

CHAPTER – 5 HAEMATINICS

Agents used for formation of blood to treat various types of anaemia's called Haematinics. These include: Zinc, Copper, *Iron, Vitamin B₁₂ and Folic Acid*.

ANAEMIA

- Decreased capacity of RBCs to carry oxygen to tissues.
- Anaemia 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 Anaemia:

1. Microcytic hypochromic – mainly due to iron deficiency.
2. Macrocytic/megaloblastic – mainly due to deficiency of vitamin B₁₂ and folic acid
3. Haemolytic Anaemia
4. Pernicious Anaemia – decreased intrinsic factor

HAEMATOPOIESIS

The production of circulating erythrocytes, leukocytes and platelets from undifferentiated stem cells, is called haematopoiesis. It requires:

1. Iron – for Hb formation
2. Vitamin B₁₂
3. Folic acid
4. Hematopoietic growth factors
5. Proteins that regulate the proliferation and differentiation of hematopoietic cells.

Classification of the Haematinics: - On the basis of dosages and activity it is mainly divide into three categories.

1. Iron containing substances: - on the basis of dose administration it is divide into two parts-

a. Oral iron: Ferrous fumarate, ferrous sulphate, Carbonyl iron, Ferric ammonium citrate.

b. Parenteral: Iron dextran, ferrous sucrose.

2. Maturation activity: - Example- Vitamin B12, folic acid.

3. Haematinics adjuvant: - Example- copper, pyridoxine, riboflavin.

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%

Note: Haemoglobin is a protoporphyrin; each molecule having 4 iron containing haeme residues. It has 0.33% iron; thus loss of 100 ml of blood (containing **15 g Hb**) means loss of 50 mg elemental iron. To raise the Hb level of blood by 1 g/ dl about 200 mg of iron is needed. Iron is stored only in ferric form, in combination with a large protein apoferritin.

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

1. Rich: Liver, egg yolk, oyster, dry beans, dry fruits, wheat germ, yeast.

2. Medium: Meat, chicken, fish, spinach, banana, apple.

3. Poor: Milk and its products, root vegetables.

FACTORS FACILITATING IRON ABSORPTION

- Acid:** Acid enhances dissolution and reduction of ferric iron.
- Reducing Substances:** Ascorbic acid reduces ferric iron and forms absorbable complexes
- Meat:** Meat also facilitates iron absorption by increasing HCl secretion
- Pregnancy/ Menstruation:** Due to increased iron requirement

FACTORS IMPEDING IRON ABSORPTION

- **Phosphates:** Phosphates are present in egg yolk.
- **Phytates:** Phytates occur in wheat and maize
- **Alkalies:** Alkalies form non-absorbable complexes as well and oppose the reduction
- **Tetracyclines:** Tetracyclines impede absorption.

ELIMINATION OF IRON

- ❖ No mechanism is present for elimination of iron from body except exfoliation of intestinal cells. Trace amounts of iron are lost in faeces, urine, bile and sweat.
- ❖ Less than 1 mg/day of iron is lost.

IRON DEFICIENCY ANAEMIA

Iron deficiency anaemia manifests as ***hypochromic, microcytic anaemia***, in which:

- (i) Erythrocyte mean cells volume is low
- (ii) Mean cell Hb concentration is low

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.

Ferrous Sulphate

Chemical formula- **FeSO₄**

Molar mass-151.91g/mol.

Ferrous sulphate is an iron salt preparation which is used to management the iron deficiency symptoms. It is popularly known as green vitriol, Melanterite, Copperas. Its hydrated form is used medically to treat iron deficiency, and also for industrial applications.

Properties: -

Color and state: It are the white crystals powder but their heptahydrate form is shows blue-green color.

Odor and taste: It are odorless with metallic taste.

Solubility: it is soluble in water but in alcohol, ethylene glycol it shows negligible solubility.

• Chemically it is a reducing agent so in pharmaceutical it reduces the other substance in useful form.

Pharmaceutical preparation: Pharmaceutically it is prepared in the form of tablet, capsule, syrup, pills oral drop etc.

Brand/Market Name: Feosol, E-Folifer kid etc.

Storage condition: It is stored in well closed air resistance unopened container and keep away from incompatible materials at room temperature and also away from the light and moisture.

Uses/Applications:

- Ferrous sulfate (or sulphate) is a medicine used to treat and prevent iron deficiency anemia.
- Ferrous sulfate provides the iron supplement during the pregnancy and maintains the iron status in both child and mother.
- Its preparations are highly required during the menstruation.