Haematinics

- an agent that stimulates the production of red blood cells or increases the amount of haemoglobin in the blood.
- used to treat iron deficiency anemia.
- These agents are Iron (Fe), Cobalt (Co), Zinc (Zn), Vit-B12, Folic acid and erythropoietin that are essential for normal erythropoiesis.

Iron (Fe)

- Iron is stored in intestinal mucosal cells as ferritin (an iron-protein complex).
- Required for hemoglobin production.
- Haemoglobin is required for oxygen delivery from lungs to peripheral tissues.
- Average daily diet contain 10- 20mg of iron.
- Daily iron requirement
  - ✓ Adult male : 0.5-1 mg (13 µg/kg)
  - ✓ Adult female (menstruating) : 1-2 mg (21 µg/kg)
  - ✓ Infants : 60 µg/kg
  - ✓ Children : 25 µg/kg
  - ✓ Pregnancy (last 2 trimesters) : 3-5 mg (80 µg/kg)

Oral iron

- The preferred route of iron administration is oral.
- A wide variety of preparations are available: ***Ferrous Sulphate, Ferrous Gluconate, Ferrous Fumarate***
- Dissociable ferrous salts are inexpensive, have high iron content and are better absorbed than ferric salts, especially at higher doses.
- Iron should be continued for 3-6 months after the Hgb level has returned to normal to replenish iron sores.

Simple oral Preparations

1. Ferrous sulfate: (hydrated salt 20% iron, dried salt 32% iron) is the cheapest; may be preferred on this account. It often leaves a metallic taste in mouth.
2. Ferrous gluconate (12% iron)
3. Ferrous fumarate (33% iron): is less water soluble than ferrous sulfate and tasteless.
4. Colloidal ferric hydroxide (50% iron)
5. Others
   - Ferrous succinate (35% iron)
   - Ferrous aminoate (10% iron)
   - Iron choline citrate
   - Ferric glycerophosphate
   - Iron calcium complex (5% iron)
   - Iron hydroxy polymaltose
   - Ferric ammonium citrate (scale iron)

Adverse effects of iron

- Gastrointestinal disturbances
- ✓ Epigastric pain, heartburn, nausea, vomiting, staining of teeth, metallic taste
- ✓ Constipation is more common.

Indication or use of iron

- Iron deficiency anaemia
- In children during rapid growth period
- In pregnant mother

Parenteral Iron

Iron therapy by injection is indicated only when:

- Oral iron is not tolerated: bowel upset is too much.
- Failure to absorb oral iron: malabsorption; inflammatory bowel disease. Chronic inflammation (rheumatoid arthritis) decreases iron absorption, also the rate at which iron can be utilized is decreased.
- Non-compliance to oral iron.
- In presence of severe deficiency with chronic bleeding.
- Along with erythropoietin: oral iron may not be absorbed at sufficient rate to meet the demands of induced rapid erythropoiesis.

Parenteral Iron Preparation

1. Iron-dextran: as a colloidal solution containing 50 mg elemental iron/ml is the preparation of choice
2. Iron-sorbitol-citric acid complex: 50 mg iron/ ml

- Parenteral iron therapy needs calculation of the total iron requirement of the patient.

$$\text{Iron requirement (mg)} = 4.4 \times \text{body weight (kg)} \times \text{Hb deficit (g/dl)}$$

- The i.m. dose of both iron-dextran and iron- sorbitol is 30% higher than the calculated requirement of a patient.
- A test dose of the preparation (few drops) must be injected first to screen sensitive patients.

Adverse effect of parenteral iron

1. **Local:** Pain at site of i.m. injection, pigmentation of skin, sterile abscess-especially in old and debilitated patient.
2. **Systemic:** Fever, headache, joint pains, flushing, palpitation, chest pain, dyspnoea, lymph node enlargement. A metallic taste in mouth lasting few hours occurs with iron-sorbitol injection.

- anaphylactoid reaction-rare. (Iron sorbitol causes more immediate reactions than iron-dextran.)
- Iron-sorbitol should be avoided in patients with kidney disease.

Acute Iron Poisoning

- It occurs mostly in infants and children: 10-20 iron tablets or equivalent of the liquid preparation (> 60 mg/kg iron) may cause serious toxicity in them.
- It is very rare in adults.
- Manifestations are vomiting, abdominal pain, haematemesis, diarrhoea, lethargy, cyanosis, dehydration, acidosis, convulsions; finally shock, cardiovascular collapse and death.

Treatment

A. To prevent further absorption of iron from gut

✓ Induce vomiting or perform gastric lavage with sodium bicarbonate solution-to render iron insoluble.

✓ Give egg yolk and milk orally: to complex iron. [Activated charcoal does not adsorb iron.]

B. To bind and remove iron already absorbed

- *Desferrioxamine* (an iron chelating agent) is the drug of choice.
- Alternatively DTPA or calcium edetate may be used if desferrioxamine is not available.

C. Supportive measures

- Maintainance of Fluid and electrolyte balance / acidosis.
- Respiration and BP may need support.
- Diazepam i.v. should be cautiously used to control convulsions

Vitamin B12

- water-soluble vitamin with a key role in normal functioning of the brain and nervous system and for the formation of blood.
- Require intrinsic factor for absorption. (Deficiency of vit B12 due to lack of intrinsic factor: pernicious anaemia)
- It cannot be produce in our body.
- Liver, kidney, sea fish, egg yolk, meat, cheese are the main vit B12 containing constituents of diet.
- Daily requirement: 1-3 µg; pregnancy and lactation 3-5 µg.
- Preparation: Cyanocobalamin, Hydroxocobalamin Methylcobalamin

Uses

- Treatment of Vit B12 deficiency

Megaloblastic/pernicious anaemia

- Neuropathies, pyschiatric disorders
- Tobacco amblyopia: traps cyanide derived from tobacco to form cyanocobalamin

Adverse effects

- Even large doses of vit B12 are quite safe.
- Allergic reactions have occurred on injection, probably due to contaminants.
- Anaphylactoid reactions (probably to sulfite contained in the formulation) have occurred on i.v. injection: this route should not be employed.

Folic Acid

- Folic acid or folate is a Vitamin B.
- Dietary sources: Liver, green leafy vegetables (spinach), egg, meat, milk.
- The primary use of folic acid is in treating deficiency states that arise from inadequate levels of the vitamin.
- A primary result of folic acid deficiency is megaloblastic anemia (large-sized red blood cells)
- **Daily requirement** of an adult is < 0.1 mg but dietary allowance of 0.2 mg/ day is recommended.
- During pregnancy, lactation or any condition of high metabolic activity, 0.8 mg/ day is considered appropriate.

Folate deficiency may be caused by

1) increased demand (for example, pregnancy and lactation),
2) poor absorption caused by pathology of the small intestine,
3) Chronic alcoholism, or
4) treatment with drugs that are dihydrofolate reductase inhibitors (for example, methotrexate or trimethoprim).,

Uses

- Megaloblastic anaemias due to:
  - ✓ Nutritional folate deficiency
  - ✓ Increased demand: pregnancy, lactation
  - ✓ Pernicious anaemia
  - ✓ Malabsorption syndromes
  - ✓ Antiepileptic therapy
- Prophylaxis: during pregnancy to reduce the risk of neural tube defects in the newborn.
- Methotrexate toxicity

Adverse effects

- Oral: safe
- Injection: sensitivity reaction