Iron

Dr. Khalid

Iron

Synonym: Fe

Specimen: Serum

Reference Value: 65–175 µg/dL

Method: Spectrophotometry

Description

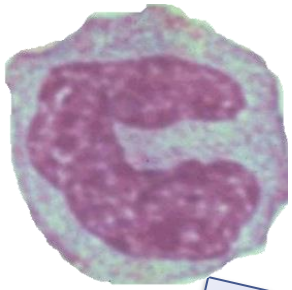
- Iron is necessary for the proliferation and maturation of red blood cells and is required for hemoglobin synthesis
- Iron travels in the blood stream bound to transferrin, a protein manufactured by the liver

Description

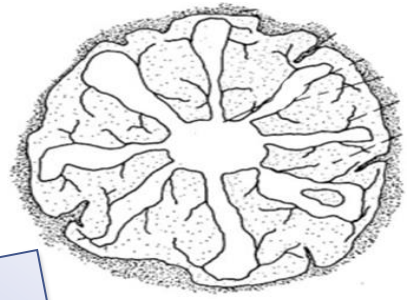
Unbound iron is highly toxic, but there is generally an excess of transferrin available to prevent the buildup of unbound iron in circulation

Indications

- Assist in the diagnosis anemia
- Assist in the diagnosis of hemochromatosis
- Determine the presence of iron poisoning
- Evaluate thalassemia and sideroblastic anemia



Storage forms:
Ferritin
Hemosiderin



Macrophage

Bone marrow

Transferrin + Fe^{2+}

Blood

Ceruloplasmin
Haephestin

Iron (Fe^{2+})

Intestine

- **Hepcidin** has been found to be the main regulator of iron homeostasis
- It is produced in the liver and changed in iron overloading (increased) or in response to anemia or hypoxia (decreased).
- Hepcidin induces the internalization and degradation of ferroportin, thereby inhibiting iron transport.

Interpretation

Increased in:

1. Acute iron poisoning (children)
2. Acute liver disease
3. Aplastic anemia
4. Excessive iron therapy
5. Hemochromatosis

6. Hemolytic anemias
7. Pernicious anemias
8. Sideroblastic anemias
9. Thalassemia

Decreased in

1. Acute and chronic infection
2. Chronic blood loss (gastrointestinal, uterine)
3. Iron-deficiency anemia
4. chronic renal failure
5. Active hematopoiesis
6. Protein malnutrition

Transferrin

Dr. Khalid

Transferrin

Synonym: Siderophilin, TRF.

Specimen: Serum

Reference Value:

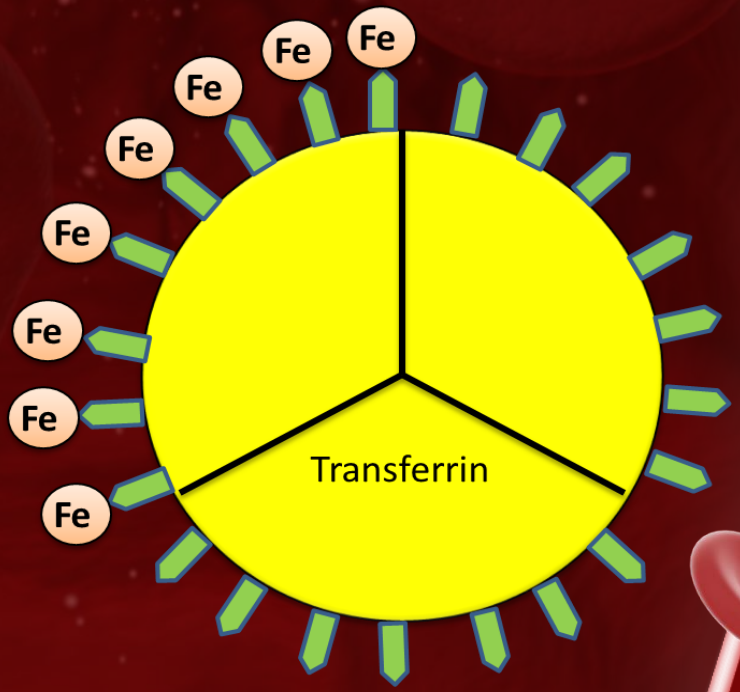
- Adult: 220–430 mg/dL:
- Newborn: 125–175 mg/dL:

Method: Nephelometry

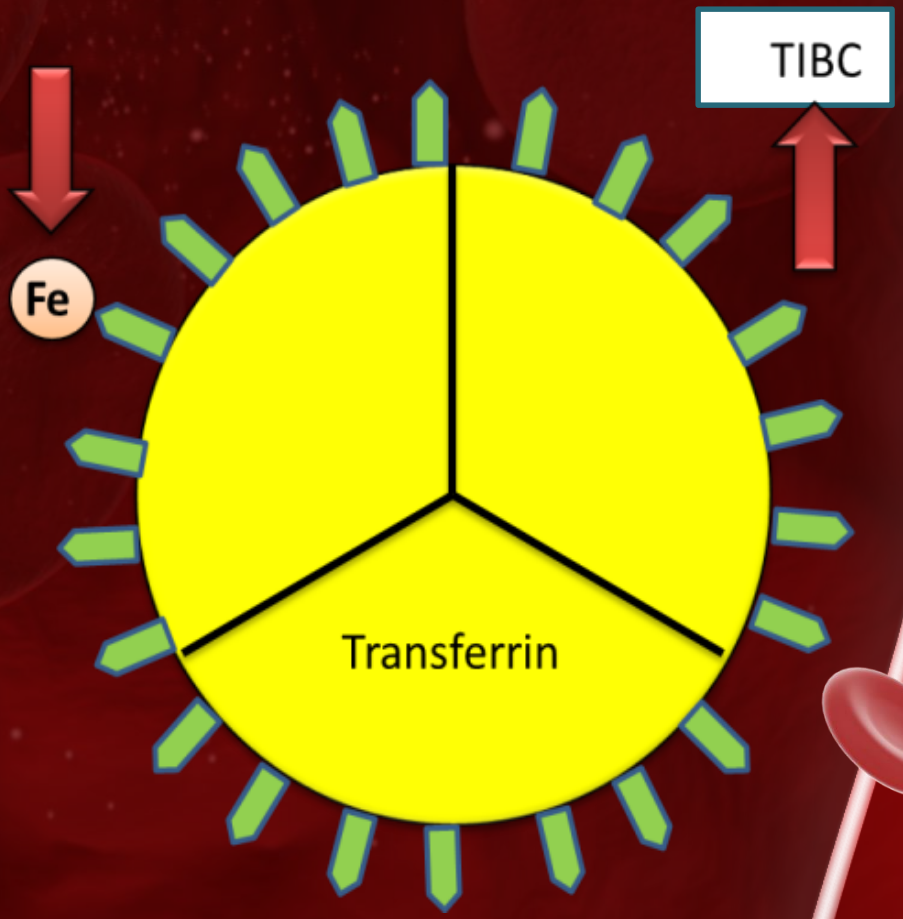
Description

- Transferrin is a glycoprotein formed in the liver.
- It transports circulating iron obtained from dietary intake and red blood cell breakdown.
- Transferrin carries 50 to 70 % of the body's iron
- Inadequate transferrin levels lead to anemia.

- 1/3 of binding sites for iron occupied
- Therefore, transferrin is 33% saturated



- Decreased serum iron
- Increased TIBC



Indications

1. Determine the iron-binding capacity of the blood
2. Evaluate iron deficiency anemia
3. Screen for hemochromatosis

Interpretation

Increased in:

- Iron-deficiency anemia

Decreased in:

- Decreased in liver damage, malnutrition, renal disease, and infection.

Total Iron-Binding Capacity

DR. KHALID

Total Iron-Binding Capacity

Synonyms: TIBC, Fe Sat.

Specimen: Serum.

Reference Value: Transferrin 200–380 mg/dL, Iron saturation 20–50%

Method: Spectrophotometry for TIBC and nephelometry for transferrin

DESCRIPTION

- Iron travels in the bloodstream bound to transport proteins.
- Transferrin is the major iron-transport protein, carrying 60 to 70 percent of the body's iron
- Total iron-binding capacity is calculated from transferrin levels

Indications

1. Iron deficiency anemia
2. Differentiate between iron-deficiency anemia and anemia secondary to chronic disease
3. Diagnosis of hemochromatosis

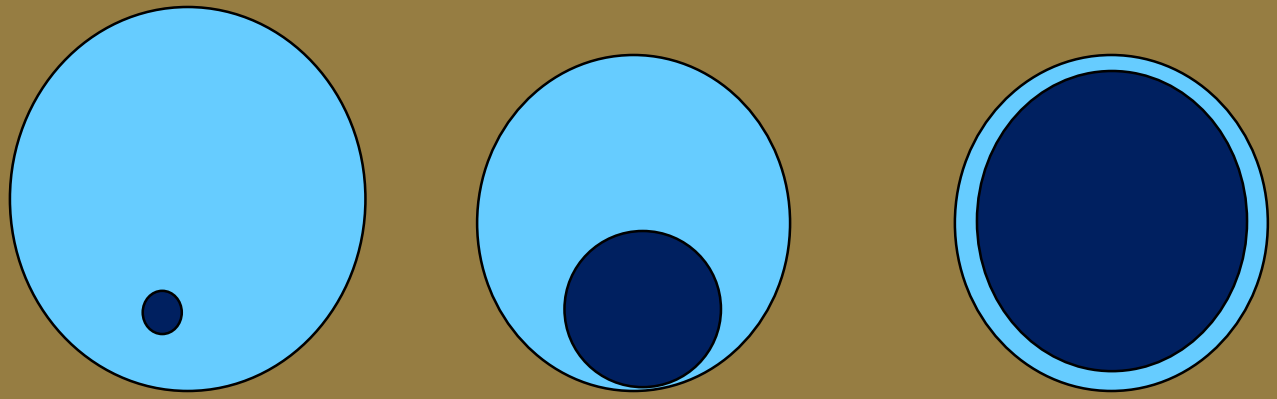
Interpretation

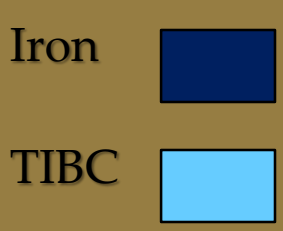
Increased in:

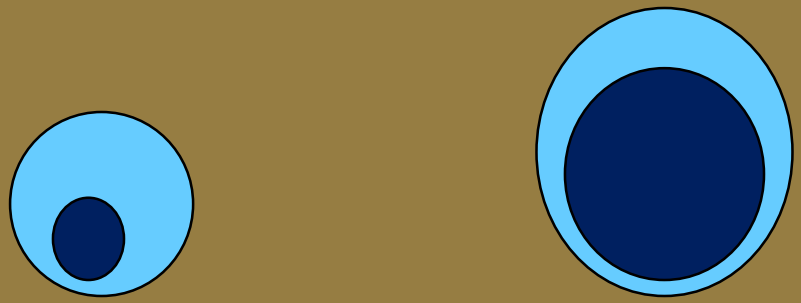
- iron-deficiency anemia
- Late pregnancy

Decreased in

1. Chronic infections
2. Cirrhosis
3. Hemochromatosis
4. Hemolytic anemias
5. Protein depletion
6. Sideroblastic anemias, Thalassemia


Iron defeciency
Normal
Hemochromatosis


Iron
TIBC


Anemia of chronic diseases
Sidroblastic anemia

Ferritinn

Dr. Khalid

Ferritin

Reference Value:

Adult:

Female: **10–150 ng/mL;**

Male: **12–300 ng/mL;**

Child >1 year: 7–140 ng/mL;

Specimen: Serum

Method: Immunoassay

Description

- Ferritin is a protein manufactured in the liver, spleen, and bone marrow, consists of a protein shell, apoferritin, and an iron core.
- The amount of ferritin in the circulation is usually proportional to the amount of stored iron (ferritin and hemosiderin) in body tissues.

- Levels vary according to age and gender
- Ferritin is a more sensitive and specific test for diagnosing iron-deficiency anemia.
- Iron-deficiency anemia in adults is indicated at ferritin levels less than 10 ng/mL; hemochromatosis or hemosiderosis is indicated at levels greater than 400 ng/mL.

Interpretation

Increased in:

- Hemochromatosis
- Hemolytic anemia
- Hemosiderosis
- Oral or parenteral administration of iron
- Thalassemia

Decreased in:

- Iron-deficiency anemia

Haptoglobin

Dr. Khalid

Haptoglobin

Synonyms: Hapto, HP, Hp.

Specimen: Serum (1 mL)

Reference Value:

- Adult: 60–270 mg/dL
- Newborn: 0–10 mg/dL

Method: Nephelometry

Description

- Haptoglobin is an α_2-globulin produced in the liver.
- It binds with the free hemoglobin released when red blood cells are lysed.
- If left unchecked, free hemoglobin in the plasma can cause renal damage; haptoglobin prevents it from accumulating.

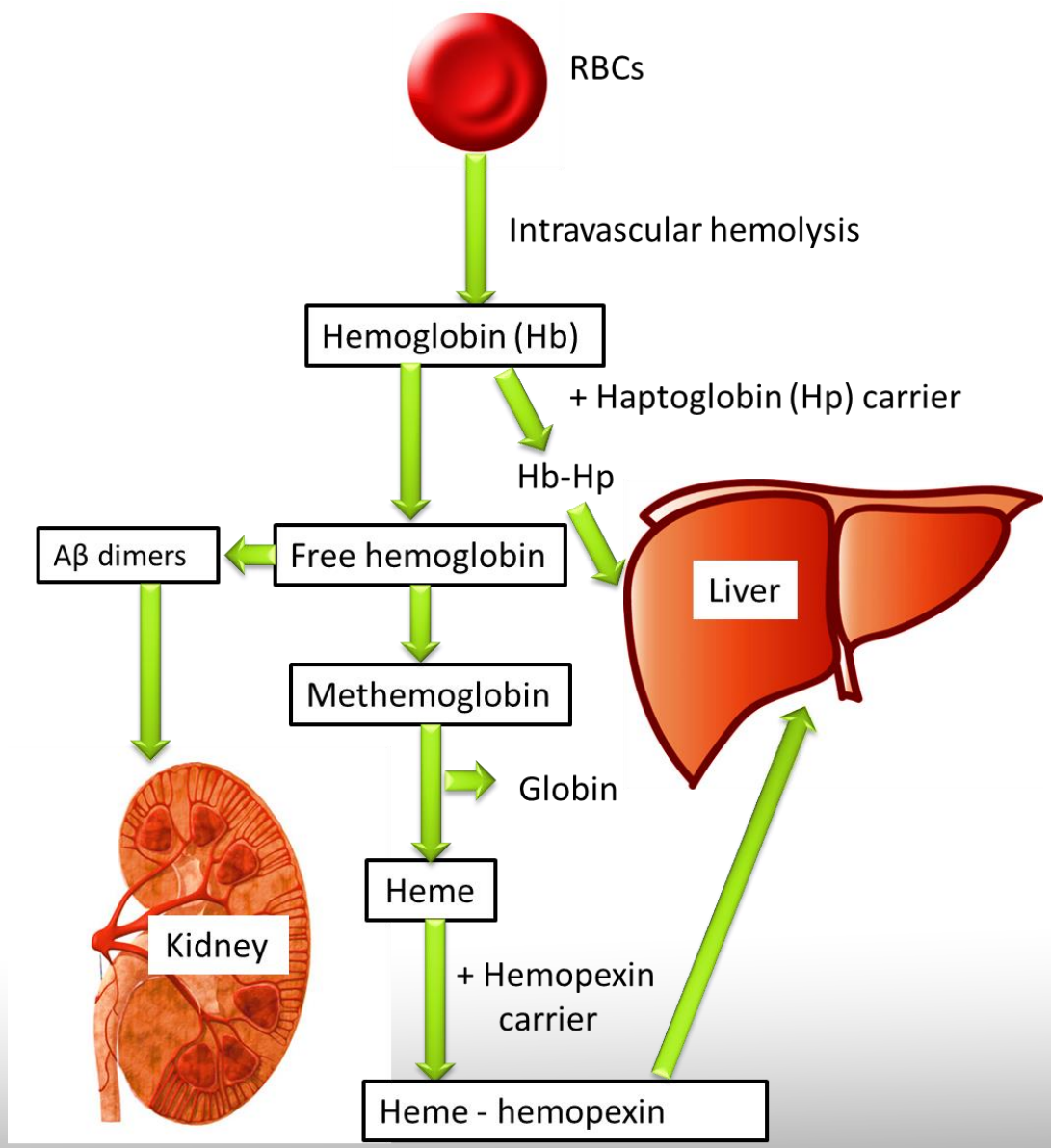
Interpretation

Increased in:

1. Biliary obstruction
2. Disorders involving tissue destruction, such as cancers, burns, and acute myocardial infarction
3. Infection or inflammatory diseases, such as ulcerative colitis, arthritis, and pyelonephritis

Decreased in

1. Autoimmune hemolysis
2. Hemolysis due to mechanical destruction (e.g., endocarditis)
3. Hemolysis due to drug reaction
4. Hemolysis due to RBC membrane defects
5. Hemolysis due to transfusion reaction
6. Hepatic disease



Intravascular erythrocyte destruction

In conditions such as hemolytic anemia, so many hemolyzed RBCs are available for binding that the liver cannot compensate by producing additional haptoglobin fast enough, resulting in low serum levels.

Hemolysis in Red cells