

Q. 21. What is Bone Marrow ? What are the varieties and method of examination of Bone Marrow ? Describe the functions of Bone Marrow.

Bone-marrow is the cellulo-vascular tissue of pulpy consistency which is found not only in the cylindrical marrow cavities of long bones but also in the spaces of spongy substance of all bones even in the larger Haversian canals.

Varieties : The bone-marrow differs in compositions in different bones and different ages and occur in two forms :

(a) Red Bone-marrow (Medula Ossium Rubra) : It consists of a small amount of connective tissue, blood vessels, well supplied with vaso-constrictor nerves and numerous cells, a few of which are flat cells but the great majority are spherical, nucleated cells turned into Marrow Cells or Myelocytes. No lymph vessels have ever been demonstrated in the yellow or red bone marrow. Red bone-marrow is the chief seat of haemopoiesis after birth.

(b) Yellow Bone-marrow (Medula Ossium Flava) : It consists of a basis of connective tissue, supporting numerous blood vessels and cells, most of which are flat cells although some are marrow cells which are predominate in red bone-marrow. It is found in the medullary cavity of long bones.

The red bone marrow consists of a network of reticular tissue in the meshes of which there are numerous cells of different types and blood vessels which ramify and anastomose with each other. The following are the different types of cells found in red bone marrow :

I. Cells of Erythroid Series :

(1) *Red blood cells* : Non-nucleated, red stained and smaller than circulating red blood cell. They are very fragile.

(2) *Normoblasts* : 7 to 10 microns in diameter, cytoplasm is reddish and the nucleus is pyknotic.

(3) *Erythroblasts* : They are nucleated 10 to 15 microns in diameter and cells show active mitosis. The cytoplasm shows a mixture of dual stains giving polychromatophil appearance.

(4) *Megaloblasts or Pro-erythroblasts* : They are 15 to 20 microns in diameter having large nucleus with deep violet cytoplasm.

II. Cells of the Myeloid Series :

(1) *Myeloblast Cells* : They are in large numbers, stained bluish. They are 12 to 18 microns in diameter. These are nucleated and amoeboid. They differ from mature cells in having round or oval nuclei with little or no indentation. These cells are classified according to the reaction of granules in the cytoplasm with Leishman's stain. The myelocytes are : (i) Neutrophilic myelocytes, taking bluish stain. (ii) Eosinophilic myelocytes, taking acid stain. (iii) Basophilic myelocytes, taking basic stains.

(3) *Granulocytes* : These are Neutrophil, Basophil and Eosinophil.

(4) *Agranulocytes* : These are monocytes and very few lymphocytes.

III. Megakaryocytes or Giant Cells or Osteoclasts : These are big amoeboid cells, 38 to 40 microns in diameter containing an irregular ring of lobed nuclei with a number of nucleoli.

IV. Reticulum cells and Fibres : They form syncytium and the fibres can reduce silver nitrate solution. Hence they are called argyrophil fibres.

V. Few Fat Cells : The fat cells appear as empty spaces.

Functions of Bone Marrow : The bone marrow serves a number of functions which are :

(1) **Haemopoietic functions** : The red bone marrow helps in the development and formation of red blood corpuscle and white blood cells. It also helps in the formation of blood platelets from megakaryocytes.

(2) **Destruction of Red blood cell or Erythroclasia** : The imperfect, abnormal damaged and aged red blood cells are destroyed by the process of phagocytosis with the help of macrophages of the bone marrow. The iron portion is stored as haemosiderin and ferritin in the liver, spleen, R. E. cells

and bone marrow and the rest of haem is ultimately converted into bile pigments.

(3) Storage Functions : Bone marrow is an important place for storage of iron in the form of ferritin and of haemosiderin coming from food sources as transferrin. The stored irons are easily utilised for the synthesis of haemoglobin.

(4) Reticulo-endothelial function : The bone marrow is rich in R. E. cells and serves all the important functions of the R.E. system.

(5) Osteogenic function : The cellular elements that take part in the formation of bone which are osteoclast, osteoblast, osteocyte, endosteum blood vessels, etc. are formed in the bone marrow.