(2) CONNECTIVE TISSUE

Connective tissue consists of

(i) Ground substance (Intercellular medium) matrix which is a mixture of carbohydrates and proteins

(ii) Connective tissue cells - The cells are (a) Fibroblast (b) produced matrix (b) Adipose cells - store fat (c) Plasma cells - Synthesize antibodies (d) Mast cells - produce histamin, heparin and Seratonin (e) Macrophages or histocytes - ingest cell debris (f) Lymphocytes - ingest cell debris (g) Mesenchyme cells - gives various types of connective tissue cells. (h) Reticular cells - phagocytic in nature (i) Chromatophore or pigment cells - impart colour to the animals.

(iii) Connective tissue fibres:- These are of 3 types:

(a) Collagenous or Collagen fibres (white fibres) - made up of Collagen protein.

(b) Elastin fibres (yellow fibres) - formed of elastin protein.

(c) Reticular fibres - they are made up of reticulin protein

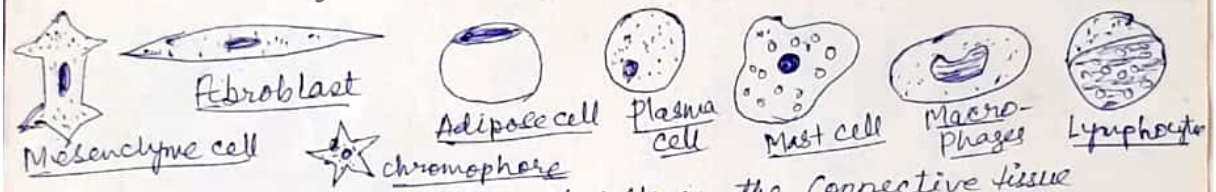


Fig: Different types of cells in the Connective tissue

All the connective tissue in the body arise from the mesoderm of embryo. Its main functions are:

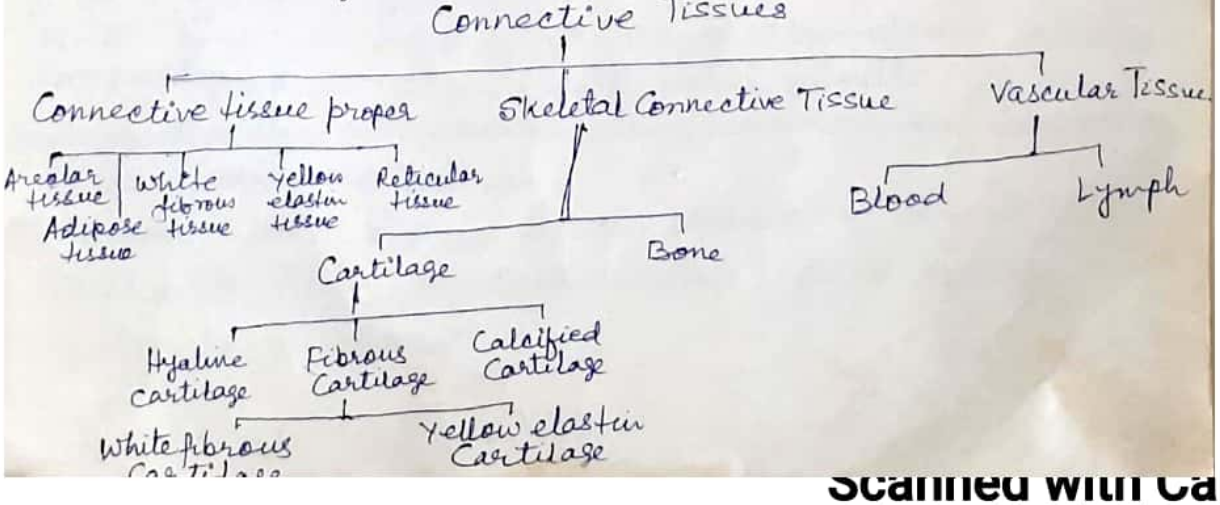
(i) To bind together cells or tissue and support the tissues and act as packing material

(ii) To form structural frame work of body, organ etc. and support the delicate organ, tissues and cells.

(iii) To defend the body by antibodies production, tissue repairs, fat storage, transmission of nutrients and other substances in body.

TYPES OF CONNECTIVE TISSUES:-

The connective tissues can be divided into following three types which are further divisible into a number of types.



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1. Areolar Tissue :-

(i) It forms a continuous sheet between skin and muscles.

(ii) It is also attached the blood vessels and nerves with surrounding tissues. This tissue also present in bone marrow.

(iii) It is loose connective tissue and it lodges air bubbles when these tissues are separated from the body hence they are called areolar tissue.

(iv) Areolar tissues consists of three types of cells —

(a) Fibroblast – flat cells with long protoplasmic projection. The cells produced two protein collagen and elastin which forms white collagen fibres and yellow elastin fibres respectively. Collagen fibres are unbranched, strong and tensile providing strength and repair. Yellow elastin fibres are branched, elastic in nature and provide elasticity to organs.

(b) Macrophages :- these cells are involved in phagocytosis of foreign bodies microbes, damaged cells.

(c) Mast cells → Large irregularly ovoid mast cells have numerous fine granules of histamine, seratonin and heparin which acts as vasodialation, vasoconstriction and anticoagulant respectively.

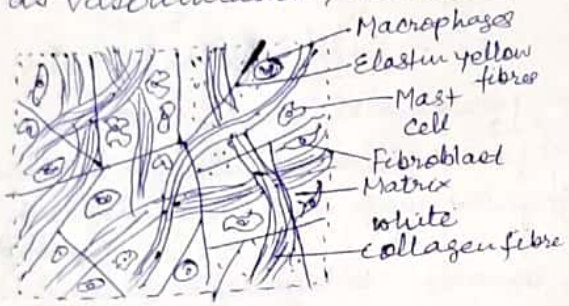


Fig: Areolar tissue

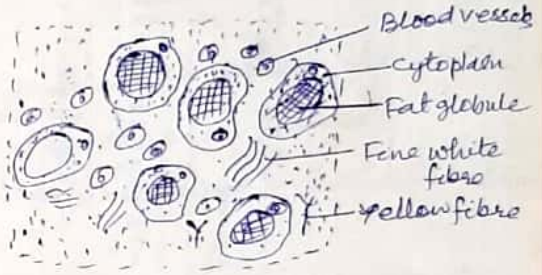


Fig Adipose tissue

2. Adipose Connective Tissue :-

(i) The adipose tissue consists of several spherical cells

(ii) Each spherical cell consists contains fat globules, due to which nucleus and cytoplasm pushed periphery.

(iii) Fibres are few in number and form a loose network for supporting the fat laden cells.

(iv) The adipose tissue are found in subcutaneous tissue, around, the heart, kidneys, eyeballs, mesentries and omenta.

3. White fibrous Tissue :-

(i) In this tissue, the white fibres are in abundance, arranged compactly and lie almost in parallel bundle.

~~(ii) The adipose tissues are found in subcutaneous tissue around the heart, kidney, eye ball, ...~~

(i) Adipose tissue is found in the blubber of whales and elephants, hump of camels, fat bodies of frog yellow bone marrow.

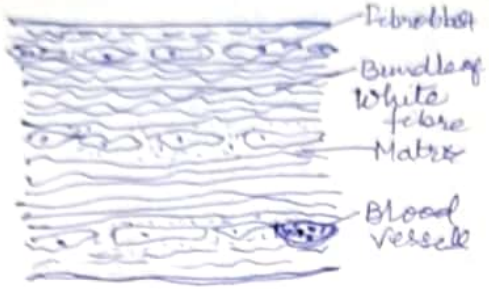
(6)

White fibrous Tissue :-

i) This tissue have white fibrous in abundance, arranged compactly and lies almost in parallel bundles.

ii) It is found in the form of cords called tendon, which connects the muscle with bones.

iii) White fibrous also forms sheets. They occur in pericardium of heart, dura mater of brain and spinal cord, capsule of kidney etc.



White fibrous tissue

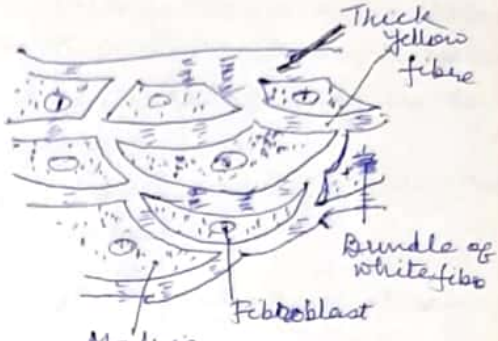


Fig: Yellow elastic tissue

4) Yellow elastic tissue :-

i) This tissue is made up of mainly of yellow fibres; The fibres are thick otherwise similar as found in areolar tissue

ii) The fibroblast and few white fibres are found in between yellow fibres

iii) This tissue has considerable strength and remarkable elasticity

iv) It is also found in cords form and are called ligaments which join bone to bone

v) It also found in sheet forms and occurs in the wall of blood vessels lungs and bronchioles.

5) Reticular tissue :-

i) It consists of star shaped reticular cells whose protoplasmic projection forms a network

ii) These cells are phagocytic in function.

iii) Reticular fibres are present on reticular cell

iv) Reticular tissue is present in spleen, lymph node, bone marrow etc.

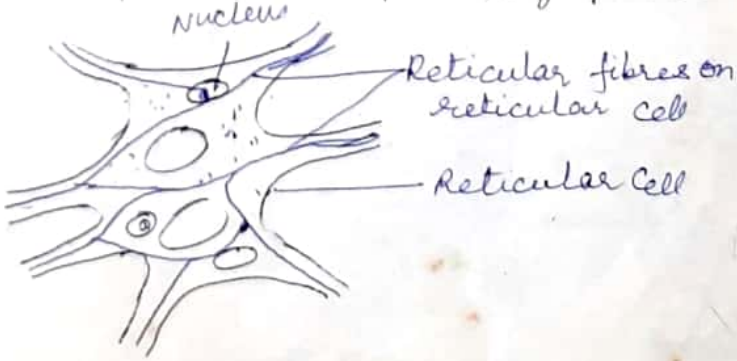


Fig: Reticular tissue

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SKELTAL TISSUES:-

These connective tissues forms the endoskeleton of vertebrates. These support the body, protect the various organs and help in locomotion. It includes cartilage and bone.

1) CARTILAGE :-

i) It is present in the several parts of vertebrate body and found more abundantly in their embryos. Since most of the bones forming skeleton of adults are cartilagenous in early stage

ii) Cartilage consists of chondriocytes (cells) and the matrix called chondrin.

iii) The chondriocytes or cells of cartilage and are enclosed in lacunae a fluid filled space.

iv) There may be one or more chondriocytes in lacunae

v) The chondriocytes are 'D' shaped.

vi) A section of cartilage show a layer of white fibrous connective tissue towards the periphery called as perichondrium. It is with blood vessels and have fibrocytes.

vii) The growth of cartilage is always from periphery (unidirectional)

The cartilage is of following types :-

a) **Hyaline Cartilage :-**

i) It contains clear, large amount of translucent, slightly elastic matrix with very less fibre.

ii) It is present in embryonic skeleton, articulating surface of bones, in between ribs and sternum, larynx, tracheal rings etc.

b) **Fibrous Cartilage :** It has well developed fibres in matrix, and is of two types

i) **White fibrous cartilage** → Matrix is fine and abundant with white collagen fibres. It occurs in intervertebral disc.

ii) **Elastic Cartilage :-** It contain yellow elastic fibres in the matrix, so cartilage become more flexible this type of cartilage found in Pinna, external auditory meatus of ear, Eustachian tube, epiglottis, tip of the nose etc.

c) **Calcified Cartilage :-** The matrix contain Calcium cartilage in their matrix, so cartilage become hard and inelastic.

Ex. Supra scapula of pectoral girdles, Vertebrae of Shark.

Hyaline Cartilage Fig Fibrous Cartilage Fig Yellow Elastic Cartilage

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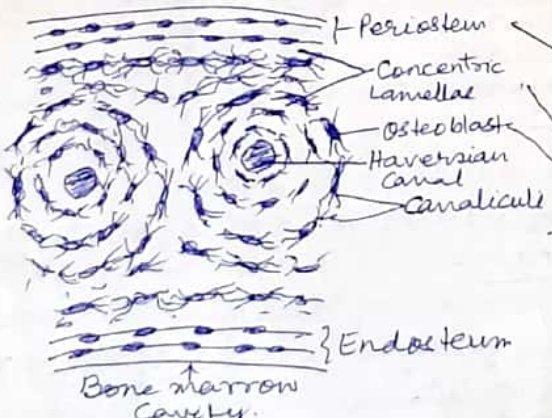
BONE :- i) It is very rigid tissue and support various organs
ii) The matrix is tough and made up of protein called ossein
iii) It has heavy deposite of calcium and phosphatous salts.
Inorganic materials form 70% and organic substance 30% of matrix.
The inorganic salts includes calcium phosphate, calcium carbonate, Calcium fluoride, magnesium phosphate etc.

A marrow bone (mammalian) consists of :-

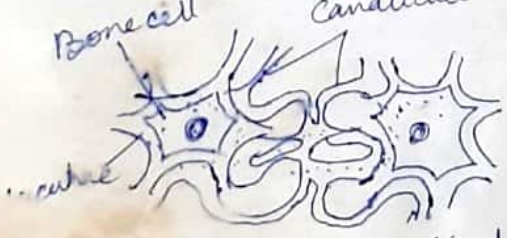
(a) Periosteum :- It is a thick and tough sheath that forms an envelop around the bone. It consists of two distinct layers, outer layer of fibrous connective tissue and a layer of osteoblast.

(b) Matrix → i) It is made up of a protein called ossein.
ii) The matrix forms thin plates called lamellae. In the lamellae minute bone cells the osteocytes are present.
iii) An osteocytes is surrounded by a space called lacunae. The lacunae leads into fine channels, the canaliculi containing protoplasmic processes of the osteocytes with the help of canaliculi, one osteocytes is in contact with another osteocytes.
iv) A central canal called Haversian canal are found around lamellae and osteocytes. Haversian canal is absent in frog.
v) A haversian canal and its lamellae and osteocytes form a Haversian System.
vi) The haversian canals are interconnected by transverse channels termed the Volkmann's Canal.
vii) Harversian system is absent in spongy bone of mammals.

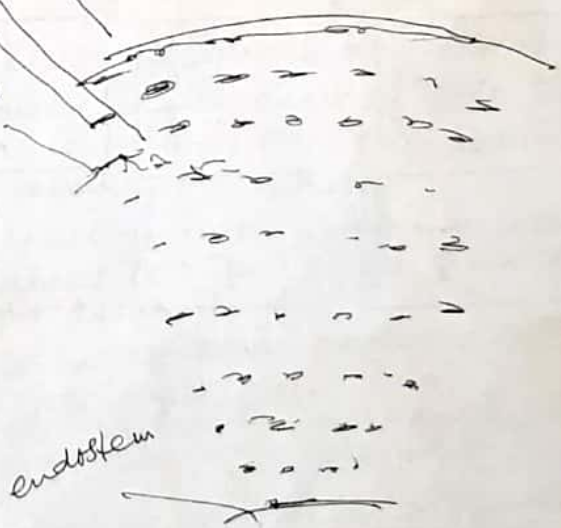
(c) Endosteum :- i) It is present outer to the bone marrow cavity. Like the periosteum it comprises two distinct layer of fibrous connective tissue and a layer of osteoblasts which produce new bone materials. The growth of bone is bidirectional.



T.S. of mammalian bone



...cytes and canaliculi enlarged.



T.S. bone of frog.