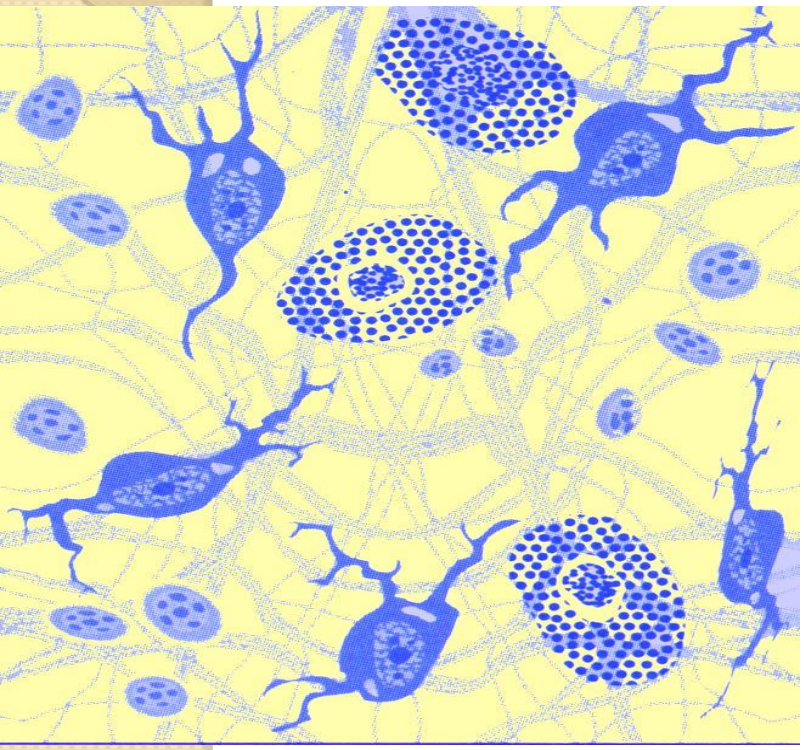
Medical Biology – Year I



Chapter 2: The Connective Tissues

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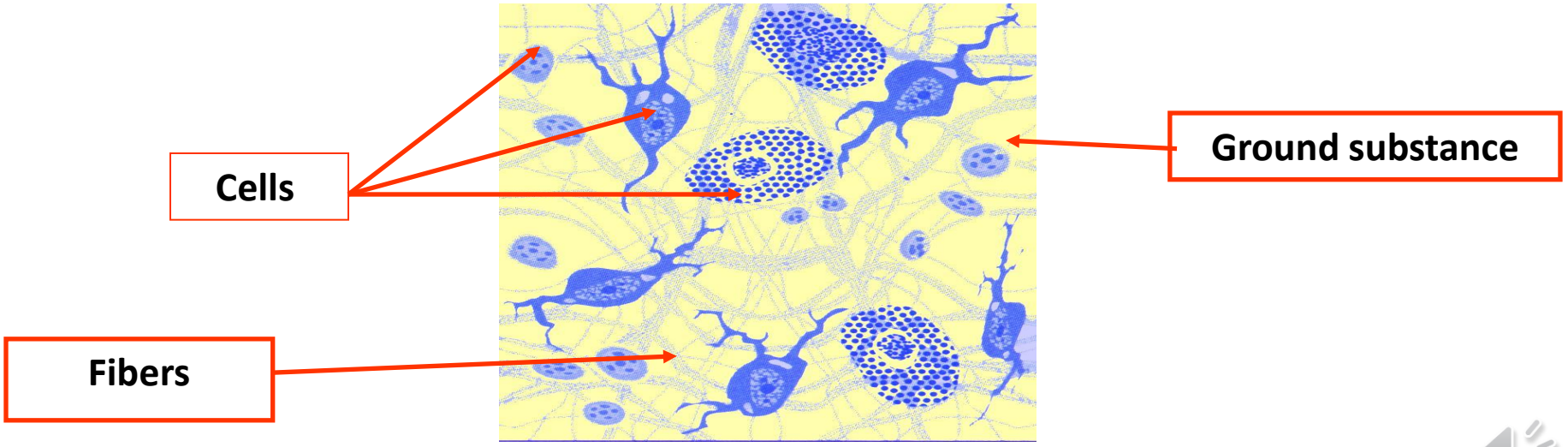
Objectives

- Identify the connective tissue.
- Identify the connective tissue types, function and location.

Connective tissue:

- **Connective tissue** is the most abundant and widely distributed tissues found in the human body.

- Connective tissue is of **mesodermal origin** and consists of a mixture of **cells, fibers, and ground substance**.
- Its **principal function** is provision of structural and metabolic support for other body tissues and organs. It also facilitates exchange of materials including nutrients and wastes between these body component parts. The connective tissue is also implicated in storage, defense, packaging, maintenance of shape of organs, regulation of body temperature and repair of damaged tissues.



Cells of the connective tissue

Connective tissues are made up of many types of specialized cells reflect the tissue function.

A. Fixed cells (intrinsic cells)

1. **Fibroblast**
2. **Mesenchymal cells**
3. **Adipocyte**

B. Free cells (extrinsic cells)

4. **Macrophage (histiocyte)**
5. **Mast cell**
6. **Plasma cells**
7. **Leucocytes**

Connective tissue fibers:

There are three types of connective tissue fibers, collagen, reticular and elastic fibers.

1- Collagen fiber

2- Elastic fiber

3- Reticular fiber

The ground substance:

- **The ground substance** is amorphous, gel like, homogenous, and transparent substance produced and secreted by the **fibroblasts**, to fill the spaces between the connective tissue cells and the connective tissue fibers.

- **The ground substance** is composed of **water, salts and adhesive organic molecules of glycosaminoglyccans, which made up of mucopolysaccharides and glycoprotein**.

- Ground substance: may be **fluid, semifluid, gelatinous, or hard**.

- **Functions** to support and bind cells, store water, and allow exchange between blood and cells

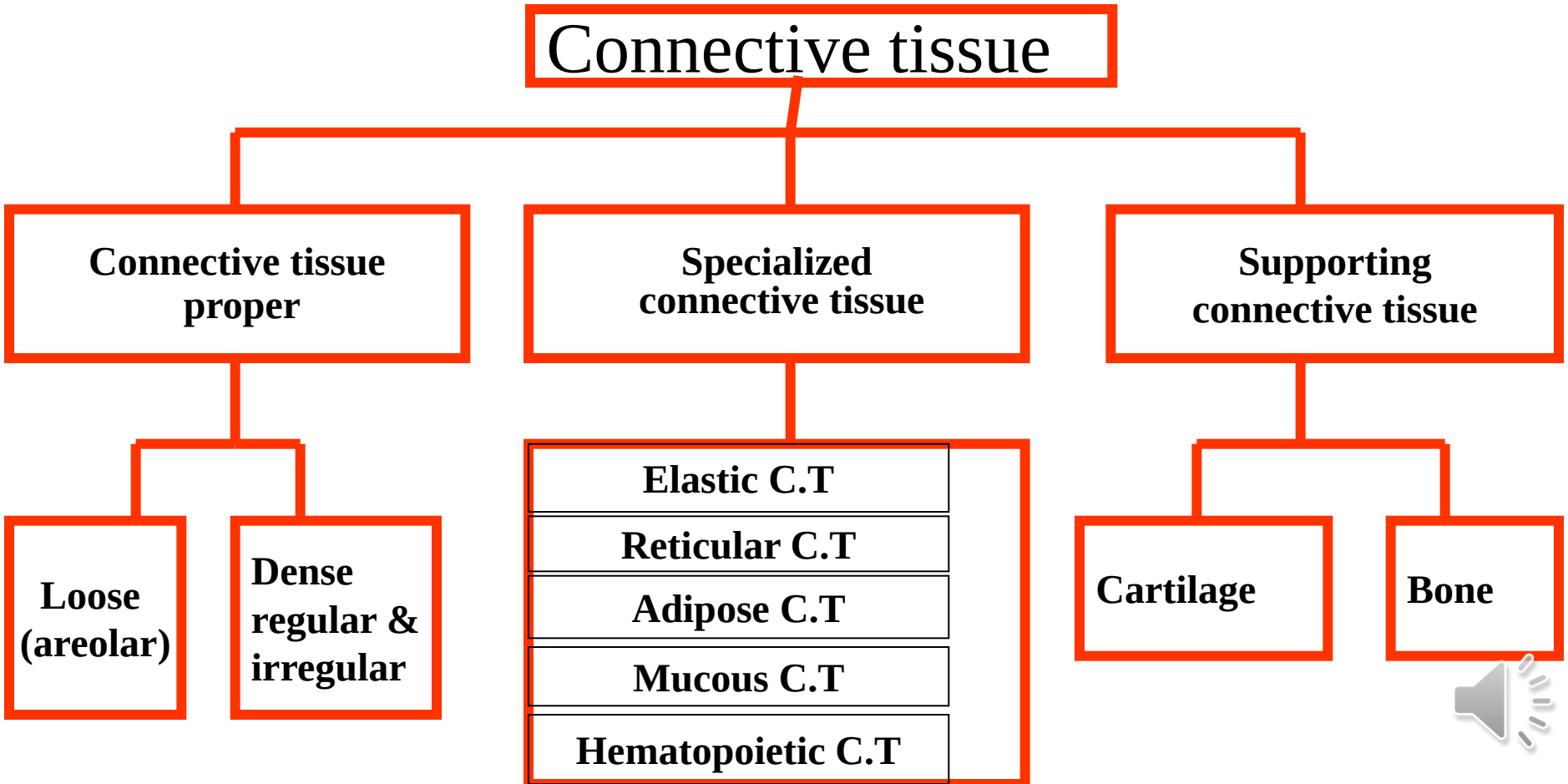
Types of connective tissue:

Classification of connective tissue depends upon:

1-Types and arrangement of the connective tissue fibers.

2-Abundance and kinds of the connective tissue cells.

3-Relative amount and type of the ground substance .

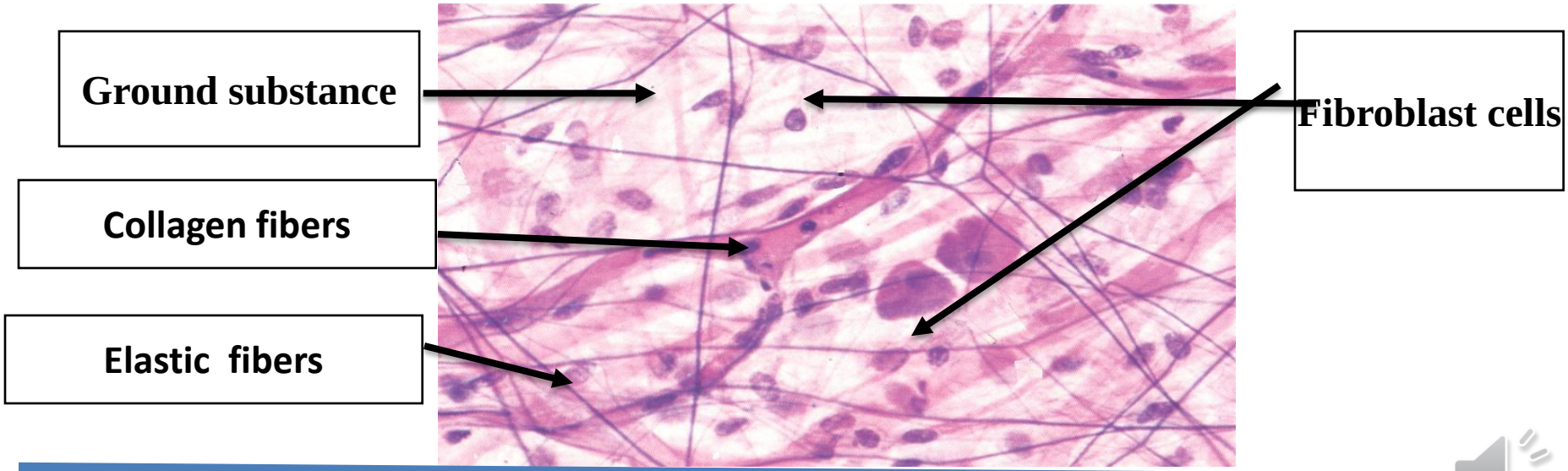


Connective tissue proper:

Depending on the amount, **type, arrangement, abundance of cells, fibers, and ground substance**, the connective tissue proper is of two types, **loose (areolar) and dense**.

1- Loose connective tissue:

- **Loose Connective Tissue**, also called **areolar connective tissue**, is characterized by **abundant ground substance**, with **numerous connective tissue** cells and **fewer fibers** (more cells and fewer fibers) compared to dense connective tissue.
- It is flexible, and not highly resistant to stress. It provides protection, suspension, and support for the tissue.

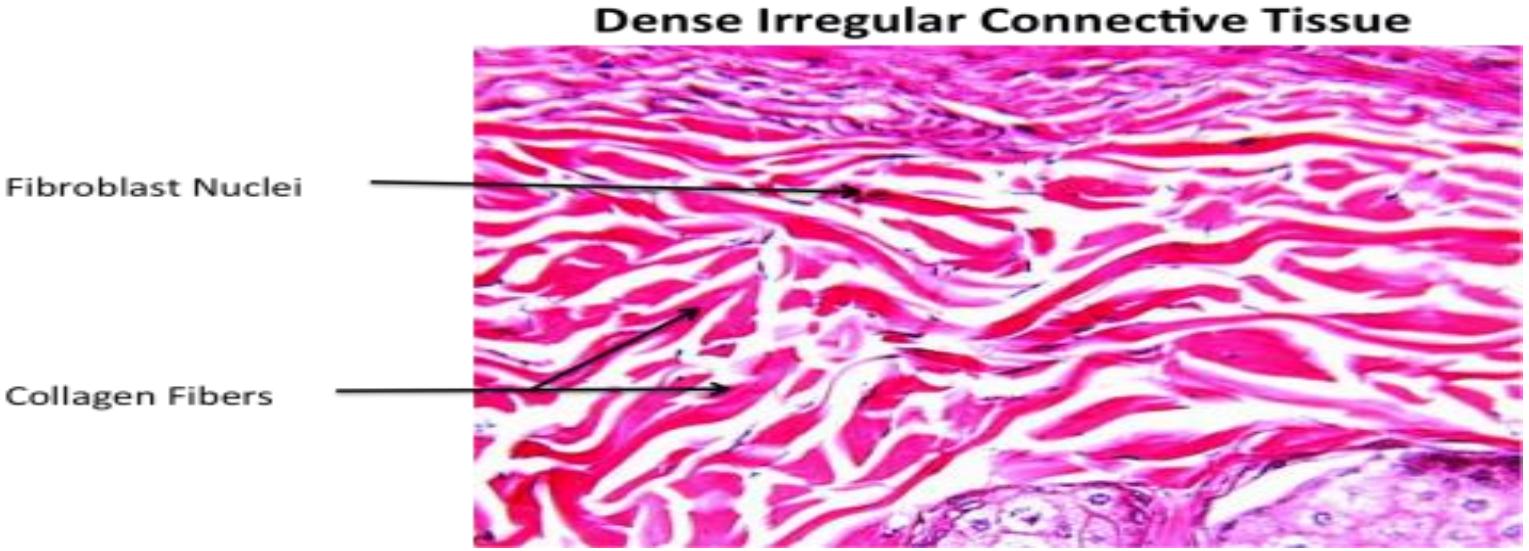


2- Dense connective tissue:

•According to arrangement of the C.T fibers, two types of dense connective tissue are recognized: dense irregular and dense regular connective tissue.

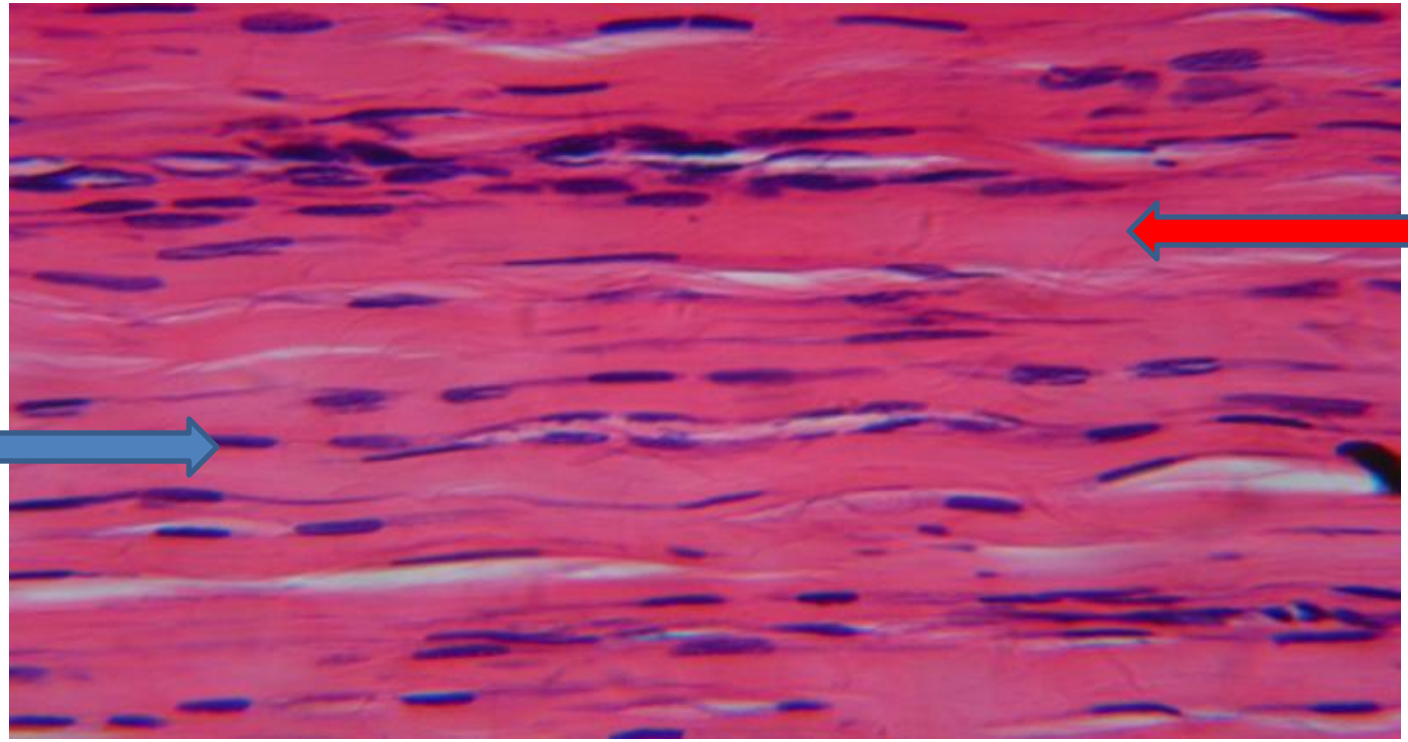
A- Dense irregular connective tissue:

- **Dense irregular connective tissue consists** of **few connective tissue cells and many connective tissue fibers** (type I collagen fibers, interlaced with a few elastic and reticular fibers).
- These fibers are arranged in bundles without a definite orientation.
- The **dermis of the skin and capsules of many organs** (testis, liver and lymph nodes) are typical examples of dense irregular connective tissue



B- Dense regular connective tissue:

- **Dense regular connective tissue** also consists of **fewer cells and more fibers, with a predominance of type I collagen fibers** like the dense irregular connective tissue.
- The fibers are arranged into a **definite linear pattern**.
- **Fibroblasts** are arranged linearly in the same orientation.
- **Tendons** and **ligaments** are the most common examples of dense regular connective tissue



Specialized connective tissue:

In this type of loose connective a modification takes place in one or more of the tissue component, cells, fibers or ground substance to form the following types of connective tissue:

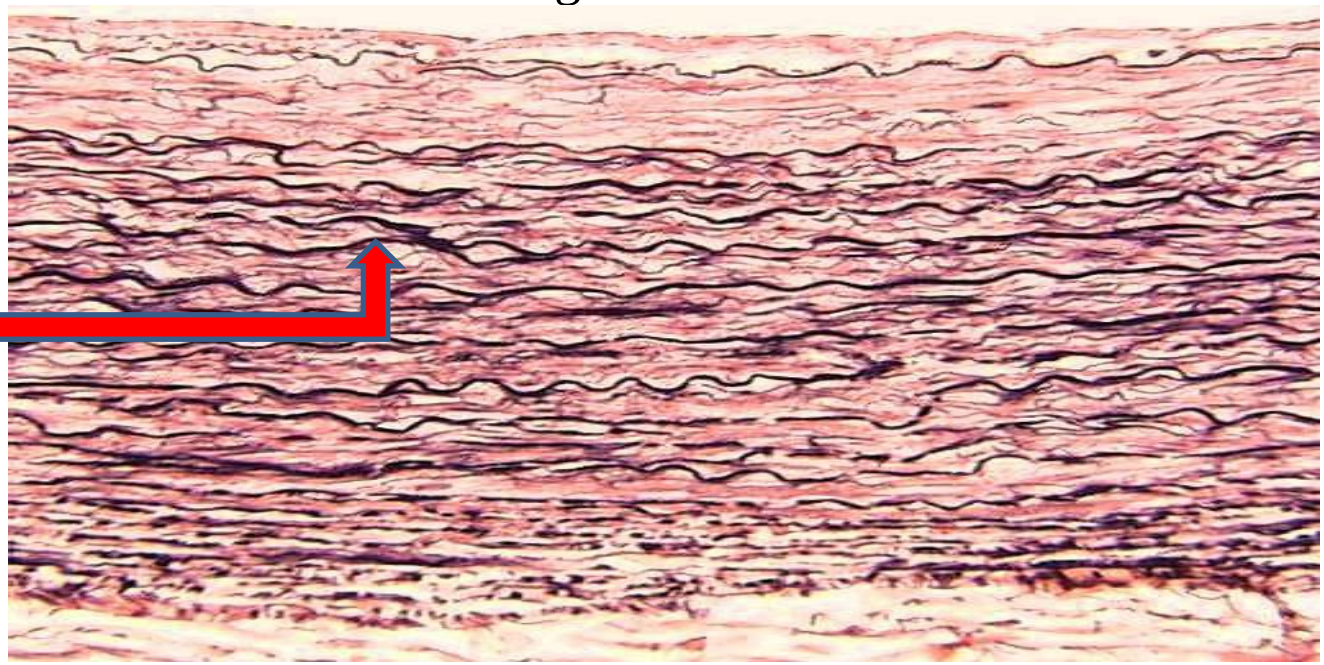
1-Elastic connective tissue

2-Reticular connective tissue

3-Adipose connective tissue

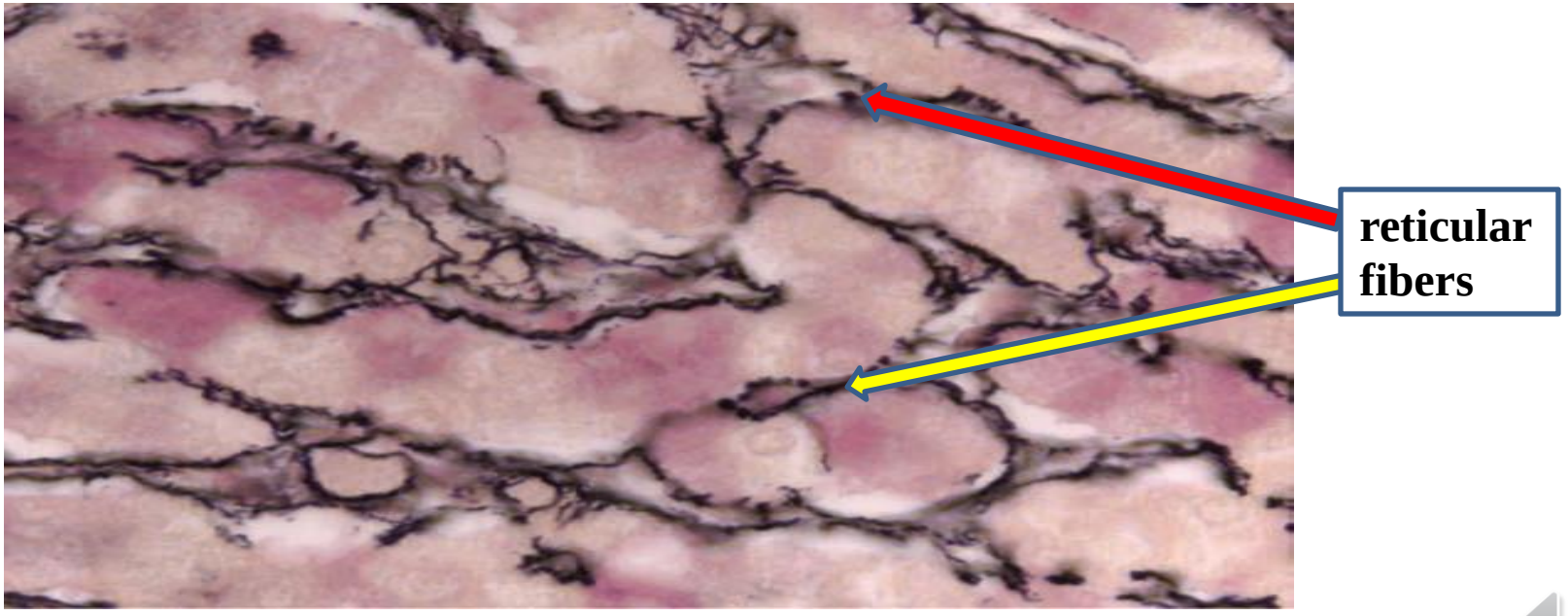
1-Elastic connective tissue

- **The elastic connective tissue** is a type of loose connective tissue consists of **elastic fibers found between supporting collagen fibers**.
- This type of C.T is found where great **elasticity is required as in aorta**, in which the elastic fibers are parallel to each other, in between them a thin layer of collagen fibers are present.
- In the **dermis of the skin,** the long thin elastic fibers are branched and scattered between the thick collagen fibers.



2-Reticular connective tissue

- **Reticular Tissue** is a specialized loose connective tissue that contains a network of **branched reticular fibers, reticulocytes (specialized fibroblasts), macrophages, and parenchymal cells, such as pancreatic cells and hepatocytes**.
- **Reticular fibers** are very fine and much smaller than collagen type 1 and elastic fibers.
- This type of connective tissue provides a framework for the internal structure of the organs in which they are found as in the liver, spleen, lymph nodes, and the bone marrow.



3-Adipose connective tissue

- **The adipose connective** tissue is a specialized loose connective tissue consists of fat storing cells called **adipocytes**, develop from the **embryonic mesenchymal cells** or modified from the **fibroblasts** by enlargement of the cell body and retraction of its cytoplasmic processes to become spherical.

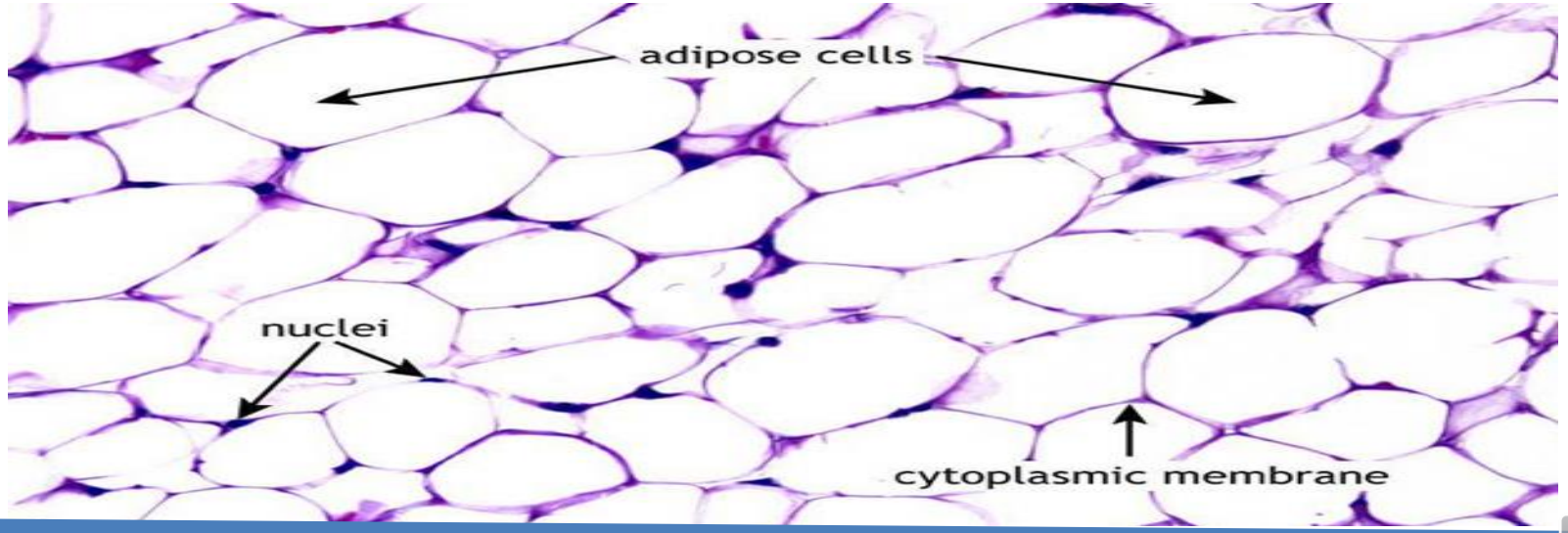
According to the colour of adipose cells (adipocytes) in a living state, the adipose tissue is classified into two types:

A- White adipose tissue

B- Brown adipose tissue

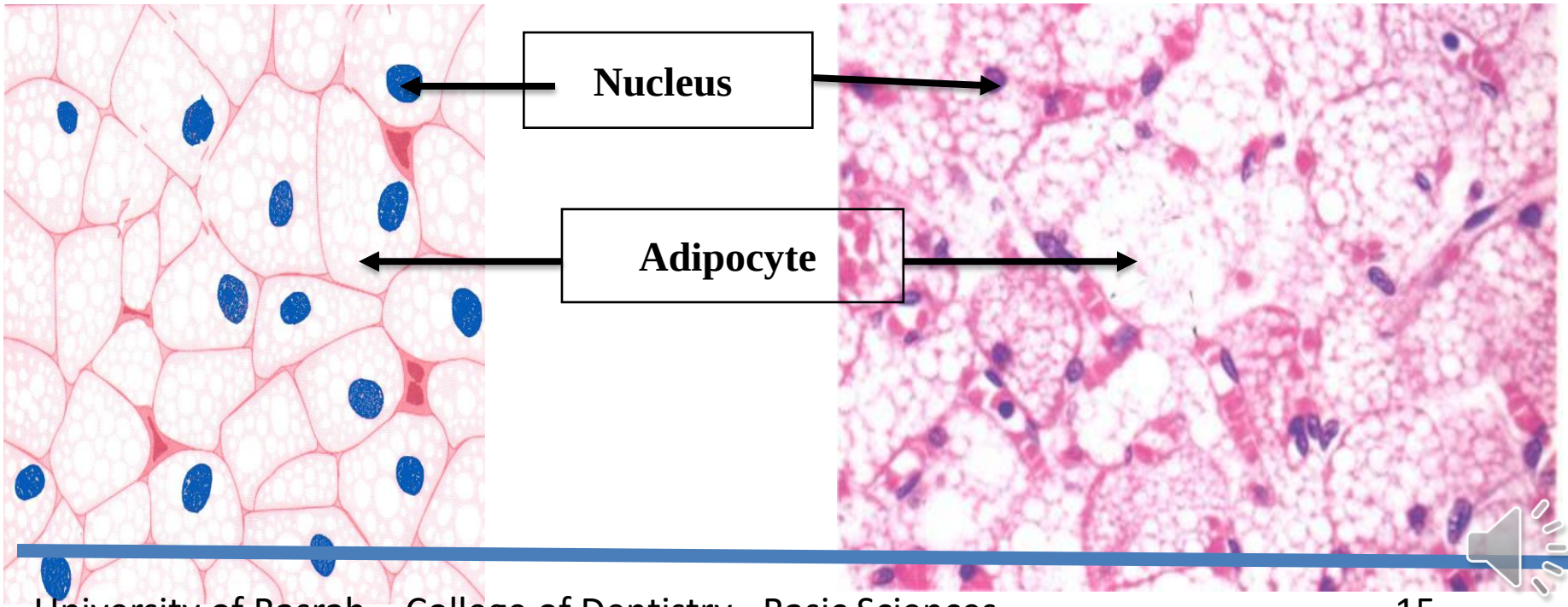
A- White Adipose Tissue

- **White adipose tissue** is composed of **unilocular adipose cells**.
- The typical appearance of cells in white adipose tissue is lipid stored in the form of a **single, large droplet in the cytoplasm of the cell**.
- **The flattened nucleus** of each adipocyte is displaced to the periphery of the cell.
- White adipose tissue is found throughout the adult human body, especially in the deeper layer of skin (hypodermis), around the kidney, in the bone marrow, hips, abdomen and breast.
- This type of connective tissue used for storage of fat material, acts as shock absorber to support the organs, and it is a good insulator against lose of heat.



B- Brown adipose tissue

- **Brown adipose tissue**, in contrast, is composed of **multilocular adipose cells**. The lipid is stored in multiple droplets in the cytoplasm.
- **Cells** have a **central nucleus** and a relatively **large amount of cytoplasm**.
- **Brown adipose** tissue is more abundant in hibernating animals and is also found in the **human embryo, in infants, and in the perirenal region in adults**.

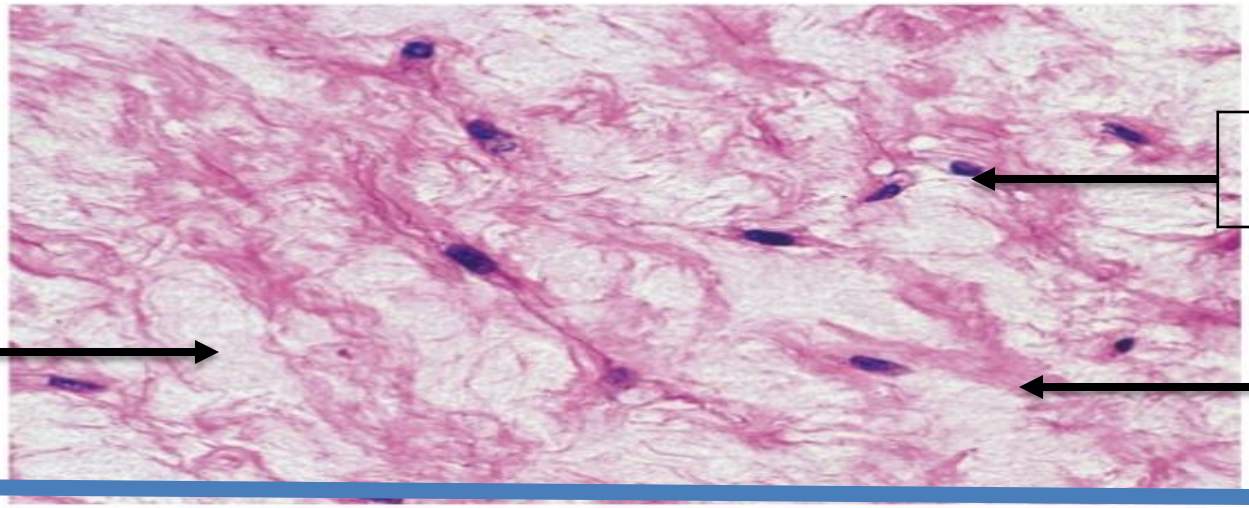


EMBRYONIC CONNECTIVE TISSUES

is a type of loose tissue formed in early embryonic development. Mesenchymal connective tissue and mucous connective tissue

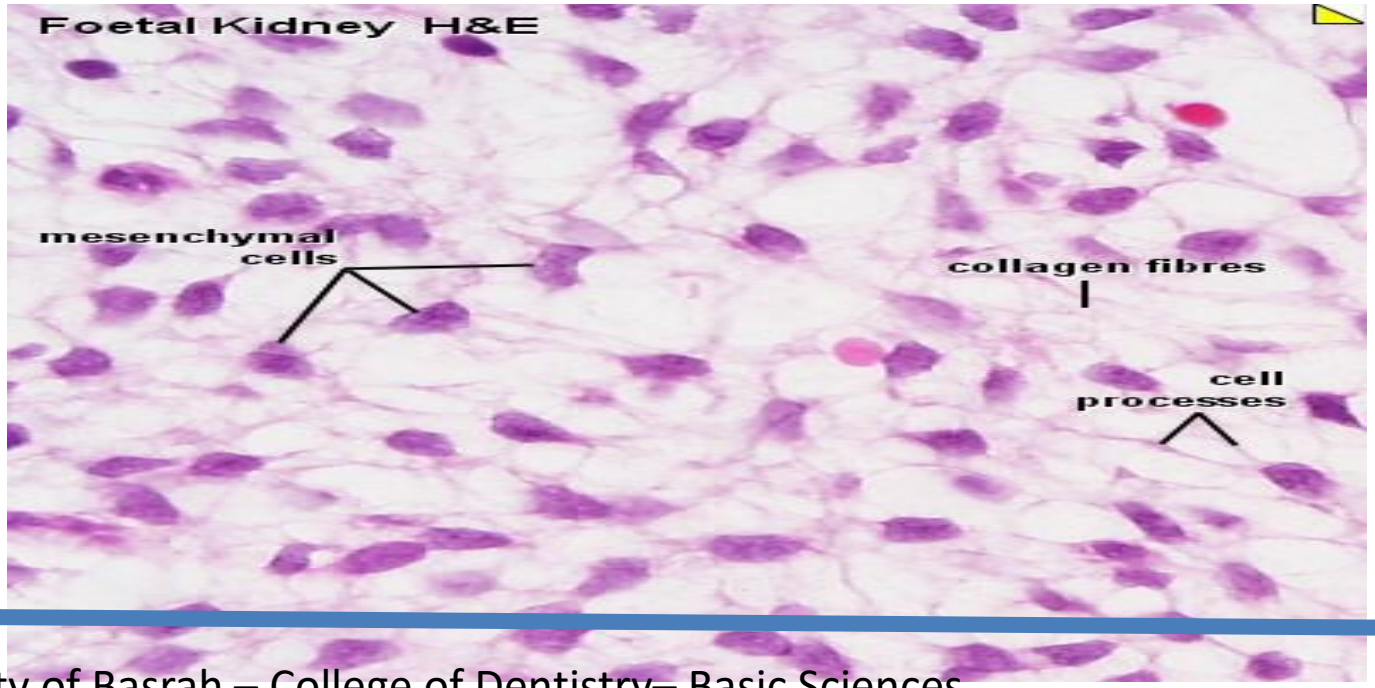
1- Mucous connective tissue:

- **Mucous connective tissue** that has an abundance of a **jellylike matrix** with **some fine aggregates of collagen fibers and stellate-shaped fibroblasts** is shown.
- It is mainly found in developing structures, such as the **umbilical cord**, subdermal connective tissue of the **fetus**, and **dental pulp of the developing teeth**.



2- Mesenchymal connective tissue:

- **Mesenchymal Connective Tissue** is found in the **embryo and fetus** and **contains considerable ground substance**.
- It contains **scattered reticular fibers** and **star-shaped mesenchymal cells** that have pale-staining cytoplasm with small processes.
- **Mesenchymal connective tissue** is capable of differentiating into different types of connective tissues



Thank you