Haematinics

Hematinics/Haematinics are those substance which are required in the formation of blood and are used for the treatment of anemia.

Anaemia/Anemia –

It is a low blood level in our body due to loss of blood or mainly loss of RBC.

Reason behind Anemia–

- Blood loss (acute/chronic)
  eg- Trauma, haemorrhage etc.
- Decreases in RBC formation.
  – deficiency of essential factors such as

Iron, Vit B_{12} (cobalamine), folic acid (vit B_9)

- Iron → Iron deficiency anemia
- Vit B_{12} → Pernicious anemia
- folic acid (folate) → Megaloblastic anemia

- Bone marrow depression, Erythropoetin deficiency → ↑ Production of RBC
- ↑ Distruction of RBCs → Hemolytic anemia.

- Essential Haematinics →

Those which are used as Haematinics.

Iron, Vitamin B_{12}, folic acid

① Iron —

It is an important essential body Constituent.

Total body iron → 2·5 – 5 gm

- Iron is essential for haemoglobin producti

RBC — Contain → Hemoglobin (Hb)

Heme → Blood

Globin → Protein

Distribution of Iron in body—

* Hemoglobin (Hb) — 62 %.
* Iron Stores as ferritin & haemosiderin — 25 %.
* Myoglobin (in muscles) — 7 %.
* Enzymes (Cytochromes etc) — 6 %.

⇒ Iron is stored in our body in ferric form in combination with large protein apoferritin.

Fe^{3+} + Apoferritin → ferritin → aggregates → Haemosiderin

(Fe^{3+} ↓ ferric form of iron.)

→ 100 ml blood → Contain about 15gm of Hb ↓ 50 mg of elemental iron

→ To raise the Hb level of blood by 1g/dl — About 200mg of iron is needed.

Daily iron requirement →

Adult male — 0.5–1 mg
Adult female — 1–2 mg (menstruating)
Children — 25 µg/kg
Pregnancy — 3–5 mg

Dietary sources of iron —

- Rich – Liver, egg yolk, dry fruits
- Medium – Meat, chicken, fish, banana etc
- Poor – Milk and its product, root vegetables.

Iron Absorption →

⇒ Normally Iron is introduced through Dietary sources, Dietary iron is present either as heme or as inorganic iron.

⇒ Heme directly absorb into mucosal cell (intestine) through HCP, (Heme Carrier protein) and inorganic firstly dissociate and convert into ferrous form (Fe^{2+})

⇒ This fe^{2+} absorb through DMT, (Divalent metal transport 1) in to mucosal cells.

⇒ Now some of ferrous ion convert into ferric form (fe^{3+}) and stored in the form of ferritin in mucosal cell and mostly left (ferrous ion) enter into blood plasma through fp (ferroportin)

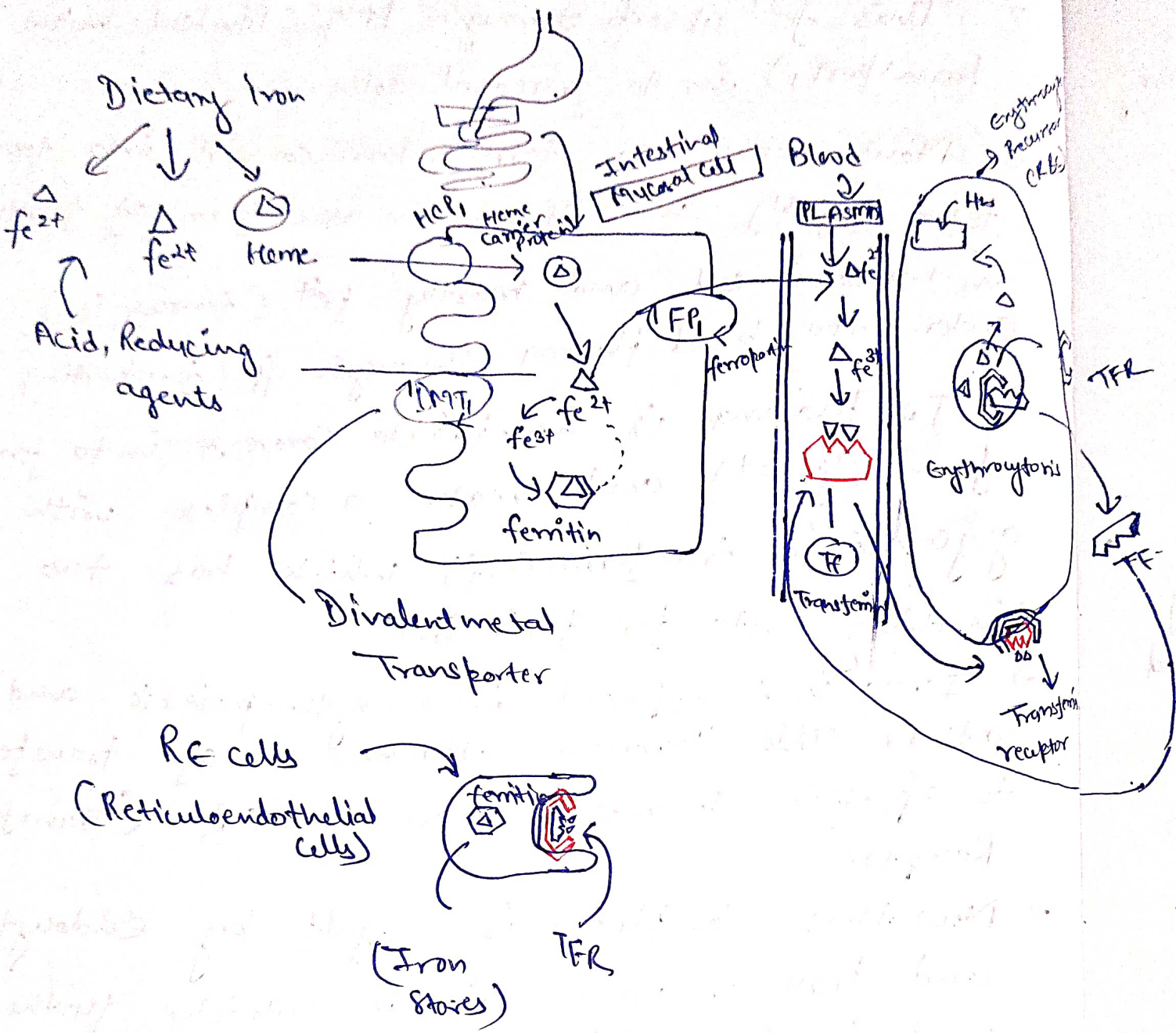
⇒ In plasma it immidiate convert in to ferric form (fe^{3+}) and make a complex with glycoprotein tranferrin (Tf) which has two binding site for ferric ions.

⇒ Iron is transported into erythropoietic and other cells through attachment of transferrin to specific membrane bound TFRs (Transferrin Receptors)

⇒ Now this complex is engulf by endocytosis and iron released inside which further used in the synthesis of hemoglobin (Hb)
Tf and TfR return to its position.

⇒ ~~Tf and TfR~~ Storage is stored in RE cells (in liver, spleen, bone marrow) as ferritin and hemosiderin.

⇒ Excreation - Mainly through faeces, Little in Urine and sweat.



IRON INTESTINAL ABSORPTION

Prepration of Iron

① **Oral iron** – Preferred route

eg- ferrous sulphate, ferrous gluconate, ferrous fumarate, ferrous succinate etc

Adr →

Nausea Vomiting
Metallic taste
Constipation etc

② **Parenteral iron** –

⇒ Given parenterally as deep IM or IV route.

⇒ Given parenterally if—

⇒ failure to absorb oral iron

⇒ severe deficiency with chronic bleeding

⇒ Oral iron is not tolerated.

Adr –

⇒ Headache, Joint pain, Palpitation, Nausea.

⇒ Pain at the site of injection.

⇒ Pigmentation of skin

Uses of iron

- Used in the treatment of Iron deficiency anemia.
- Increased iron requirement, during Pregnancy professional blood donor etc.
- Prophylaxis of anemia.

Acute iron poisoning –

Overdose of iron can cause toxicity in body & known as acute iron poisoning.

- It is mostly common in infants and children.
- 1-2 gm can be dangerous

Symptoms –

Vomiting, Abdominal pain, Diarrhoea, drowsiness etc.

Treatment –

Gastric lavage with sodium bicarbonate

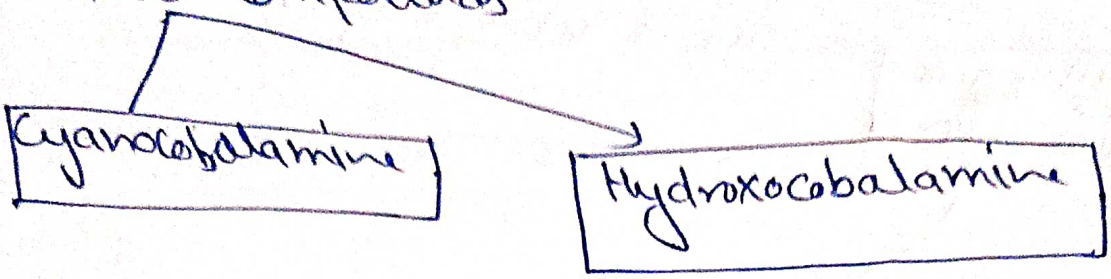
Antidote –

Desferrioxamine

(Prevent iron absorption.

* Vit B_{12} (Cyanocobalamine)

two Compounds



→ They can be synthesized by microorganism.

→ Daily requirement is about 1-3 µg

→ Dietary sources → Liver, kidney, seafish, egg yolk, meat cheese.

→ Essential for normal DNA synthesis

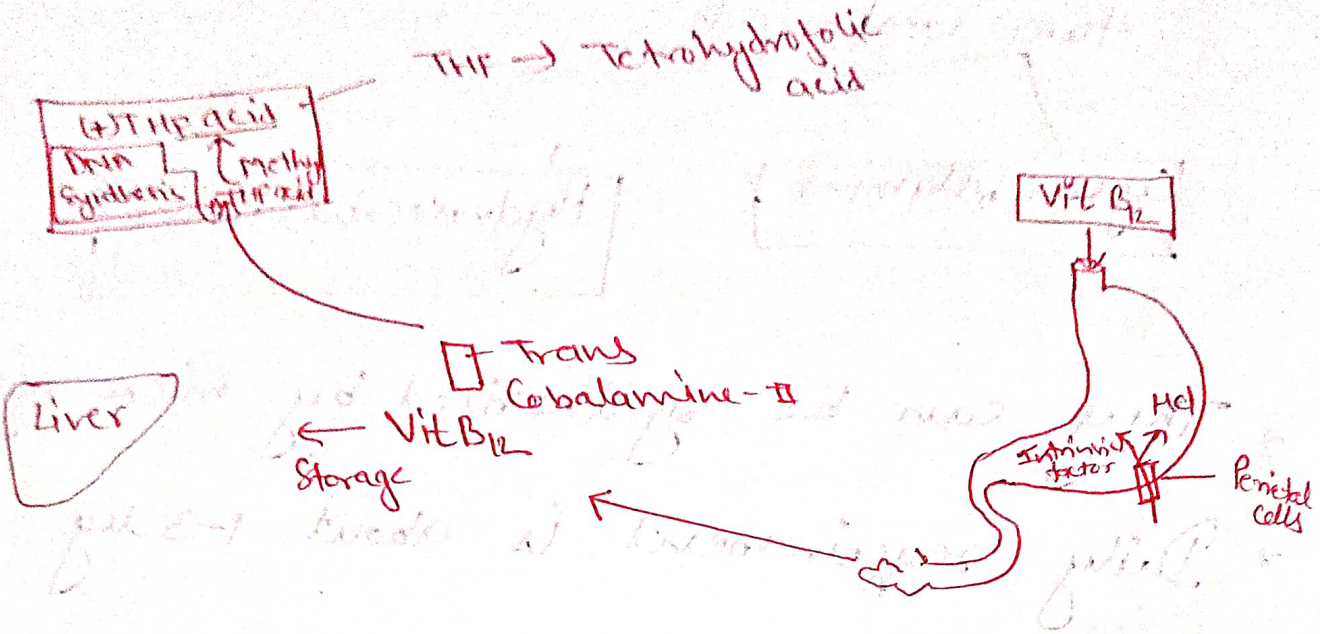
→ Deficiency occurs due to —

— Destruction of peital cells cause inability to absorb vit B_{12}

— Chronic gastritis (gastric mucosal damage), nutritional deficiency.

— ↑se demand (during Pregnancy)

* Pharmacokinetics -



» Vit B_{12} is absorbed in intestine with the help of intrinsic factor (from the parietal cells)

» Then it transported in to blood by Trans Cobalamine II to liver for storage (up to 3 years) and to Erythropoetic cells to convert Methyltetrahydrofolic acid to Tetrahydrofolic acid which helps in DNA synthesis

» Excreted through bile acid

Preparation

Absorb through I.M or deep s.c injection.

→ Cyanocobalamine

→ Hydroxocobalamine

Also given in combination with other vitamin

Uses →

→ Treatment of Vit B_{12} deficiency.

→ Treatment of megaloblastic anemia.

→ Treatment of pernicious anemia

Folic acid - Folate / Vit B_9

Chemically it is

Pteroyl glutamic acid (PGA)

Consist of

Pteridine + Paraaminobenzoic acid (PABA) + glutamic acid

→ Dietary sources -

Liver, green vegetables, egg, meat, yeast etc.

→ Daily requirements - 0.2 mg/day

→ Present in food as polyglutamates.

→ Absorption through duodenum and Jejunum