Name : Muhammad kamran
I.D : 16215
Section: (A)
Paper : (Hematology)
Department : (MLT)
Sir : Adnan Ahemd

Q,No (1) : Discus developmental stages of erythropoiesis ?
(Ans) : stages of development :-

Multipotential hematopoietic stem cell
Common myeloid progenitor
Proerythrobiast (pronormoblast)
Basophilic erythroblast
Polychromatic erythroblast
Orthochromatic erythroblast (normoblast)
Polychromatic erythroblast (Reticulocyte)
Erythrocyte

(1): Proerythroblast :- The first erythrocyte precursor produce directly from the CFU - GEMM under the influence of erythropoietin . It has a large nucleus with free ribosomes in the cytoplasm giving the cytoplasm a basophilic appearance . Alternative nomenclature. Pronormoblast or Rubriblast

(2): Basophilic erythroblast :-
Smaller than the proerythroblast with a smaller nucleus buta a more basophilic cytoplasm due to increased numbers of ribosomes in the cytoplasm these ribosomes are involved in the production of haemoglobin. Alternative nomenclature : early normoblast or Rubriblast .

(3): Polychromatic erythroblast :-
This is the last precursor cell capable of mitosis and is smaller than the basophilic erythroblast its cytoplasm appears greyer due to the increased acidophilic staining caused by the presence of haemoglobin alternative nomenclature : intermediate normoblast or prorubricyte .
(4) :Orthochromatic erythroblast :-
Also called a normoblast .it is incapable of cell division and is only slightly larger than a mature erythrocyte but it does contain a small dense nucleus. Alternative nomenclature : late normoblast or Rubricyte
(5): Polychromatophilic erythrocyte: -
Also called a Reticulocyte and is formed when the nucleus is extruded from the normoblast . It still contains some ribosomes and therefore retains a slight basophilic stain. The clustering of the ribosomes forms a reticular network giving the name Reticulocyte these cells can carry oxygen and enter the blood stream and are found in low concentrations in normal blood alternative nomenclature Polychromatic cell or metarubricyte.
(6): Erythrocyte :-
Commonly called the red blood cell it is the final product of erythropoiesis and is released from the bone marrow into circulation :

QNO (2) : Enlist common causes of poor blood filam (blood smear) ?
(Ans) : common causes of poor blood smear :-
As soon as the drop of blood is placed on the glass slide there should be no delay in the making of the smear . Any delay whatsoever results in abnormal distribution of the white cells with many of the white cells accumulating at the edge of the smear . Rouleaux of the red cell and clumping

of the platelets may also occur
- drop of blood too large too small:
- spreader slide pushed across the horizontal slide in a jerky manner:
- failure to keep the entire edge of the spreader slide against the horizontal slide while making the smear :
- failure in using appropriate angle for the spreader slide . As a rule of thumb if your patient has a low haemoglobin increase the angle of your spreader slide ; if your patient has a high hemoglobin , than decrease the angle.
- failure to push the spreader slide across complete horizontal slode:
- Exposure of slide to formalin interferes with stain quality of smear :

QNO (3) : Briefly explain Granulupoiesis in detail ?

(ANS) : Granulopoiesis (or granulocytopoiesis) is a part of haematopoiesis, that leads to the production of granulocytes. A granulocyte, also referred to as polymorphonuclear lymphocyte (PMN), 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.[1] Granulopoiesis takes place in the bone marrow. [2] It leads to the production of three types of mature granulocytes: neutrophils (most abundant, making up to 60% of all white blood cells), eosinophils (up to 4%) and basophils (up to 1%). [3] Even though haematopoiesis is usually presented in a form of hierarchically organized haematopoietic tree, it is becoming evident, that the cells are gradually progressing from one type to another, while remaining flexible and forming complex landscapes. [4] Granulopoiesis is often divided into two parts - granulocyte lineage determination , involving the early maturation steps that are common for all myeloid cells and committed granulopoiesis, the irreversible commitment of a myeloid cell to become a granulocyte. [1]

(1) : Granulocyte lineage determination :-

Granulopoiesis, as well as the rest of haematopoiesis, begins from a haematopoietic stem cells. These are multipotent cells that reside in the bone marrow niche and have the ability to give rise to all heamatopoetic cells, as well as the ability of self renewal. [5] They give rise to either a common lymphoid progenitor (CLP, a progenitor for all lymphoid cells) or a common myeloid progenitor, CMP, an oligopotent progenitor cell, that gives rise to the myeloid part of the heamatopoetic tree.[1] The first stage of the myeloid lineage is a granulocyte - monocyte progenitor (GMP), still an ligopotent progenitor, which then develops into unipotent cells that will later on form a population of granulocytes, as well as a population of monocytes. The first unipotent cell in granulopoiesis is a myeloblast. [6]

(2) : Committed granulopoiesis :-

Committed granulopoiesis consists of maturation stages of unipotent cells. The first cell that starts to resemble a granulocyte is a myeloblast. It is characterized by large oval nucleus that takes up most of the space in the cell and very little cytoplasm. The next developmental stage, a promyelocyte, still has a l arge oval nucleus , but there is more cytoplasm in the cell of at this point, also cytoplasmic granules are beginning to form . The development of granules continues with the next stage, a myelocte. At this point, its nucleus is starting to shrink. At the stage of a metamyelocyte the cell bnucleus is

becoming kidney- shaped and it becomes even more bent in the stage of a band cell. The maturation is finished with the emergence of a segmented nucleus that is specific for a mature granulocyte. :

QNO (4) : what is iron deficiency Anemia ? Also discuss its causes:

(ANS) : Overview:-

Anemia is a condition in which you lack enough healthy red blood cells to carry adequate oxygen to your body's tissues. Having anemia can make you feel tired and weak.

There are many forms of anemia, each with its own cause. Anemia can be temporary or long term, and it can range from mild to severe. See your doctor if you suspect that you have anemia. It can be a warning sign of serious illness.

(1) : Causes of anemia:-

Different types of anemia have different causes. They include:

● Iron deficiency anemia: - This most common type of anemia is caused by a shortage of iron in your body. Your bone marrow needs iron to make hemoglobin. Without adequate iron, your body can't produce enough hemoglobin for red blood cells.

Without iro n supplementation, this type of anemia occurs in many pregnant women. It is also caused by blood loss, such as from heavy menstrual bleeding, an ulcer, cancer and regular use of some over-the- counter pain relievers, especially aspirin, which can cause inflammation of the stomach lining resulting in blood loss.

● Vitamin deficiency anemia :- Besides iron, your body needs folate and vitamin B-12 to produce enough healthy red blood cells. A diet lacking in these and other key nutrients can cause decreased red blood cell production.

Also, some people who consume enough B-12 aren't able to absorb the vitamin. This can lead to vitamin deficiency anemia, also known as pernicious anemia.

● Anemia of inflammation :- Certain diseases — such as cancer, HIV/AIDS, rheumatoid arthritis, kidney disease, Crohn's disease and other acute or chronic inflammatory diseases — can interfere with the production of red blood cells.

● Aplastic anemia :- This rare, life- threatening anemia occurs when your body doesn't produce enough red blood cells. Causes of aplastic anemia include infections, certain medicines, autoimmune diseases and exposure to toxic chemicals.

● Anemias associated with bone marrow disease :- A variety of diseases, such as leukemia and myelofibrosis, can cause anemia by affecting blood production in your bone marrow. The effects of these types of cancer and cancer- like disorders vary from mild to life- threatening.

● Hemolytic anemias :- This group of anemias develops when red blood cells are

destroyed faster than bone marrow can replace them. Certain blood diseases increase red blood cell destruction. You can inherit a hemolytic anemia, or you can develop it later in life.

- Sickle cell anemia :- This inherited and sometimes serious condition is a hemolytic anemia. It's caused by a defective form of hemoglobin that forces red blood cells to assume an abnormal crescent (sickle) shape. These irregular blood cells die prematurely, resulting in a chronic shortage of red blood cells.

QNO (5) : Classify anemia on the basis of morphology with examples ?
(ANS) : Morphologic Classification of Anemias

Red blood cell morphology is another system for classifying anemia. There are three basic divisions within the morphologic classification system:
(1): Microcytic -- MCV <80 fL
(2) : Macrocytic -- MCV >100 fL
(3) :Normocytic -- MCV 80-100 fL
The table below provides examples of anemias in each category.

Category:-	Anemia :-
Microcytic (mcv < 80fl)	iron deficiency Anemia of chronic information . Globin deficiency - thalassemia. Sideroblastic anemia .
Macrocytic (mcv > 100fl)	
Normocytic (mcv 80 - 100 fl)	

- Anemia :-

- iron deficiency .
- Anemia of chronic inflammation .
- Globin deficiency - thalassemia .
- sideroblastic anemja.

- Megaloblastic :-

- B- 2 deficiency .
- folic acid deficiency .

- Non megaloblastic :-

- chronic liver disease .
- Alcoholism .
- Aplastic Anemia .

- Hemolytic anemia : RBC : membrane abnormality:

- spherocytosis .
- Elliptocytosis.
- Acanthocytosis.
- stomatocytosis.

- Bone marrow suppression: -

- Antibody mediated.
- infection malaria.
- chemical and physical agents drug burns.
- mechanical cardiac valve prosthesis.