

HAEMATINICS

Prepared by:

N. Tejaswini
Assistant professor
Raghu College of pharmacy

Haematinics: These are the substance required in formation of blood and are used in the treatment of anemia. These drugs increase the number of red blood cells and the amount of hemoglobin to the normal level and above when they are below normal. These include: Iron, Vitamin B₁₂ and Folic acid.

Anemia: Decreased capacity of RBCs to carry oxygen to tissues.

Anemia occurs when the balance between production and destruction of RBCs is disturbed by:

(A) Blood loss (acute or chronic)

(B) Impaired red cell formation due to:

- Deficiency of essential factors, i.e. iron, vitamin B₁₂, folic acid.
- Bone marrow depression (hypoplastic anaemia), erythropoietin deficiency.

(C) Increased destruction of RBCs (haemolytic anaemia) - Iron deficiency occurs due to:

1. Malnutrition
2. Loss
3. Congenital atransferrinemia (inability to release iron from transferrin)

Types of anemia:

1. **Microlytic anemia:** Size of RBC's is less than the normal size. It occurs mainly due to iron deficiency.
2. **Macrolytic anemia:** Size of RBC's is more than the normal size. It occurs mainly due to vitamin B₁₂ deficiency and folic acid deficiency.
3. **Aplastic anemia:** Body stops producing enough RBC results in bone marrow damage.
4. **Haemolytic anemia:** It occurs when RBC's are destroyed faster than that can be replaced.
5. **Sickel cell anemia:** In this condition, the hemoglobin undergoes polymerization under low oxygen. The shape of the RBC's changes from concave to longitudinal sickle that blocks blood flow.
6. **Megaloblastic anemia:** In this condition, the erythrocytes fail to mature because of deficiency of vitamin B₁₂ or folic acid.
7. **Pernicious anemia:** It occurs due to decreased intrinsic factor.

Distribution of iron in body: Iron is an essential body constituent. Total body iron in an adult is 2.5-5 g (average 3.5 g). It is more in men (50 mg/ kg) than in women (38 mg/kg).

It is distributed into:

- Haemoglobin (Hb) : 66%
- Iron stores as ferritin and haemosiderin : 25%
- Myoglobin (in muscles) : 3%
- Parenchymal iron (in enzymes, etc.) : 6%

Daily requirement of iron: To make good average daily loss, iron requirements are:

- Adult male: 0.5--1 mg (13µg/kg)
- Adult female (menstruating): 1-2 mg (21µg/kg)
- Infants : 60µg/kg
- Children : 25µg/kg
- Pregnancy : 3-5µg/kg

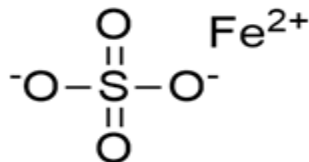
Dietary sources of iron:

- Rich: Liver, egg yolk, oyster, dry beans, dry fruits, wheat germ, yeast.
- Medium: Meat, chicken, fish, spinach, banana, apple.
- Poor: Milk and its products, root vegetables.

Treatment of iron deficiency:

- **Oral preparations can be used:** Oral preparation is present in the form of salts like: Ferrous gluconate, ferrous sulphate, Ferrous fumarate.
- **Parenteral Therapy:** Iron dextran, Sodium ferric gluconate complex, Iron sucrose.
- **Adverse effect of oral iron preparation:** Individuals differ in susceptibility like epigastric pain, heartburn, nausea, vomiting, staining of teeth, metallic taste, blotting, colic and Constipation is more common (believed to be due to astringent action of iron).

Ferrous sulphate: (FeSO₄·7H₂O)



Synonyms: Iron (II) sulphate, Green vitriol, Iron vitriol

Molecular weight: 278.02 g/mol.

Standards: It contains not less than 98% and not more than 103% of ferrous sulphate

Properties:

Appearance: White crystals (anhydrous); White yellow crystals (monohydrate); Blue green crystals (heptahydrate).

Crystal structure: Orthorhombic (anhydrous); Monoclinic (heptahydrate);

Odor: Odorless

Taste: Astringents and metallic taste

Density: 3.65 g/cm³ (anhydrous); 3 g/cm³ (monohydrate); 1.895 g/cm³ (heptahydrate)

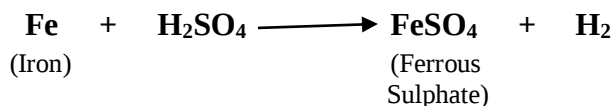
Melting point: 680°C (anhydrous); 300°C (monohydrate); 60–64°C (heptahydrate)

Solubility in water: Monohydrate: 44.69 g/100 mL (77°C); Heptahydrate: 15.65 g/100 mL (0°C); 20.5 g/100 mL (10°C); 29.51 g/100 mL (25°C); 39.89 g/100 mL (40.1°C); 51.35 g/100 mL (54°C)

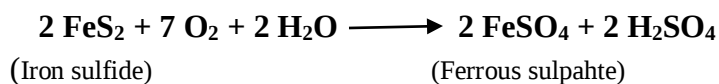
Refractive index: 1.591 (monohydrate); 1.471 (heptahydrate)

Preparation:

1. Ferrous sulphate is obtained by reaction between iron with dilute sulphuric acid. After the effervescent ceases the liquid is filtered. From the concentrated solution obtained, green crystals are separated by filtration.



2. Ferrous sulfate is also prepared commercially by oxidation of pyrite.

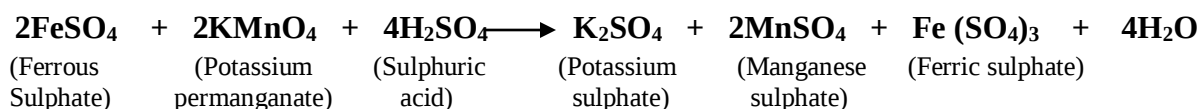


Assay: The assay is based on oxidation-reduction titration methods.

- Weight accurate about 1.0 gm of ferrous sulfate, dissolved in a mixture of 25 ml of dilute sulfuric acid and 25 ml of freshly boiled and cooled water
- Titrate with 10N Potassium permanganate.
- Potassium permanganate acts as a self indicator.

Each ml 0.02M Potassium permanganate is equivalent to 27.802 mg of FeSO₄·7H₂O (ferrous sulfate heptahydrate).

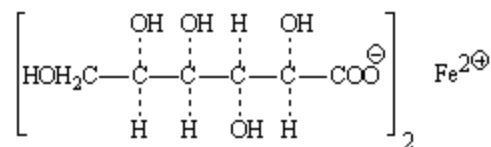
Each ml 0.02M Potassium permanganate is equivalent to 27.802 mg of FeSO₄ (Anhydrous ferrous sulfate).

**Uses:**

- Ferrous sulfate is a haematinic agent, it is used to treat and prevent iron deficiency anaemia.
- Ferrous sulfate was used in the manufacture of inks, most notably iron gall ink
- Woodworkers use ferrous sulfate solutions to color maple wood a silvery hue.
- In horticulture it is used for treating iron chlorosis.
- Ferrous sulfate is sometimes added to the cooling water flowing through the brass tubes of turbine condensers to form a corrosion resistant protective coating.
- It is used in gold refining.
- Green vitriol is also a useful reagent in the identification of mushrooms.

Storage: Store in amber color bottle or light resistant container.

Dose: 60 mg to 600 mg

Ferrous gluconate: (C₁₂H₂₂FeO₁₄)

Molecular weight: 446.14 g/mol

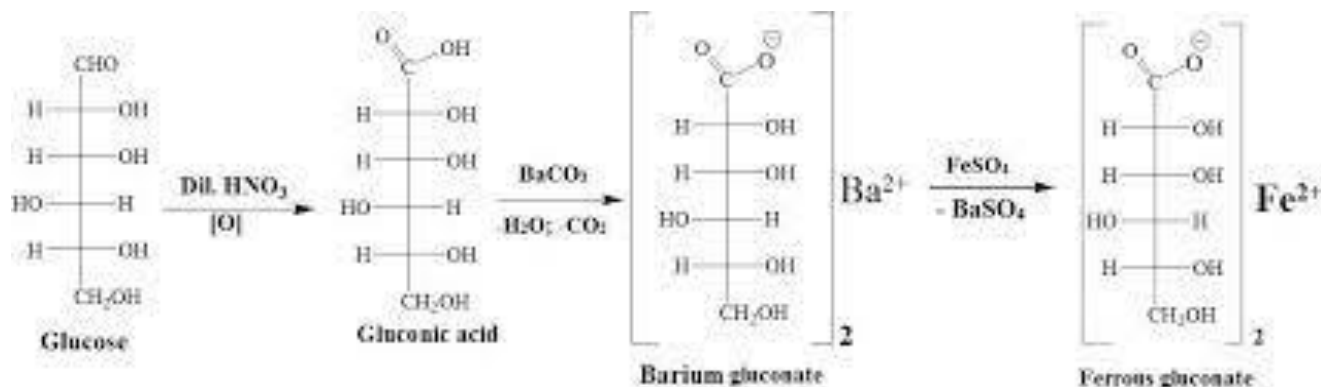
Standards: It is having not less than 95% of ferrous gluconate.

Properties:

- **Appearance:** A greenish-yellow to grey fine powder or granules
- **Odor:** Slight caramel odor or slight odor like burnt sugar
- **Taste:** Caramel test
- **Melting point:** 188⁰C
- **Solubility:** Freely but slowly soluble in water giving a greenish-brown solution, more readily soluble in hot water, practically insoluble in alcohol, but soluble in glycerin.

Preparation:

1. Gluconic acid is first prepared by oxidation of glucose by dilute nitric acid, and then gluconic acid is treated with barium carbonate. So barium carbonate is formed which when treated with ferrous sulphate solution. Barium sulphate will be precipitated out. The barium sulphate is filtered and clear filtrate is concentrated and cooled. Precipitates of ferrous gluconate will be obtained that will be filtered.

**Uses:**

- Ferrous gluconate is effectively used in the treatment of hypochromic anemia.
- Ferrous gluconate is also used as a food additive when processing black olives.

Dose:

- Men: 8 mg/day
- Women 18 mg/day
- Pregnant women: 27 mg/day
- Lactating women: 9 mg/day

Storage: Stored in a well closed container protected from air and light.

