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**Department: AHS MLT 2ND SEMESTER**

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**Q1:** Discus developmental stages of erythropoiesis.

**Erythropoiesis:**

Erythropoiesis is Greek word which is derived from two words “erythro” means “red” and “poieses” means “to make”. So erythropoiesis is process of maturation of red blood cells. Maturation or development of red blood cells from hematopoietic stem cell to mature red blood cell is called as erythropoiesis.

Erythropoiesis is divide in some following developmental stages.

* PHSC (Pluripotent hemopoietic stem cell).
* BFU-E (Burst forming unit erythrocyte).
* CFU-E (Colony forming unit erythrocyte).
* Pronormoblast.
* Basophilic (early) normoblast.
* Polychromatic (intermediate) normoblast.
* Orthochromatic (late) normoblast.
* Reticulocyte.
* Erythrocyte.

1. **Pronormoblast:**

Pronormoblast is the earliest stage of the development of normoblast. In history it is very difficult to distinguish it from the other cells such as lymphoblast, myeloblast, monoblast, and Megakaryoblast in H and E stain the cytoplasm become blue which indicate that it is basophilic. It diameter size is 15---20µ.

1. **Basophilic normoblast:**

The basophilic normoblast is slightly smaller in size then Pronormoblast. In this stage nucleoli will have completely close it is the major feature that distinguish a basophilic normoblast from Pronormoblast. It can be mostly observed in bone marrow with increase erythroeid production. Basophilic normoblast is smaller than pronormoblast which is more condensed chromatin and lower nuclear cytoplasmic ratio. The cytoplasm is deep blue and perinuclear and halo may present. Microscopic feature 2—3x larger than a mature RBC. Higher nuclear to cytoplasmic ratio, nucleoli are not prominent. Round nucleus and having immature promatin in normal marrow they comprise 2---3% of the total nucleated cell.

1. **Polychromatic normblast:**

A nucleated immature erythrocyte in which nucleus occupy a smaller part of the cell as compaier to the basophilic normoblast at the beginning the cell acquire haemoglobin and thus no longer purely basophilic, which take it acidophilic aspect and progressively more mark as the cell mature the chromatin which is present in the nucleus is deeply arrange in staining clumps. The polychromatic normoblast is slate blue or gray while the basophilic still maintain the mid night blue view.

1. **Orthochromatic normoblast:**

Before nucleus lows the orthochromatic normoblast is the final stage of the nuclide immature erythrocyte. The nucleus is small in size and at the beginning may still have coarse, clumped chromatin but ultimately it becomes pyknotic and appear as a deeply staining blue, black and homogenous structure less mass in orthochromatic normoblast the nucleus is oftenly eccentric and sometime lobulated or like a low. The colour almost identical to the RBCs.

1. **Reticulocyte:**

Reticulocyte is the immature red blood cells. Before the circulation in to the blood stream the reticulocyte develop and mature in the bone marrow. Cell nucleus are not present in reticulocyte like that of mature red blood cells. Reticulocyte appear slightly blue in colour as compare. Reticulocyte normal range 0.5---1.5%.

1. **Red blood cells:**

Red blood cell is biconcave disk like in shape and also flexible, their life is 120 days and have haemoglobin which take place in respiration.

**Q2:** Enlist common causes of poor blood filam(blood smear).

**Causes of poor blood film:**

* Drop of blood too large or too small.
* Spreader slide pushed across the slide in jerky manner.
* Failure in keep the entire edge of the spreader slide against the slide while making the smear.
* Failure in keep the spreader slide at a (30 degree) angel with the slide.
* Failure to push the spreader slide completely across the slide.
* Irregular spread with ridges and long tail: edges of spreader dirty or chipped; dusty slide.
* Hole in film – slide contaminated with far or grease air bubbles.
* Cellular degenerative changes: delay in fixing inadequate fixing time or methanol contaminated with water.

**Q3:** Briefly explain Granulopoiesis in detail.

***Granulupoiesis:-***

Granulupoiesis is a part of heamatopoiesis, that leads to the production of granulocytes. Also referred to as polymorphonuclear lymphocytes.is a type of white blood cell that has multi lobed nuclei , usually containing three lobes and has a significant amount of cytoplasmic granules within the cell.

***Formation of Neutrophils:-***

1. ***Myeloblast:-***

* An early precursor cell, diameter 15-20um, lower nuclear cytoplasmic ratio, no cytoplasmic granules.
* Large cell with a large nuclear and which demonstrates basophilic staining. This stages exists for all granulocytes.

1. ***Promyelocytes:-***

* Is the next stage of maturation, similar in size and appearance to myeloblast.
* During this stage primary (azurophilic) granules are formed. This stage exist for all granulocytes.
* Has numerous azurophillic primary granules in cytoplasm, that contain variety of enzymes.

1. ***Myelocyte:-***

* Secondary granules become apparent.
* Increased size and smaller primary granules.
* Secondary granules have several bactericidal enzymes.
* Nucleus become indented.

1. ***Metamyelcytes:-***

* Next stage in myelopoiesis is a cell having more indented and smaller nucleus and having more granules.

1. ***Band form:-***

* It is also known as band neutrophil and stab cell. It has crow but not lobular crow. An increase in band neutrophils indicate that bone marrow has signled to release more white blood cell and increase production of white blood cell which is known as left shift it is due to infection or inflammation in the body. Neutrophilic band cell by range, in adult it is 3---5% of white blood cell.

1. **Granulocyte:-**

* it is also known as polymarphonuclear leukocyte because of different shapes of nucleus which is usually low in to three segments this loop segment shape distinguish them from the mononuclear A granulocyte. Granulocyte are the category of white blood cell in the innate immune system and presence of granules and their cytoplasm. Through the process of granulopoiesis in the bone marrow the granulocytes are produced. There are four tyes of granulocytes basophils, esonophils, neutrophis and mast cell.

**Q:4** What Is iron deficiency Anemia? Also discuss its causes.

**Iron deficiency Anemia:**

Anemia is a condition in which a person lake enough healthy red blood cells to carry adequate to rest of the body tissue person having anemia can feel tired and weak. There are different type of anemia each of that having its own cause anemia can be temporary or long term and can be mild to severe it can be a warning sign of seriace illness. There are different treatment of anemia such that taking sepliment or undergoing some other medical procedure it can be prevent by eating healthy varied diet.

**Symptoms:**

There are different symptom of anemia which is depending on the cause if the anemia is cause by a chronic disease it might be dedoted by test these are some major symptom of anemia

1. fatigue
2. weakness
3. pale or yellow skin
4. shortness of breath
5. irregular heart beats
6. chest pain
7. dizziness
8. cold hands and feet
9. headache

**Types of anemia:**

Iron deficiency anemia

Vitamin deficiency anemia

Anemia of inflammation

A plastic anemia

Anemia is accociated with bone marrow disease

Hemolatic anemia

Sikle cell anemia

**Iron deficiency anemia:**

it is a common type of anemia in which blood lakes adequate healthy red blood cell, red blood carry oxygen to the body tissue as the name indicate that it is due to insuffient iron due to iron deficiency body cannot produce haemoglobin which carry oxygen and travel it to the body tissue as a result of this a patient feel tired and short of breath

it can be cure by iron supplementation

**Causes:**

Causes of iron deficiency anemia are

1. blood loss
2. A lake of iron in diet
3. Inability to absorb iron
4. Pregnancy

**Prevention:**

It can be reduce by certain use of food such as

1. Iron rich foods
2. Food containing vitamin c which enhance iron absorption.

**Q5:** Classify anemia on the basis of morphology with examples.

**Anemia:**

 Results when there is a deficiency of red blood cells or a decreased amount of hemoglobin. This diminishes the blood's ability to carry oxygen and leads to symptoms like fatigue, lightheadedness, and shortness of breath.

Morphological Classification

Anemia is classified in two ways, either morphological classification or pathophysiological classification. The morphological classification is based on the size or volume of the red blood cell and may also be classified by the hemoglobin content of the red blood cell. A red blood cell of a normal size or volume is said to be *normocytic*.

With our earlier terminology lesson this term becomes easy to recall. With this understanding it is easy to see that if the cell volume is decreased, then we will have an abnormally small cell, or it is said to be *microcytic*, and if the volume is increased, we will have an abnormally large cell, and we can use the term *macrocytic*.

A morphological classification of anemia can also be *normochromic*, which we know from our terminology lesson means red blood cells with normal hemoglobin content. Or they could be *hypochromic*, meaning low hemoglobin content, or *hyperchromic*, meaning high hemoglobin content.

At this point you might be wondering why we would go to so much trouble to try and classify anemias. The reason is because categorizing an anemia is useful in determining what is going on in the body and, therefore, defining the underlying condition. For example, if tests reveal small red blood cells (*microcytic*) and low hemoglobin content (*hypochromic*), then the physician would have a good indication that this patient might be dealing with iron-deficiency anemia and could prescribe an appropriate treatment plan. It might help you to recall this fact by remembering that iron helps make blood cells, so if iron is deficient, then the cell volume and hemoglobin will be deficient, giving us microcytic, hypochromic cells.