans la peau et les muqueuses, où il lie la peau ou la membrane aux tissus sous-jacents tels que les muscles. On la trouve également autour des vaisseaux sanguins et des organes internes, qu'elle relie et soutient.

I- Types of connective tissue

Connective tissue divides into **three categories**:

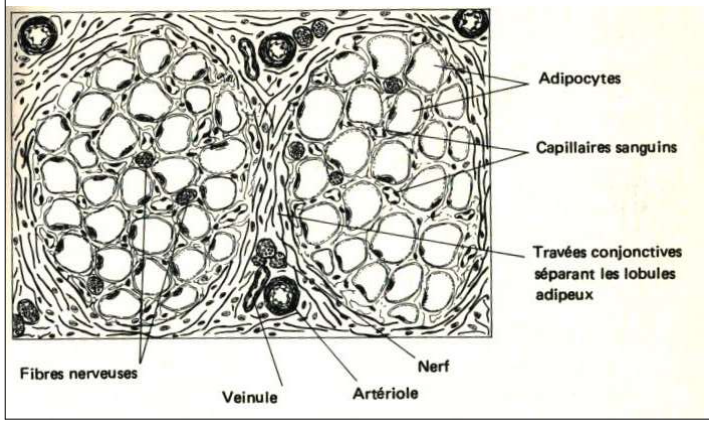


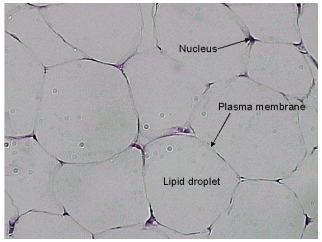
1. Loose connective tissue

1.2. Adipose connective tissue

is commonly known as fat. This tissue contains fat cells that are specialized for lipid storage. In addition to storing energy, this tissue also cushions and protects the organs.

est communément appelé graisse.
Ce tissu contient des cellules adipeuses spécialisées dans le stockage des lipides. Outre le stockage de l'énergie, ce tissu sert également de coussin et de protection aux organes.

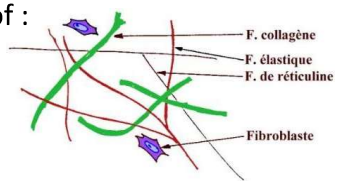




1. Loose connective tissue

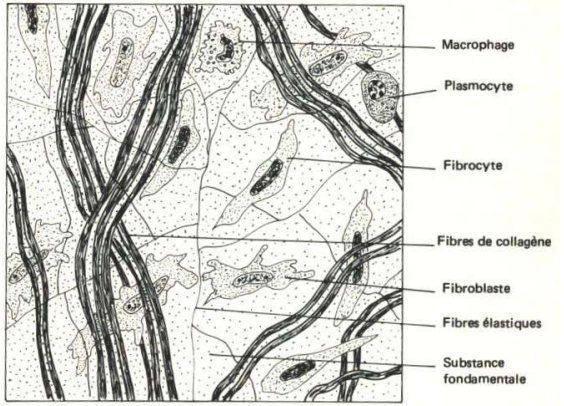
Composition: there is a harmonious distribution of :

- Cells
- fundamental substance
- fibers: collagen, elastic and reticular.



Function: It plays a role, of

- support
- and defense thanks to its macrophages,
- but especially metabolic.



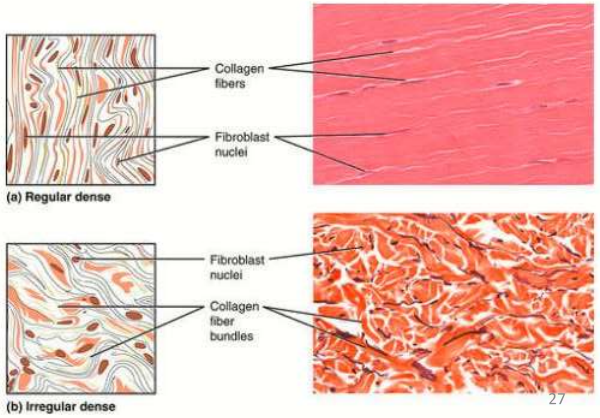
2. Dense connective tissue

Regular
Irregular
Elastic

2.2. Dense irregular connective tissue_not oriented: the fibers do not have a precise organization.

contains collagen and elastic fibers which are found running in all different directions and planes.

The dermis of the skin is composed of dense irregular connective tissue



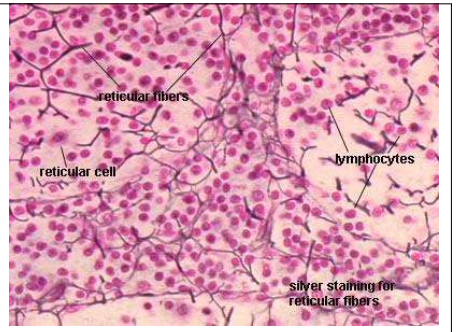
1. Loose connective tissue

Types: There are three types of loose connective tissue

1.1. Areolar connective tissue

1.2. Adipose connective tissue

1.3. Reticular connective tissue

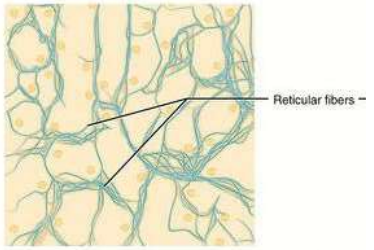


1.3. Reticular connective tissue

is mostly composed of reticular protein fibers which make a skeleton, known as stroma, for the lymphatic and white blood cells. This type of tissue is found in the spleen and other lymphatic system structures.

est principalement composé de fibres protéiques réticulaires qui forment un squelette, appelé stroma, pour les cellules lymphatiques et les globules blancs. leucocytes. Ce type de tissu se trouve dans la rate et dans d'autres structures du système lymphatique.

C'est un tissu propre aux organes hématopoïétiques (la moelle osseuse, la rate, le thymus..). Il est formé de fibres de réticulines qui dessinent un réseau et de cellules réticulaires.



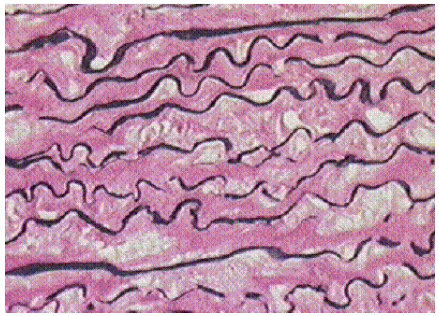
2. Dense connective tissue

Regular
Irregular
Elastic

2.3. Elastic connective tissue

It is characterized by the predominance of thick, anastomosing elastic fibers.

The vertebral yellow ligament is an example of this type of tissue.



2. Dense connective tissue

Regular
Irregular
Elastic

It is a **strong** (solid) tissue

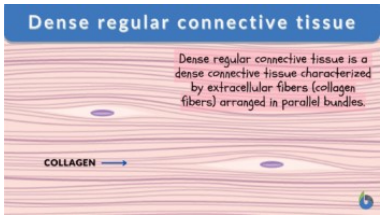
Composition: very rich in collagen fibers.

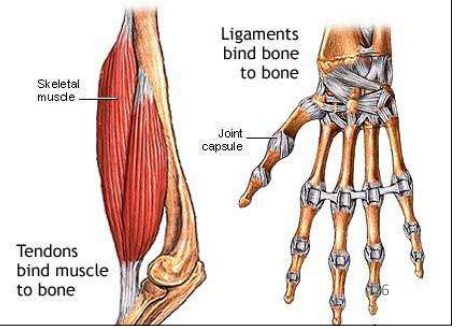
Conversely, it is poor in cells and fundamental substances

Types: there are three types:

2.1. Dense regular connective tissue_oriented: the collagen fibers are elongated with a precise organization.

- has extracellular fibers that all run in the same direction and plane.
  Exemple: Muscle tendons + Ligaments





Tissu conjonctif Muqueux
Un des rares exemples que l'on connaisse est la gelée de Wharton du cordon ombilical. Il s'agit d'un tissu caractérisé par la prédominance de la substance fondamentale.

fonction

Selon sa localisation et son sous-type, le tissu conjonctif assure 3 fonctions principales :

i) une **fonction de soutien et de cohésion**, liée à sa richesse en fibres ;

ii) une **fonction nutritive et d'échange**, liée à sa richesse en matrice extracellulaire et en vaisseaux ;

iii) une **fonction de défense**, liée à la présence de cellules immune dites de passage.