

Iron metabolism and anemia

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Causes and diagnosis Iron deficiency anemia

Stomach HCL and VC Fe⁺³ to Fe⁺² (heme iron) duodenum

Duodenum

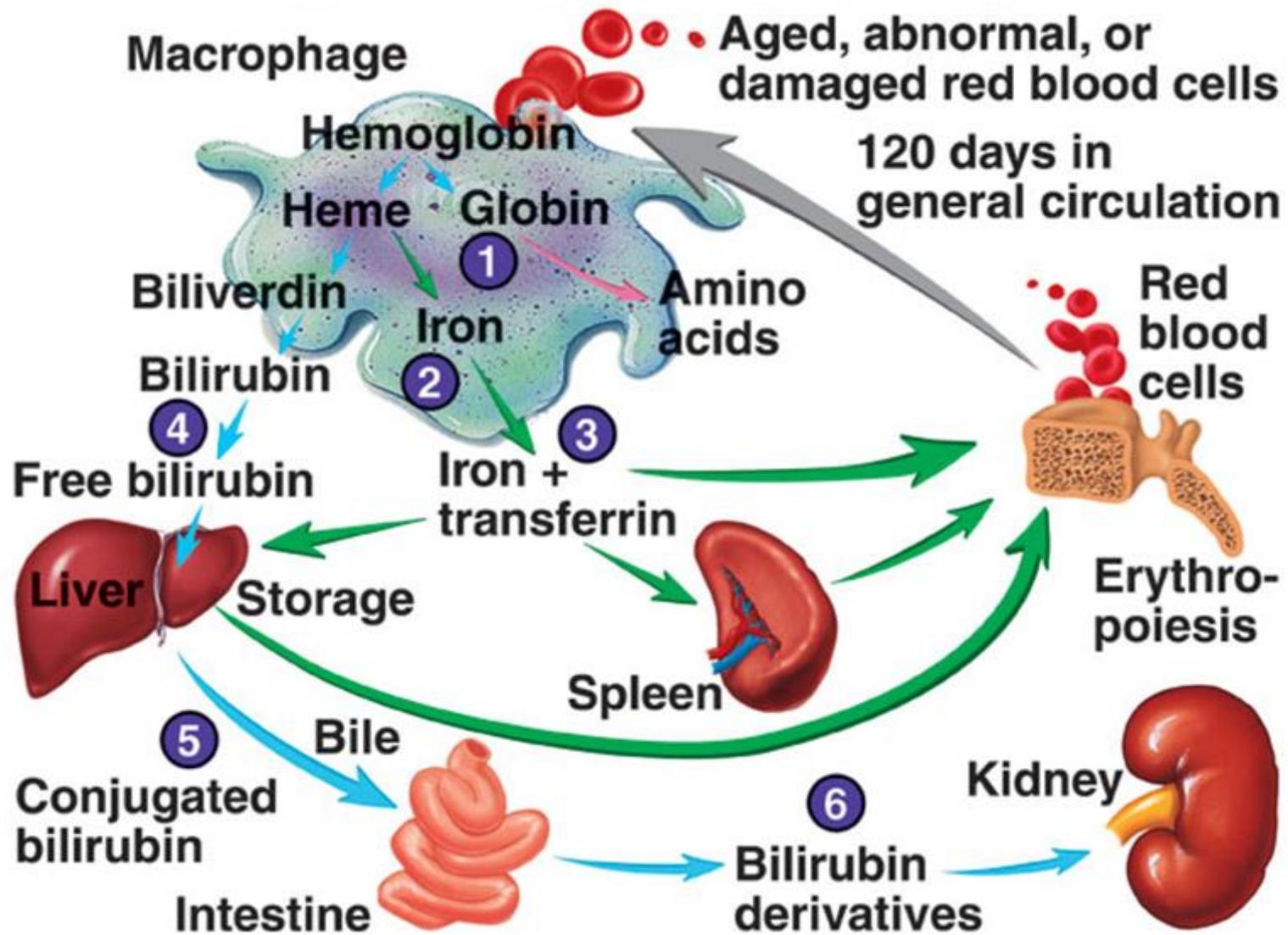
stool

Transferrin erythroid precursor or

Liver hepcidin regulator Not absorption or macrophage

Blood loss :

- GIT: peptic ulcer, NSAID, Inflammatory bowel disease ; malignancy would result in Iron deficiency anemia
- mensuration in women



Anemia of chronic inflammation

- Cytokines

Bone Marrow: insensitive to erythropoietin and
Suppression

Erythrocyte: Autolysis and Apoptosis

Spleen and liver : Storage of iron into ferritin

.All of these are strategies to prevent bacteria
from growth

Ferritin in bone marrow 1Mg 8mg of iron

Low in iron deficiency anemia

Serum iron

Low in iron deficiency anemia

low in chronic deficiency anemia

High in hemochromatosis and sideroblastic anemia

Serum total iron binding capacity (TIBC)

transferrin liver and

Fe+3 (ferric) bone marrow and duodenum

High in serum iron deficiency

Low in chronic inflammation

Iron saturation percentage (transferrin saturation)

$\text{Iron/TIBC} \times 100 = 33\%$

Decrease in iron deficiency anemia and increase in iron overload

Soluble transferrin receptors (STFR) concentration

Increase in iron deficiency anemia

Normal in chronic inflammatory disease

Iron studies

Causes of Anemia

- Production defect

Bone marrow or kidney damage (EPO) hypothyroidism (hypometabolic) low retic

- Maturation defects

cytoplasmic : Hgb: Iron , globin, DNA

nuclear: B12 and folate deficiency

- Survival defects

Intrinsic defect

Membrane Spherocytosis

Enzyme G6PD deficiency

Glycolysis: pyruvate 2ATP , 2,3BPG increase right shift

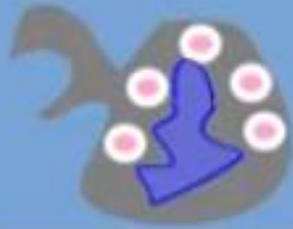
Hgb sickle disease

Extrinsic attack RBCs

Sequestration (hypersplenism) portal hypertension

Blood loss acute loss peptic ulcer disease , hemorrhagic shock

The most common cause of anemia in US is iron deficiency anemia



Features of Hemolysis



Extravascular

BOTH

Intravascular

acute

- Reticulocytosis
- Hyperbilirubinemia (indirect)
- ↑ LDH
- ↓ haptoglobin

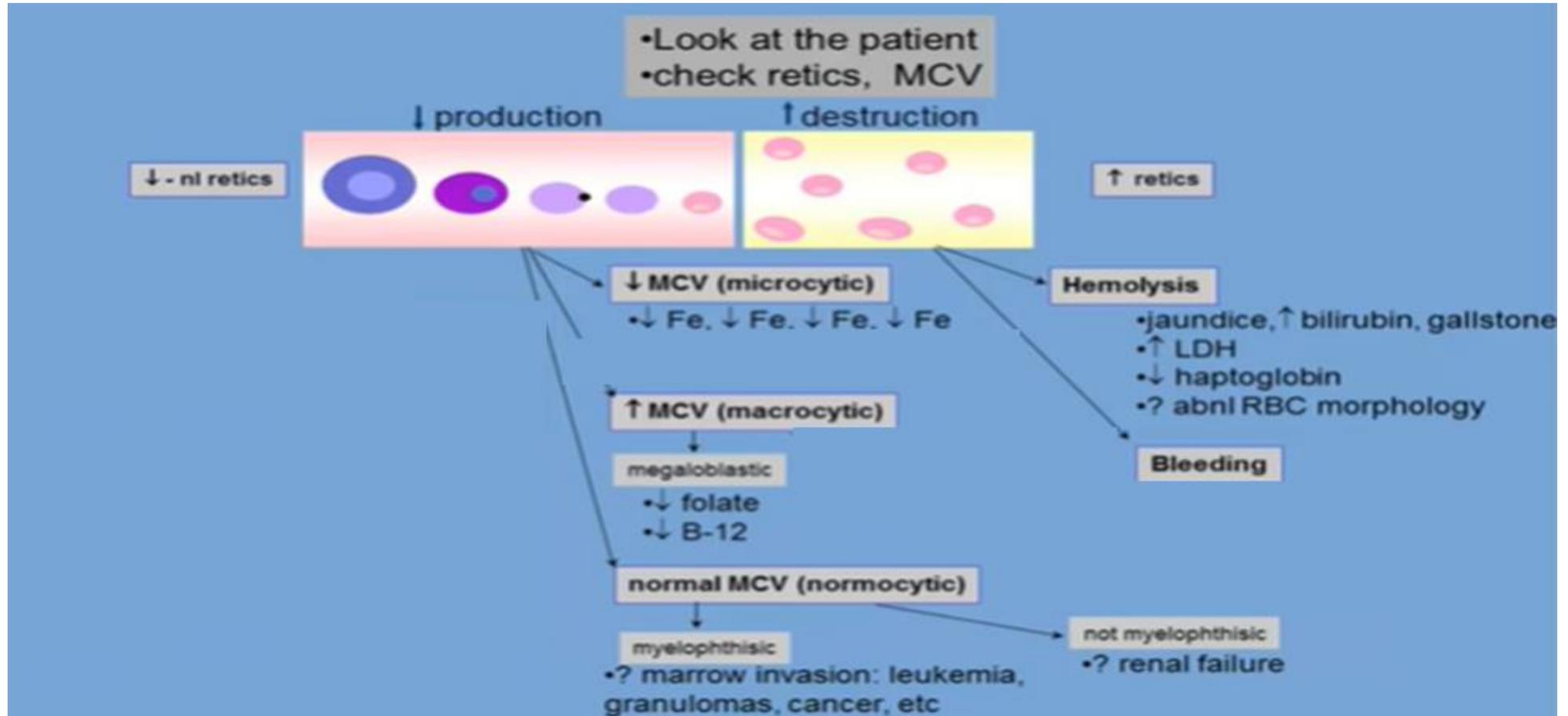
- Free hemoglobin in plasma
- Hemoglobinuria
- Hemosiderinuria

chronic

- BM erythroid hyperplasia
- ↑ folate requirement
- gall stones (bilirubin)

- Fe deficiency

How to approach Differential diagnosis of anemia



65 yr old woman with fatigue, wt loss, and night sweats.

Test ordered	Result	Units	Ref range
Hemoglobin	6.8L	g/dL	13-18
Hematocrit	22L	%	37-55
Reticulocytes	0.3L	%	0.4-1.5
MCV	93	fL	78-93
Bilirubin, total	1.2	mg/dL	0.2-1.2
Bilirubin, dir.	0.1	mg/dL	0.1-0.3
LDH	230	U/L	100-230
Haptoglobin	200	mg/dL	30-200

5 Year old boy noted by his new pediatrician to be mildly icteric. Mom says: "he's got his father's coloring."

Test ordered	Result	Units	Ref range
Hemoglobin	11.5L	g/dL	13-18
Hematocrit	35L	%	37-55
Reticulocytes	5H	%	0.4-1.5
MCV	89	fL	78-93
Bilirubin, total	1.6H	mg/dL	0.2-1.2
Bilirubin, dir.	0.3	mg/dL	0.1-0.3
LDH	380H	U/L	100-230
Haptoglobin	10L	mg/dL	30-200