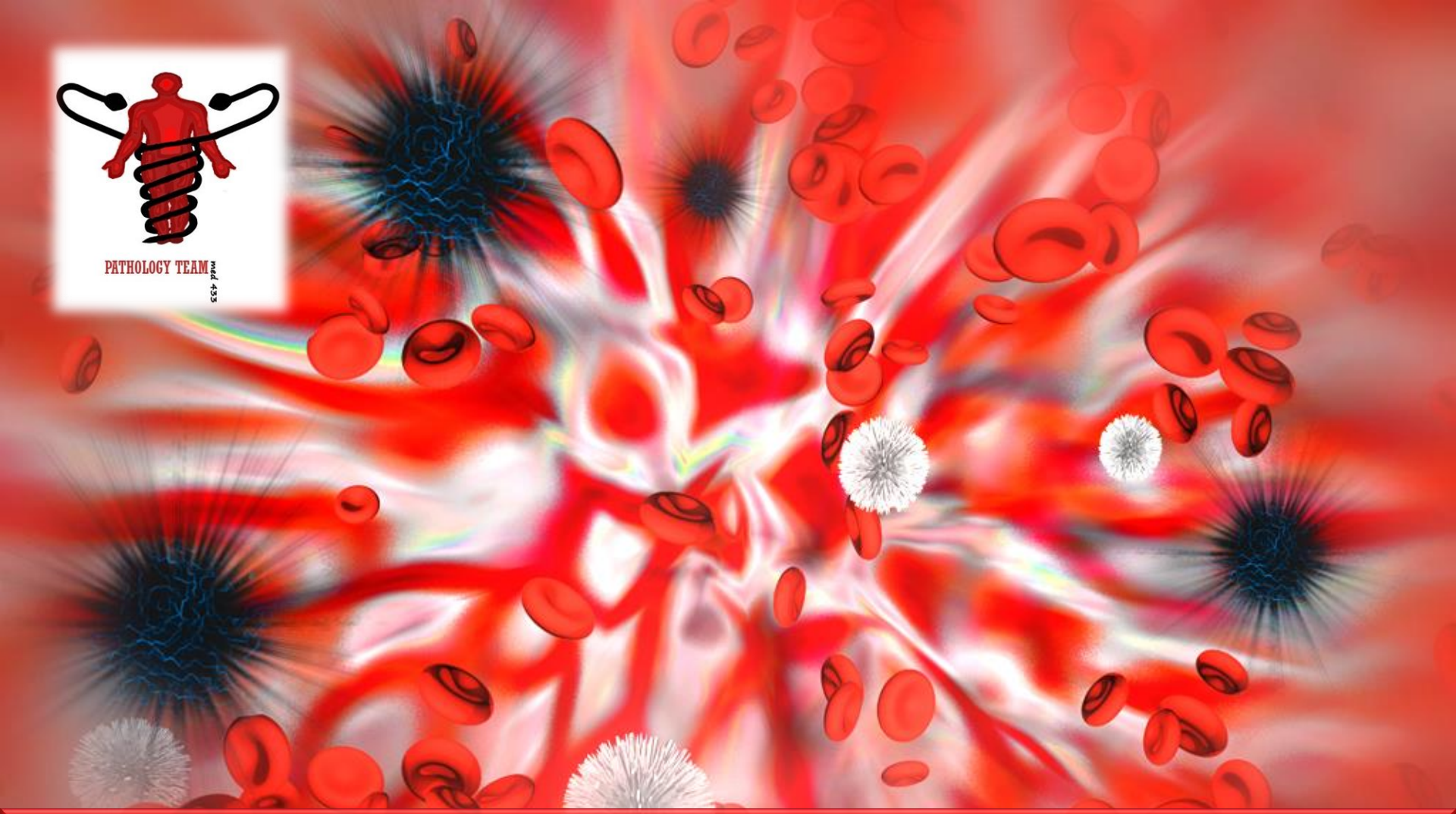


Review of hematology (Summary & MCQs)

L1&2&3&4

Summary L1: haemoglobinopathies

Types of Hemoglobinopathies

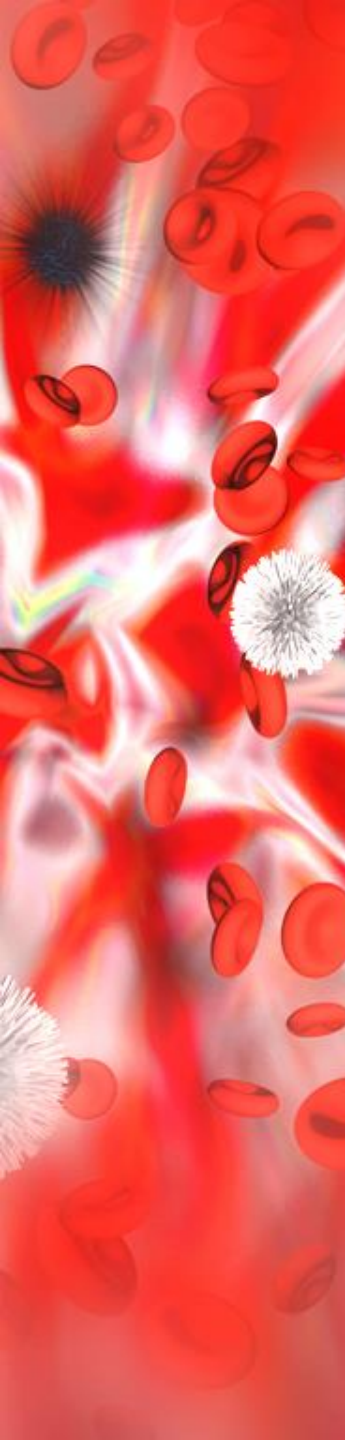
- Thalassemia: an inherited autosomal recessive disorder in which the protein part (Globin) of the hemoglobin is completely or partially missed.

- Abnormal Hemoglobins: a condition characterized by abnormal hemoglobin structure, due to an error in the sequence of amino acids which form the globin. Ex: Sickle cell anemia.

- RBC's are formed in: yolk sac till 2nd month, liver & spleen till 8th month, then bone marrow will take over.
  - most numerous produced globin in body:

Prenatal: Mostly α & γ

Postnatal: Mostly α , β and very little amounts of δ & γ.



Thalassemia

❖ α-Thalassemia:

A condition in which Alpha globin is partially or completely absent due to missed genes, which are responsible to express it.

Type	Description
Silent	Missing one gene
Thalassemia trait	Missing two genes, either in the same chromosome (Asian type) or one on each chromosome (African type).
HbH	3 genes are missed. Only one gene remains.
Hydrops fetalis	All 4 genes are missed, the fetus cannot live without intervention.

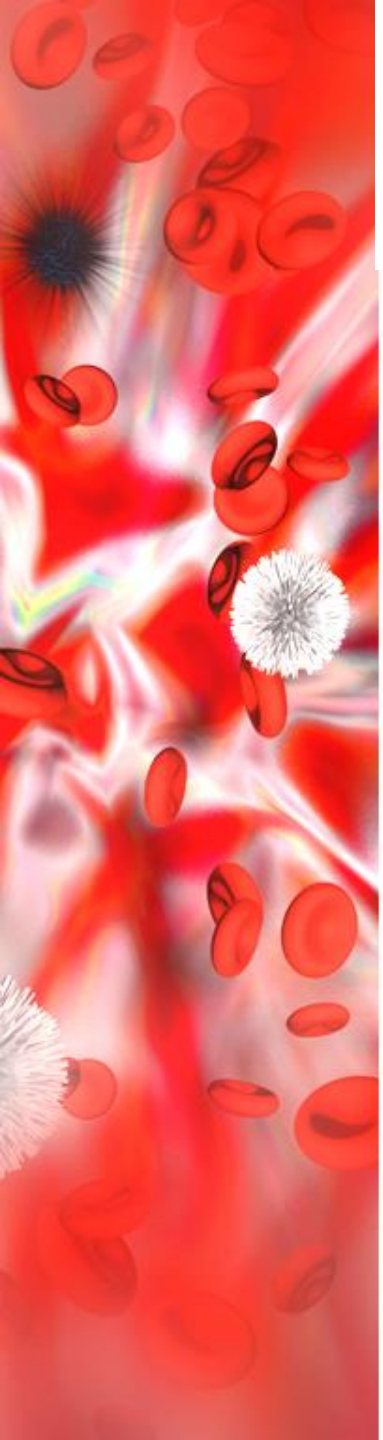
❖ β-Thalassemia:

A condition in which Beta globin is partially or completely absent due to missed genes.

1/Beta+: the synthesis of Beta globin is partially decreased.

2/Beta0: the synthesis of Beta globin is completely lost.

Type	Description
Major	Hb A1: absent, Hb A2: more than 3.5, Hb F: raised.
Intermedia	Hb A1: present but very low, Hb A2: more than 3.5, Hb F: raised.
Trait	Hb A1: 90, Hb A2: more than 3.5, Hb F: raised.
Minima	Hard to investigate.



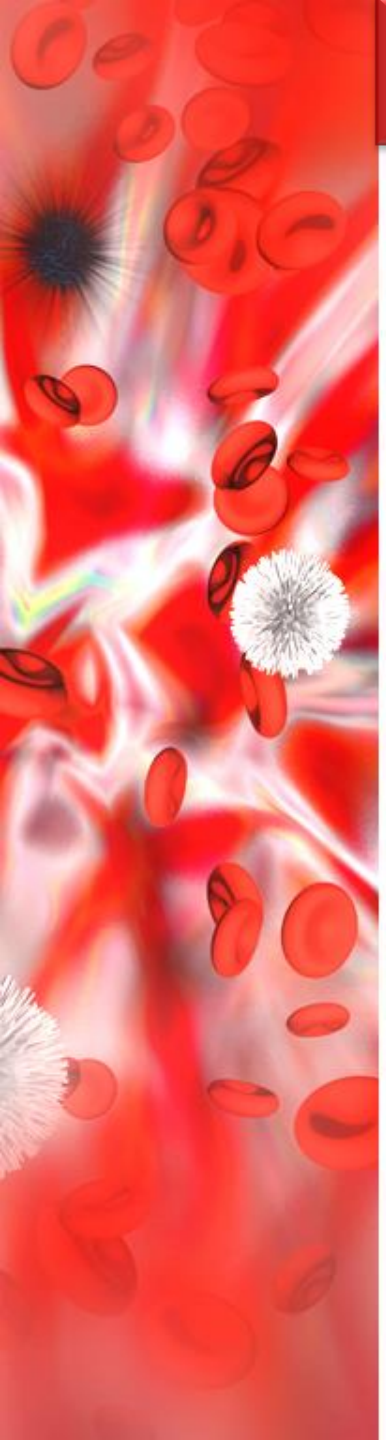
❖ Clinical manifestations:

Pallor, Jaundice, Apathy and Anorexia, Failure to Thrive, Hepato-splenomegaly, Skeletal Deformity (Under X-ray hair on end appearance. and Iron Overload.

Name	Chain	
HbA (adult)	2 Alpha	2 Beta
HbA2 (adult)	2 Alpha	2 Delta
HbF (fetus)	2 Alpha	2 Gamma
HbH (disease)	-	4 Beta
Hb Bart's (disease)	-	4 Gamma
Hb Gower1(embryo)	2 Zeta	2 Epsilon
Hb Gower2 (embryo)	2 Alpha	2 Epsilon
Hb Portland (embryo)	2 Gamma	2 Zeta
Hb Lepore (rare disease)	2 Alpha	2 (Beta-Delta)

Notes:

- HbH is considered as α-Thalassemia (Because of the absence of Alpha globins in the Hemoglobin subunits).
- Hb Lepore has 2 alpha subunits normally, but it also contains 2 other subunits of fused Beta and Delta globins, this is usually is due to fusion of the genes expressing these two globins in chromosome 11.



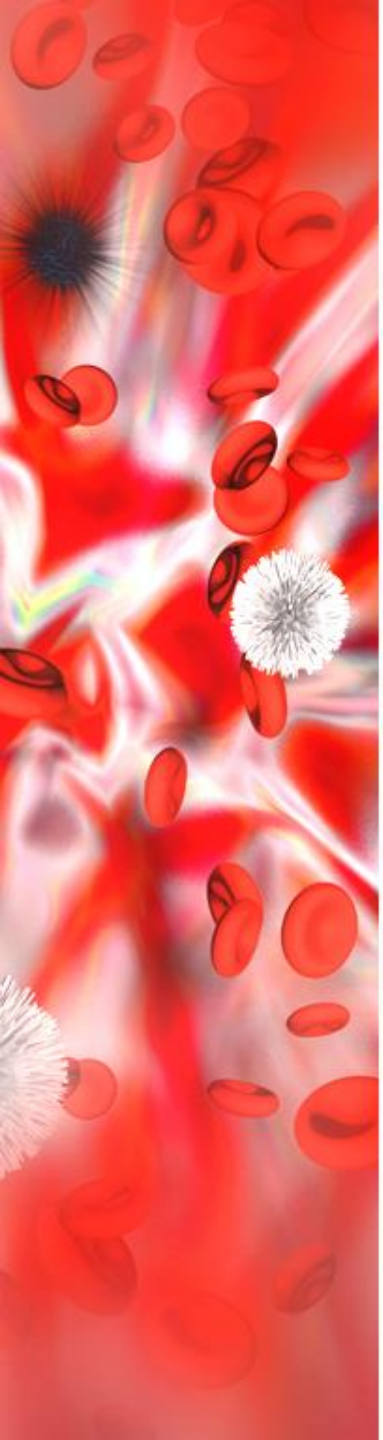
Summary L2: Blood Transfusion

Blood donors:

1- voluntary donors: outdoor voluntary and hospital stuff
2- involuntary donors: Relatives of patients admitted to hospital, Persons applying for driving licenses
3- Directed blood donations from close relative of patients on their requests
4- Autologous donations

The criteria for blood donation

1- the person must be in good health.
2- donors age at least 16
3-weight must be at least 50 KG(110 pounds).
4-All donors must pass the physical and health history examinations.
5- The donor's body replenishes the fluid lost from donation in 24 hours.
6- Whole blood can be donated once every eight weeks (56 days).
7- Two units of red blood cells can be donated at one time, using a process known as red cell aphaeresis.
8- Volunteer donors provide nearly all blood used for transfusion in KSA

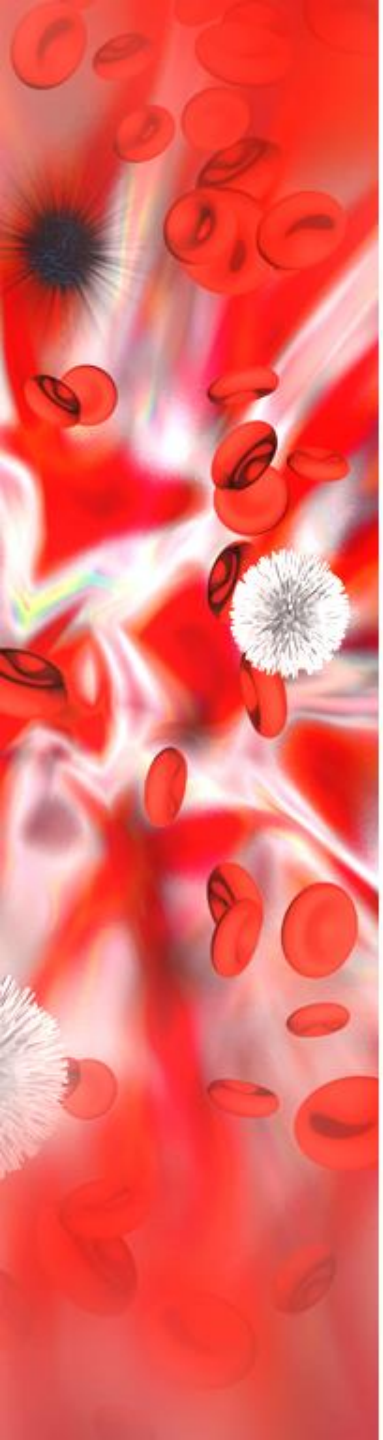


Who should not donate blood?

1-Anyone who has ever used intravenous drugs (illegal IV drugs).
2-Men who have had sexual contact with other men since 1977.
3-Anyone who has ever received clotting factor concentrates.
4-Anyone with a positive test for HIV (AIDS virus)
5-Men and women who have engaged in sex for money or drugs since 1977.
6-Anyone who has had hepatitis since his or her eleventh birthday.

Those who may be deferred include:

-Anyone who has taken Tegison for psoriasis.
-Anyone who has risk factors for Crueutzfeldt-Jakob disease (CJD) or who has an immediate family member with CJD.
-Anyone who has risk factors for vCJD.
-Anyone who spent three months or more in the United Kingdom from
-Anyone who has spent five years in Europe
-Anyone who has had babesiosis or Chagas disease.



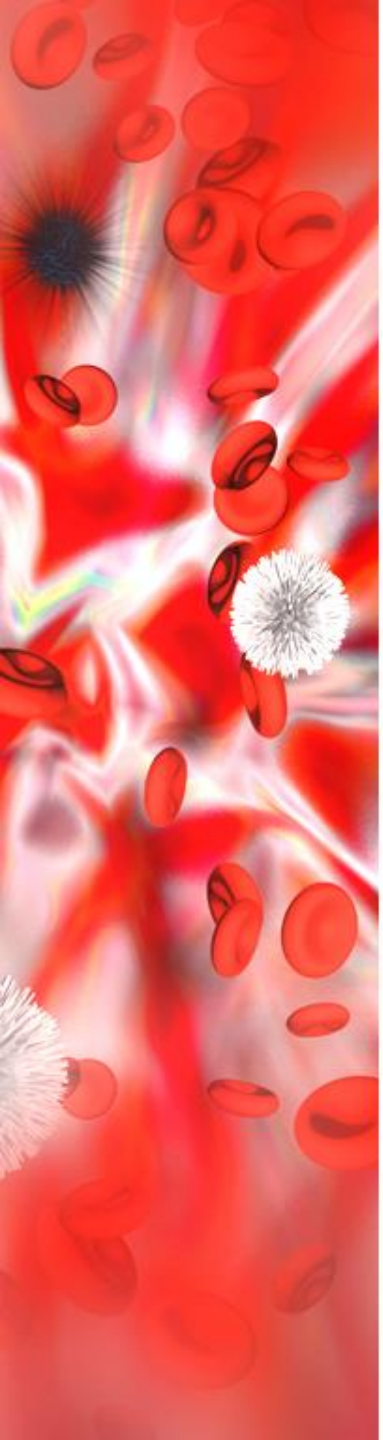
Blood Groups

*ABO=most important blood group, Rh=2nd most important blood group.

*The most common blood types: O Rh-positive 38%, A Rh-positive 34%.

Blood group	Antigen(s) present on the red blood cells	Antibodies present in the serum	Genotype(s)
A	A antigen	Anti-B	AA or AO
B	B antigen	Anti-A	BB or BO
AB	A antigen and B antigen	None	AB
O	None	Anti-A and Anti-B	OO

*Age of RBCs (120 days) platelet (10days) leukocytes(22hours)



Mandatory Tests on All Units of Blood:

- ABO group and Rh type
- Screening for blood-group antibodies
- Serologic test for syphilis
- Serologic tests for human retroviruses including:
  - ✓HIV-1 antibody
  - ✓HIV-2 antibody
  - ✓HIV p24 antigen
  - ✓HTLV I antibodies
- Serologic tests for hepatitis including:
  - ✓ Hepatitis B core antibody (HBcAb)
  - ✓ Hepatitis B surface antigen (HBsAg)
  - ✓ Hepatitis C antibody

Nucleic acid amplification testing (NAT) for HIV-1 and HCV.
G6PD test.
Sickle cell test.

Compatibility Testing

To be Completed Before Blood or Blood Products can be Transfused:

* Determination of the blood type with a crossmatch (between patients serum and donor red cells).
* Antibody screening on patients sera. (indirect comb's test)
* Directs comb's test on (donors red cells and patients red cells)
* Screening for antibodies that may produce adverse effects if transfused.
* Screening for possible infectious agents that could be transmitted with transfusion.

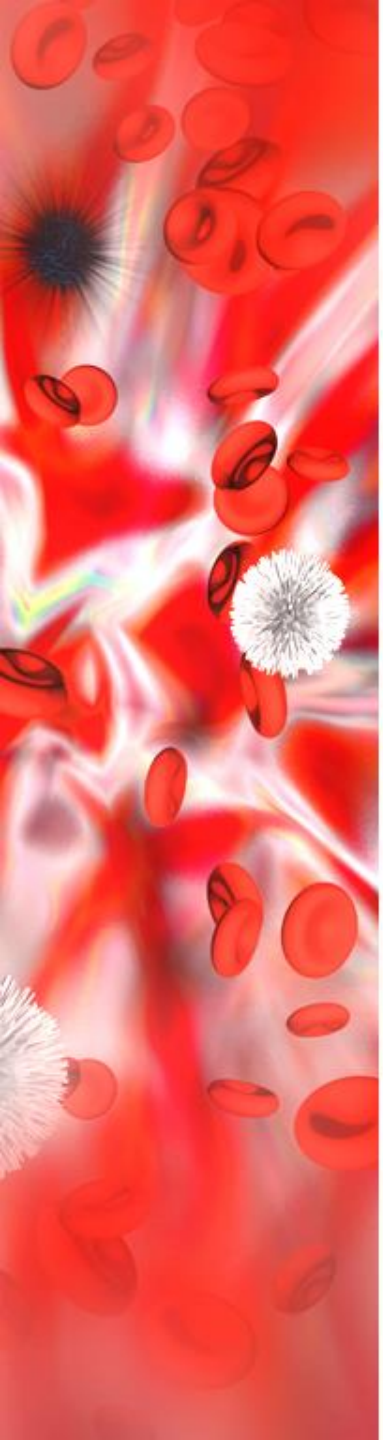
Summary L3: Anemia

- Hb synthesis begin at erythroblast and stop at reticulocyte .
- All the stages of HB synthesis will be in the bone marrow Except reticulocyte and erythrocyte .

- **The normal rages :**

Indices	Male	Female		
Hemoglobin(g/dL)	13.5-17.5	11.5-15.5		
Hematocrit (PCV) (%)	40-52	36-48		
Red Cell Count ($\times 10^{12}$)	4.5-6.5	3.9-5.6	**Low :**	**High :**
Mean Cell Volume (MCV) (fL)	80-95		microcytic	macrocytic
Mean Cell Hemoglobin (MCH) (pg)	30-35		hypochromic	___

	Hypochromic microcytic anemia	Macrocytic anemia	Normocytic normochromic anemia
MCV	low	high	normal
MCH	low	___	normal
HB	low	high	low
Red cell count	___	___	low



- Anemia is : Reduction of Hb concentration below the normal range for the age and gender .
- **In iron deficiency anemia the absorption will be limited due to :**

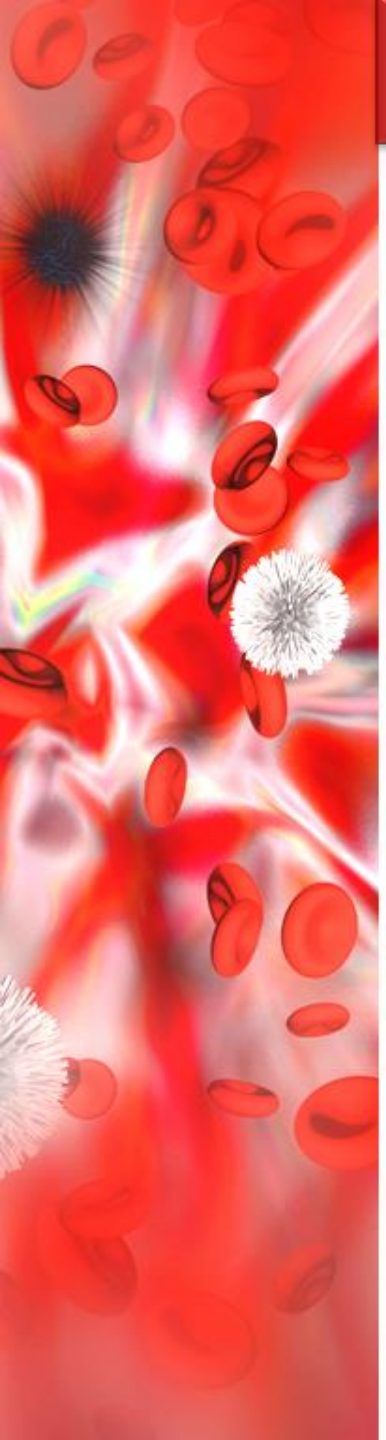
- Weak absorption of iron and inorganic iron .

- Iron deficiency anemia is the most common anemia in the world .
- Duodenum is the site of absorption for iron .
- Iron is transported in the blood as transferrin and stored in the
- macrophages and other tissues as ferritin and haemosiderin.
- Hepcidin produced in liver and it's the major hormonal regulator of iron, it interfere with ferroportin either in intestine or macrophages so it inhibits iron absorption and release.
- ferroportin is a protein responsible for the exit of iron (the only exit pathway)
- The most significant singe of IDA is Koilonychia (spoon-shaped nails)
- **Under the microscope in IDA we will see microcytic hypochromic cells with**

- Pencil- shaped cells
- Target cells

- **Normochromic normocytic anemia caused by decreased release of iron from iron stores due to raised serum Hepcidin this type of anemia will occur in patients with chronic diseases like :**

  - ✓ Chronic infection including HIV, malaria.
  - ✓ Chronic inflammations.
  - ✓ Tissue necrosis and malignancy



Summary L4: Megaloblastic anemia

1-Anemia divided into three groups : Microcyte – Normocyte - Macrocyte anemia

2-Macrocyte anemia divided into two groups : Megaloblastic-non megaloblastic anemia .

3-Megaloblastic anemia caused by : deficiency of vitamin B12 or folate .

4-Megaloblastic anemia characterized by large size erythrocyte (MCV>95).

5-Non Megaloblastic anemia characterized by large RBCs with normal production from bone marrow.

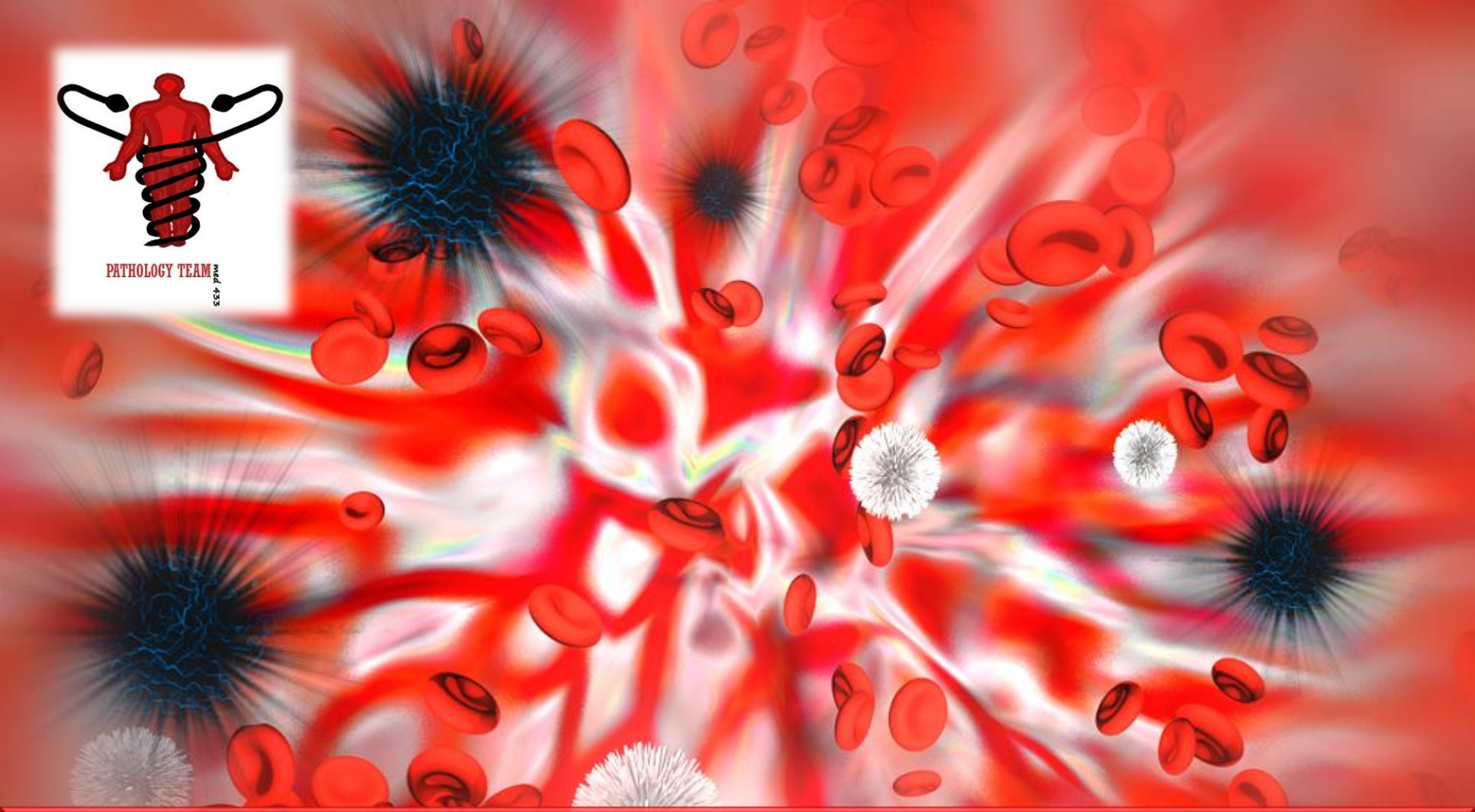
6-Megaloblastic anemia characterized by **large RBCs** with **abnormality in DNA synthsis** during erythropoiesis in bone marrow.

7-There is **two** features of magaloblastic anemia : **macrocytes and hypersegemented neutrophils.**

8- Site of absorption of **vitamin B12** in the ilium and folate in the jejunum and deudenum

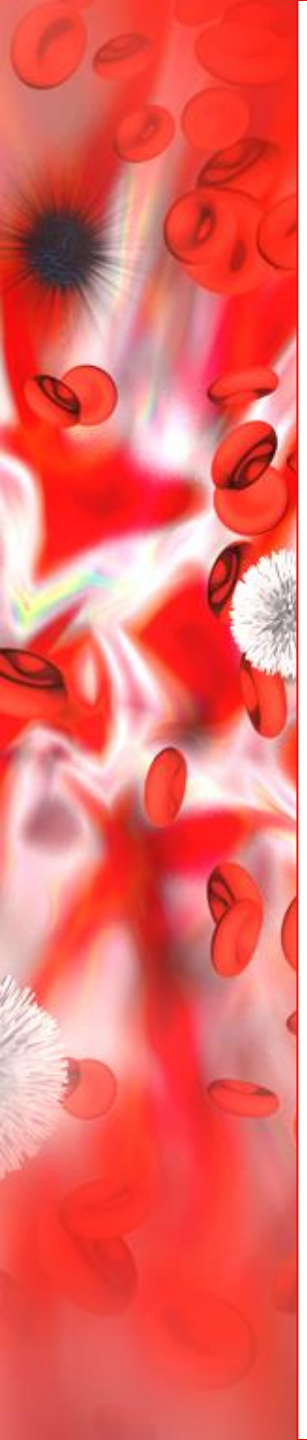
9-Treatment of **vitamin B12 deficiency** is usually by injection of hydroxycobalamin.

10-Treatment of folate deficiency with oral folic acid.



MCQs

L1&2&3&4



Key answers : 1-d 2-c 3-d 4-a 5-b

Q1- Which of the following is present In the embryo until the 8th week ?

a. Haemoglobin Gower I
b. Haemoglobin Gower II
c. Haemoglobin Portland
d. All of the above

Q2- If both parents have an absent α + gene, what kind of Thalassemia would their child have?

a. Heterozygous α– thalassemia-2
b. Heterozygous α– thalassemia-1
c. Homozygous α– thalassemia
d. None of the above

Q3- how to diagnose a thalassemia face grossly:

a. Wide area between the eye
b. Bone extended in the maxilla area
c. Skull extended outward.
d. All of the above

Q4: in hypochromic and microtic anemia :

a. Low MCV & MCH
b. High MCV & MCH
c. Normal MCV & MCH

Q5: Regarding to HbA2, which of the following is correct?

a. High in alpha thalassemia.
b. High in beta thalassemia.
c. High in fetus.
d. High in Caucasian adult.

MCQs

L1

Q6: What is the type of anemia which is associated with α thalassemia?

a. Hemolytic anemia
b. Iron overload
c. Iron deficiency
d. Hypochromic & microcytic

Q7: Which type of thalassemia that you can find a "free α chain" in it?

a. β thalassemia major
b. β thalassemia intermediate
c. β thalassemia minor
d. β thalassemia minima

Q8: A child presented to the hematology with jaundice, hepatomegaly and forehead bossing. What is the most likely type of thalassemia does the child have?

a. β thalassemia major
b. β thalassemia intermediate
c. α thalassemia hemoglobin H
d. α thalassemia Hydrops fetalis

Q9: A 1-year patient presented to the hematologic clinic with α thalassemia. After doing some investigations, which of the following is expect to see?

a. High Hemoglobin A2
b. Low hemoglobin H
c. High Bart's hemoglobin
d. High hemoglobin F

Key answers : 6-b 7-a 8-a 9-c

Key answers : 10-a 11-c 12-c 13-a 14-c

Q10: A patient has α thalassemia. After doing PCR they found he has only 1 copy from α-globin gene. What is the diagnosis?

a. α thalassemia hemoglobin H
b. α thalassemia Trait
c. α thalassemia silent
d. Hydrops fetalis

Q11: What is the stain that is used to see target cells in α thalassemia?

a. E&H stain
b. Silver stain
c. Supravital stain
d. Mucicarmine stain

Q12: What type of β-thalassemia is have one abnormal allele and one normal?

a. β thalassemia major
b. β thalassemia intermediate
c. β thalassemia minor
d. β thalassemia minima

Q13: A 3-year patient presented to the hematologic clinic with major β thalassemia. After doing some investigations, what is the value of HbA expected to see?

a. 0 b. 85 c. 97 d. 70

Q14: From the previous scenario, what is the most abundant Hb?

a.HbA b.HbA2 c. HbF d. HbH

Q15: A 31-year old male has been screened for a familial blood disorder. The results show hemoglobin of 9.5 g/dL and smear displays few target cells. Hemoglobin electrophoresis shows a mild increase in HbA2. What is the the appropriate diagnosis?

a. Hetrozygous β-thalassemia
b. Hemozygous β thalassemia
c. Silent carrier α- thalassemia
d. Trait α-thalassemia

432 team

Q16: The α-genes are located on which one of the following chromosomes ?

a. Chromosome 11
b. Chromosome 12
c. Chromosome 16
d. Chromosome 20

432 team

Key answers : 15-a 16-c

1. A woman with blood group O married a man with blood group O, their child's genotype is?

a. AO
b. AB
c. OO
d. BO

2. A young man is brought into the emergency room and needs a blood transfusion His blood type is B+. Which one of the following blood groups we should give to him?

a. B-
b. AB+
c. AB-
d. A+

3- What is the minimum donors age?

a. 18
b. 20
c. 16
d. 12

4- Patients for elective surgery can donate 4 units in one month before surgery (one unit/week), this Called?

a. Predeposited
b. Haemodilution
c. Salvage
d. None above

Key answers : 1-C 2-A 3-C 4-A

MCQs

L2

Key answers : 5-B 6-D 7-A 8-A 9-D

5- Acute normovolaemic haemodilution, 2-3 units of blood can be obtained ,from the patient immediately before surgery, this Called?

a. Predeposited
b. Haemodilution
c. Salvage
d. None above

6-Who should not donate blood?

a. Person received clotting factor concentrates.
b. positive test for HIV.
c. Anyone who has ever used illegal IV drugs.
d. All above

7- ACD - A (NIH - A) Solution store red blood cells for ?

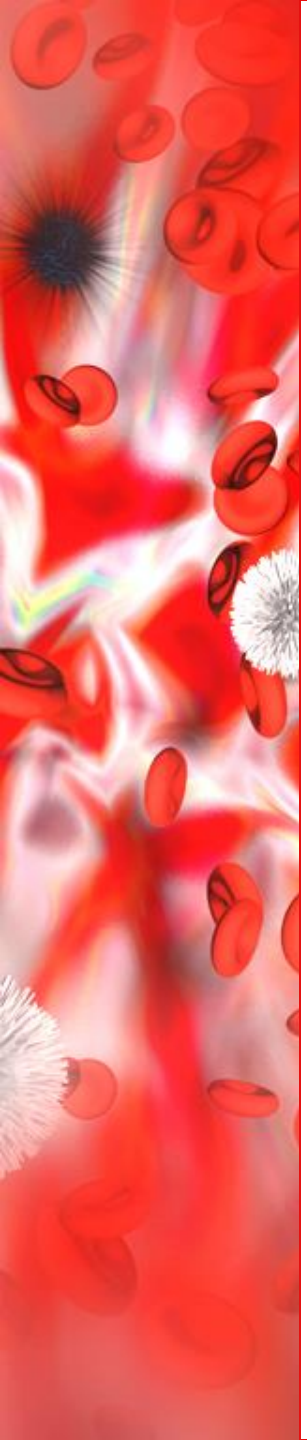
a. 21 days at 1 – 6 0 C
b. 28 days at 1 – 6 0 C
c. 35 days at 1 – 6 0 C
d. 42 days at 1 – 6 0 C

8- CITRATE – PHOSPHATE – DEXTROSE (CPD) Store Platelets for :

a. 3 days at 20 – 24 ^{0} C
b. 5 days at 20 – 24 0 C
c. 10 days at 20 – 24 0 C
d. 7 days at 20 – 24 ^{0} C

9- The most common blood group is ?

a. O Rh-positive
b. A Rh-positive
c. B Rh-positive
d. A&B



Key answers :10-A 11-B 12-C 13-A 14- C

Q10: a person with a history of close contact with hepatitis patient should wait……. Before blood donation :

a. One year .
b. Tow months .
c. Three years .

Q11: which medication if a person took in the past or is taking now he should not be accepted as a donor ?

a. lasix.
b. Tegison .
c. Loratadine .

Q12: what is the best anit-coagulant to be used in blood banks :

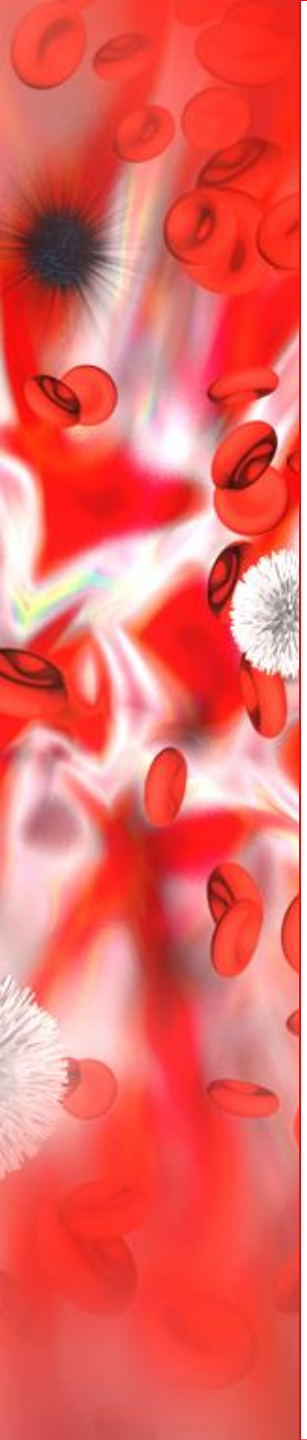
a. citrate -dextrose -water solution
b. Citrate-phosphate-dextrose solution
c. Citrate-phosphate-dextrose solution + optisol

13- Which one of ABO blood group has galactosamin group (GalNAc) ?

a. A
b. B
c. AB
d. O

Q14- Group O has :

a. a and b antigens
b. no antibodies
c. a and b antibodies



Key answers : 15-B 16-C 17-B

Q15 : In case of emergency which blood group can be given without a crossmatch ?

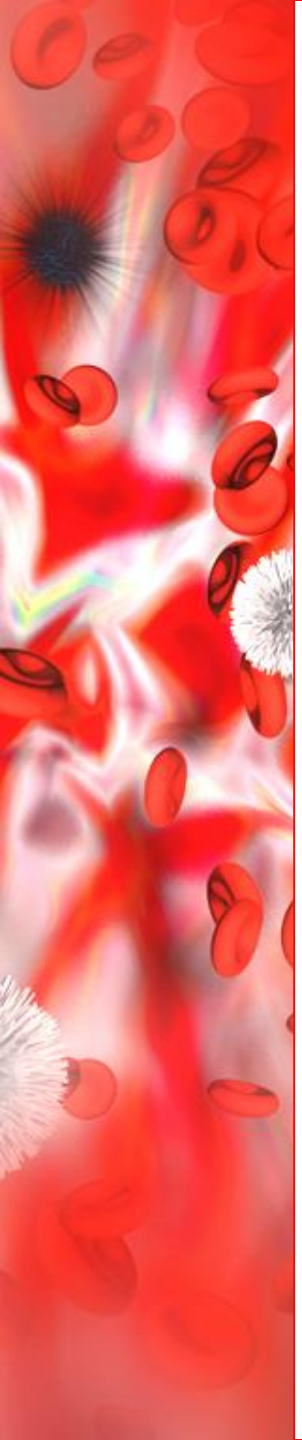
a. AB+
b. O-
c. O+

Q16: Red blood cells can be stored …… :

a. 5 days in room temperature .
b. one year if in frozen state .
c. 42 at 1-6 c

Q17: which of the following is a delayed transfusion reaction :

a. circulatory overload .
b. Graft verses host disease
c. Air embolism .



Key answers : 1.B 2.B 3.C 4.D 5.D

Q1:the major site for erythropoiesis?

a. liver
b. bone morrow
c. kidney
d. all of the folloiwng

Q2: reduction in hemoglobin concentration can lead to :

a. increase O2 carrying capacity
b. decrease O2 carrying capacity
c. increase CO2 carrying capacity
d. no effect

Q3:which one of the following is a specific clinical feature of anemia ?

a. cardiac failure
b. Headache
c. bone deformities
d. angina

Q4: megaloplastic anaemia is characterized by?

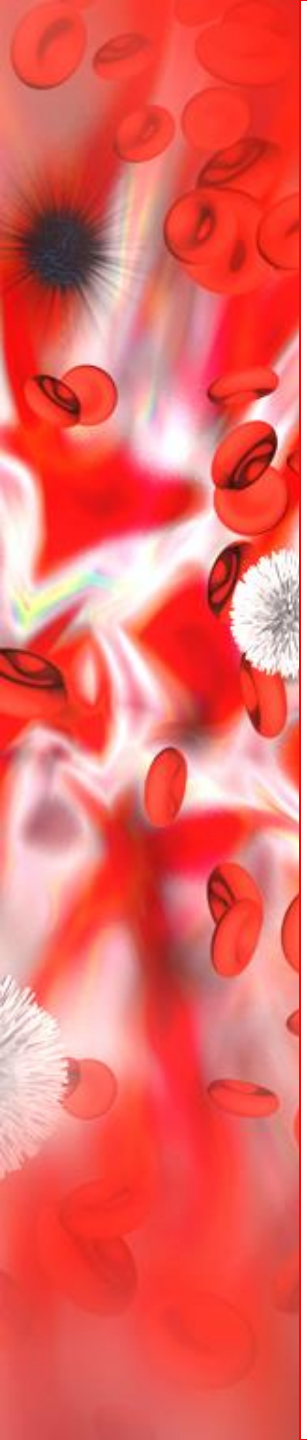
a. vitB6 deficiency
b. vitB12 deficiency
c. folate deficiency
d. B and C

Q5: which one of the following are the storage forms of iron?

a. ferritin
b. hemosiderin
c. transferrin
d. A and B

MCQ

L3



Key answers : 6.A 7.B 8.A 9.B

Q6: Iron carried in the blood in the form of ?

a. transferrin
b. hemosiderin
c. ferritin
d. Hepcidine

Q7: in the intestine, hepcidine interacts with ferroportin(which is an iron carrier) that will lead to ?

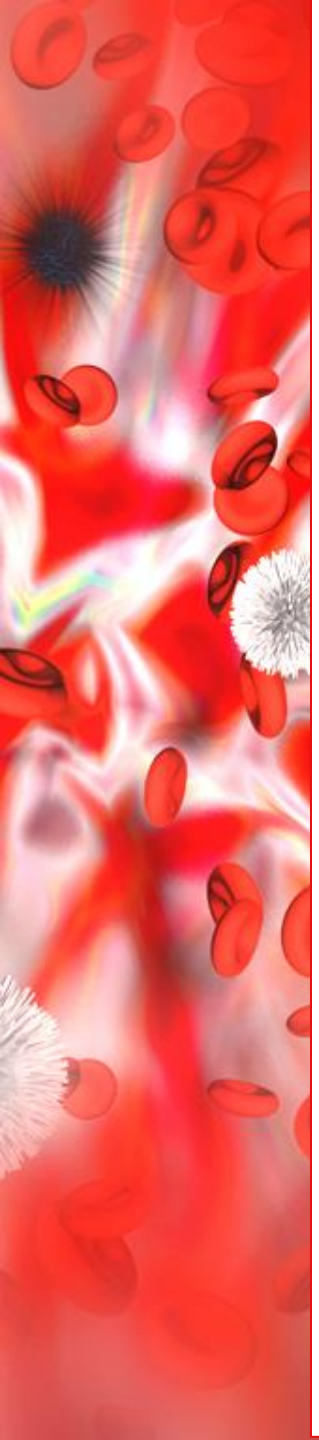
a. enhance iron absorption
b. inhibit iron absorption
c. no effect on absorption
d. lysis of iron

Q8: which one of the following is a factor favouring absorption ?

a. Haem iron
b. Ferric iron(Fe+++)
c. Tea
d. Increased hepcidin

Q9: 35 year old man comes to a clinic with Koilonychia and Dysphagia. After taking blood sample and examine it under the microscope, there was Pokiliocytosis and Anisocytosis. Which type of anemia does this patient have?

a. Megaloblastic anemia
b. microcytic Hypochromic anemia
c. Microcytic hyperochromic anemia
d. Normocytic normochromic anemia



Key answers : 10.C 11.D 12.A 13.B

Q10: high TIBC ,low serum (iron and ferritin) and low transferrin saturation will indicate ?

a. thalassemia
b. megaloblastic anemia
c. IDA
d. normal blood

Q11: the gold standard investigation of IDA is?

a. silver stain
b. immunhistochemsitry stain
c. H AND E stain
d. BM iron stain

12Q: Hemoglobin maintain the shape of the RBCs :

a. Quality
b. Quantity
c. Quality & quantity

13Q: which of the following is the mature form of the RBCs that appear in the peripheral :

a. Erythroblast & reticulocyte
b. Erythrocyte & reticulocyte
c. Late normoblast & reticulocyte

Key answers : 14.C 15.B 16.B 17.A

14Q: hemoglobin synthesis occur in all stages of erythropoiesis expect in

a. Reticulocyte

b. Erythroblast

c. Erythrocyte

15Q: In Perl's stain , the indicator for IDA is the absence of :

a. Transferrin

b. Hemosiderin

c. Hepcidin

16Q: the site for iron absorption is:

a. Jejunum

b. Duodenum

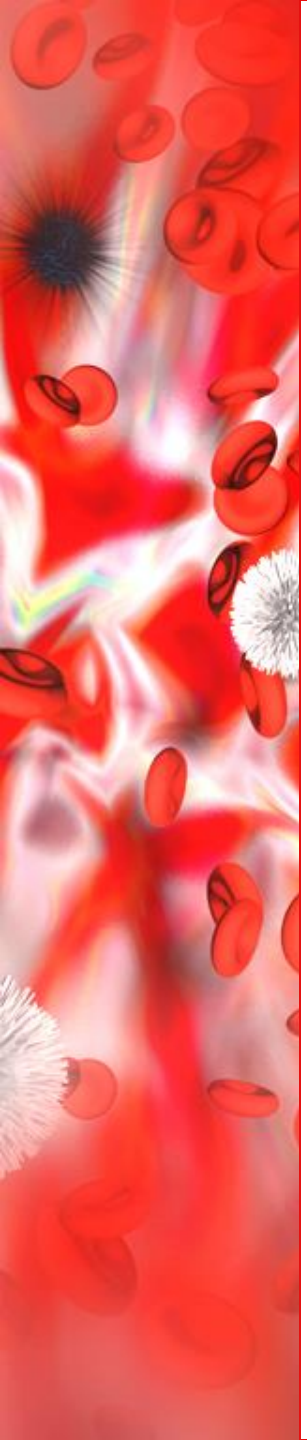
c. Ileum

17Q: The hormone that control the iron cycle is called and secreted from :

a. Hepcidin , liver

b. Hepcidin , kidney

c. Heparin , liver



18Q: pencil-like RBCs shape in blood film indicate :

a. Thalassemia

b. Macrocytic anemia

c. Iron deficiency anemia

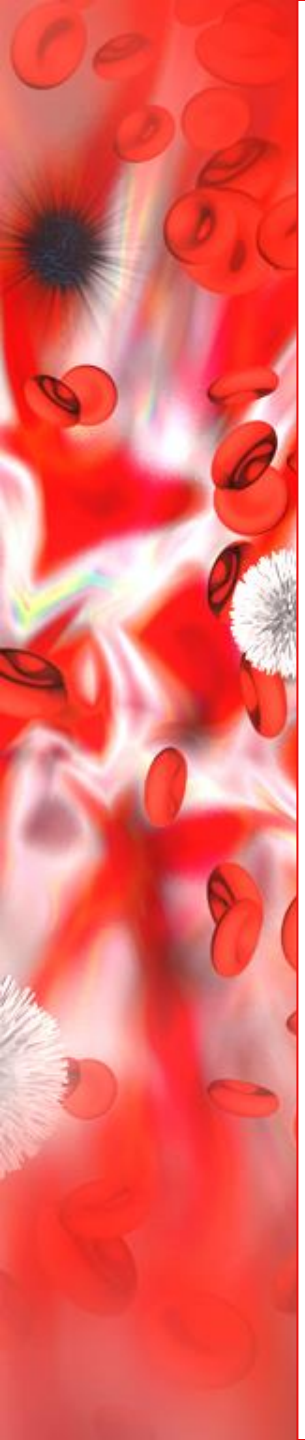
19Q: A patient came to the hospital suffering from dizziness and headache , after investigation and performing CBC they found decrease in hemoglobin and increase in the MCV , which of the following matches these findings :

a. Macrocytic anemia

b. Thalassemia

c. Sidroblastic anemia

Key answers : 18.C 19.A



Key answers : 1-A 2-A 3-A 4- A.

Q1: Children have higher count than adult in :

a. lymphocyte .

b. Neutrophils .

c. Monocytes

d. Basophils.

Q2: Thalassemia is :

a. Microcytic , hypo - chromatic .

b. Macrocytic , hyper - chromatic .

c. Microcytic , hyper - chromatic .

d. Macrocytic , hypo - chromatic .

Q3: Which one is more predispose to vit B 12 deficiency :

a. People who don't eat meat .

b. People who don't eat fish .

c. Vegetarians .

d. Burger eaters .

Q4: Vitamin B 12 & folate stored in :

a. Liver .

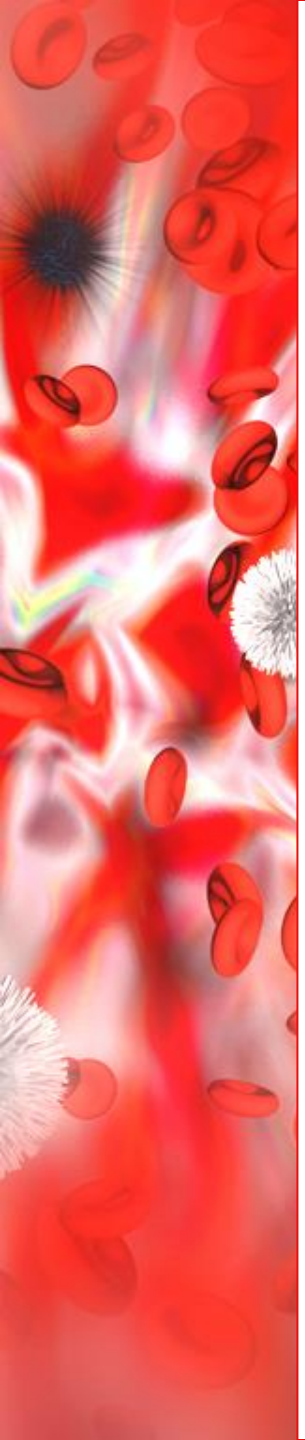
b. Spleen .

c. Pancreas .

d. Blood .

MCQ

L4



Key answers : 5-A 6 - A 7 - E.

Q5 : Intrinsic factor essential for the absorption of :

a. Vit B 12 .

b. Folate .

c. Nicene .

d. Vit C

Q6 : Deficiency of intestinal folate conjugase cause :

a. Folate deficiency .

b. Vit B 12 deficiency .

c. Folate accumulation .

d. Vit C deficiency .

Q7: Which one of the following is a source of folate :

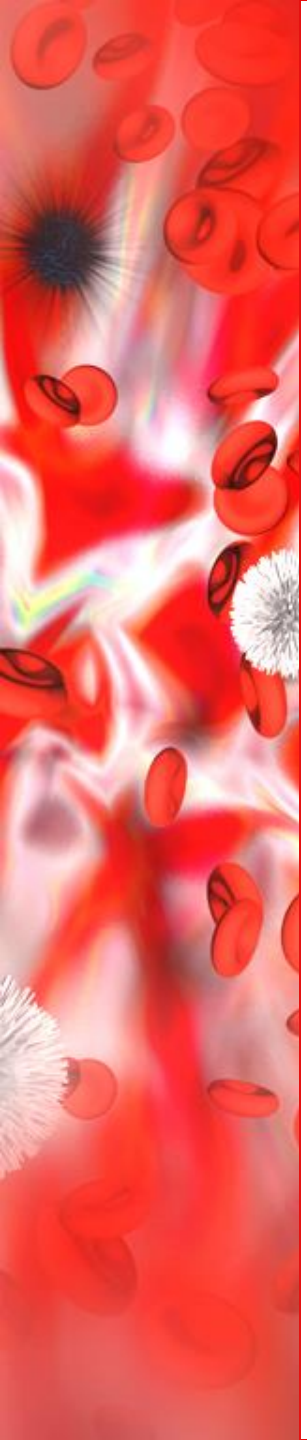
a. Green Vegetables .

b. liver.

c. Yeast .

d. Polyglutamates .

e. All .



Key answers : 8 – A 9 - A 10 – B 11 - A

Q8 : Intrinsic factor formed by :

a. Parietal cell .

b. Chief cell .

c. Zymogenic cell .

d. Mucus neck cell .

Q9 : Where does methyl tetra- hydrate (THF) GO :

a. Plasma .

b. Blood .

c. Lung .

d. Liver .

Q10 : what is the Function of intrinsic factor :

a. Come inside .

b. Don’t come inside & broken down .

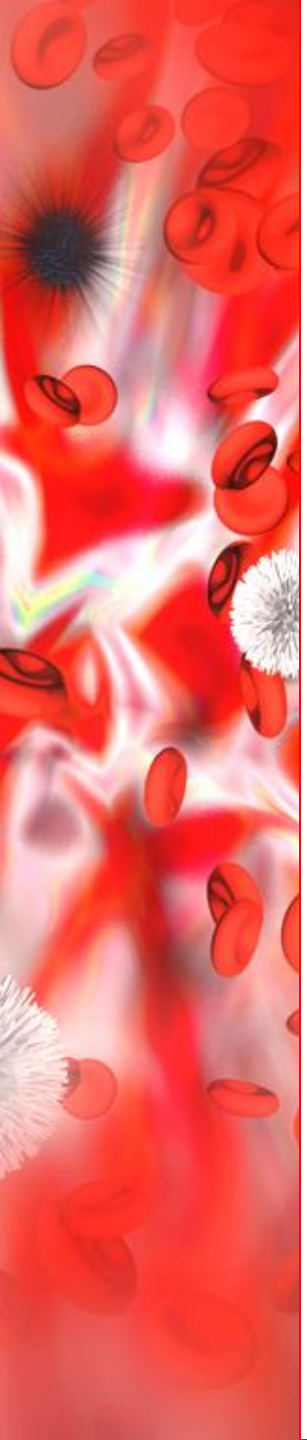
Q11 : Transcopalamine transport ?

a. Vit B 12 .

b. Folate .

c. Vit C .

d. Vit E .



Key answers : 12- C 13- A 14- A 15- A

Q12: Vit B 12 deficiency occur in :

a. Vegetarian .

b. Inadequate intake .

c. a & b .

d. None .

Q13 : Increased homocystine level will affect :

a. Folate .

b. Vit B 12 .

c. Vit C .

d. Vit E .

Q14 : Increased methylmalonyl coA level will affect :

a. Vit B 12 .

b. Folate .

c. Vit C .

d. Vit E .

Q15 : the Symptoms of megaloplastic anemia are similar to :

a. Typical anemia .

b. Thalassemia .

c. Bulimia .

d. Hemophilia

Key answers : 16-A 17- A 18- A 19- A

Q16 : Vit B 12 & Folate causes :

a. Paralysis .

b. Vomiting .

c. Diarrhea .

d. Coma .

Q17 : Vit B 12 associated with neuropathy :

a. True.

b. False

Q18 : Neuronal tube defect caused by a deficiency of :

a. Folate & vit B 12 .

b. Folate & vit C .

c. Nicene & folate .

d. Glucose

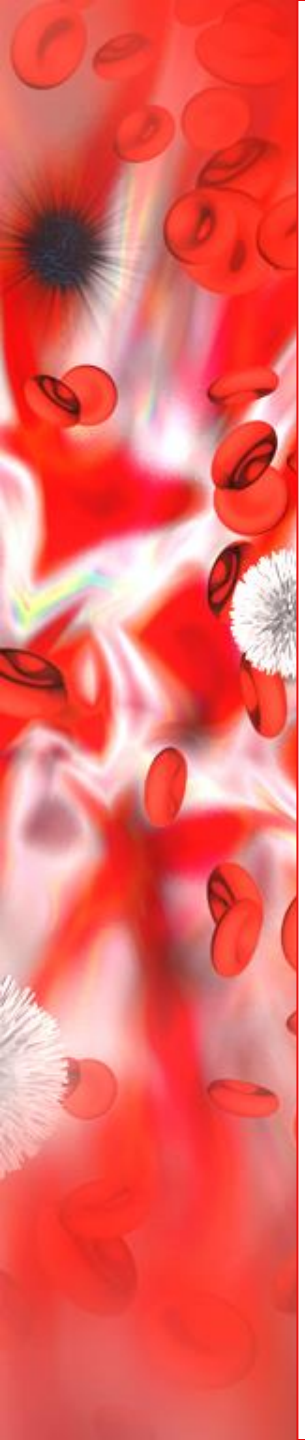
Q19 : CLEFT PALAT caused by :

a. Folate deficiency .

b. Iron lack .

c. Salmonellae .

d. Vit K excess



Key answers : 20- A 21-C 22- B 23-B

Q20 : Spinal cord defect due to :

a. Megaloplastic anemia .

b. Thalassemia .

c. IBS .

d. Sporadic .

Q21: non megaloblastic anemia is characterized by :

a. small RBCs in the peripheral blood.

b. large RBCs in the bone marrow.

c. large RBCs in the peripheral blood.

d. small RBCs in the bone marrow.

Q22: most commen cause of macrocytic anemia (macrocytosis) is :

a. liver disease.

b. alcohol.

c. pregnancy.

d. hypothirodism.

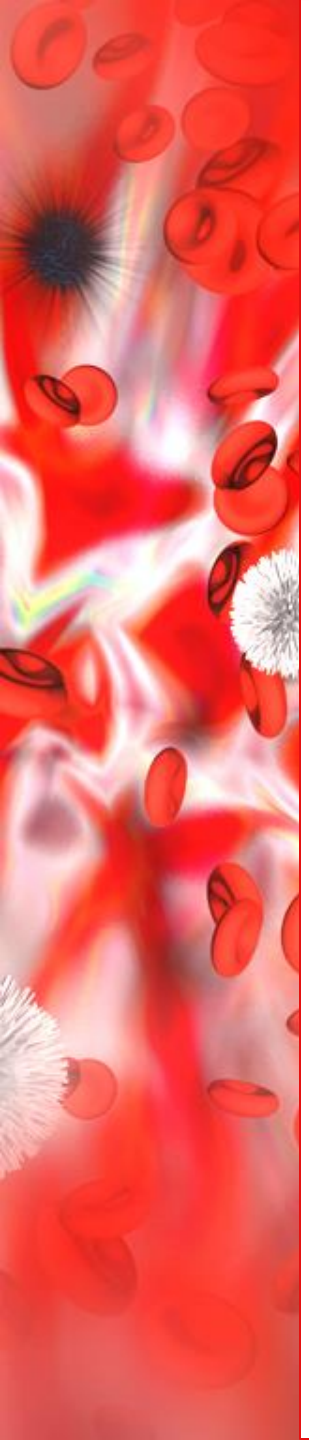
Q23: macrocytosis with normoblast can be seen in :

a. old people.

b. neonates.

c. pregnancy.

d. all of them.



Key answers : 24-A 25- C 26-B 27- D

Q24: megaloblastic anemia is characterized by :

a. large RBCs result from abnormal synthesis of DNA in bone marrow .

b. small RBCs result from abnormal synthesis of DNA in bone marrow

c. large RBCs result from abnormal synthesis of DNA in peripheral blood .

d. small RBCs result from abnormal synthesis of DNA in preipheral blood .

Q25: most commen cause of megaloblastic anemia is :

a. folate deficiency.

b. iron deficiency.

c. vitamin B12 deficiency.

d. ferritin deficiency.

Q26: hypersegemented neutrophils mainly seen in :)

a. non megaloblastic anemia.

b. megaloblastic anemia.

c. microcytic anemia.

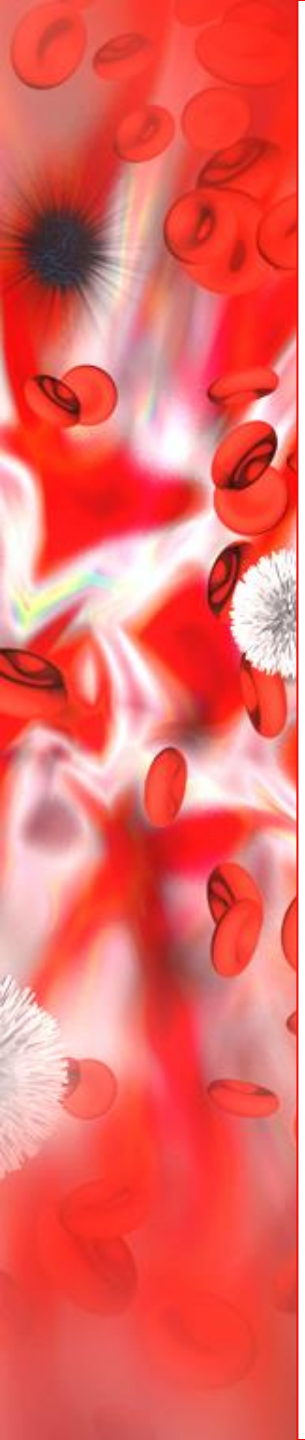
d. normocytic anemia.

Q27: time of devolop folate deficiency is : A)five years.

a. three years.

b. three months.

c. five months.



Key answers : 28-B 29-D 30-A 31-C

Q28: most commen requiretment for absorption of vitamin B12 is :

a. intestinal conjucase.

b. intrinsic factor.

c. HCl.

d. non of them.

Q29: homocystiene will be ..... in case of vitamine B12 deficiency :

a. low.

b. very low.

c. normal.

d. high.

Q30: treatment of megaloblastic anemia by :

a. Treatment of cause.

b. blood transfusion.

c. there is no treatment.

d. None of them

Q31: treatment of vitamin B12 deficiency :

a. folic acid.

b. pyridoxine.

c. hydroxocabalamin.

d. diet rich in riboflavin.

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Good luck …