

Hematopoietic Drugs

Anemia

Topic 5a
No Chapter in Text



RBC Production Needs

To produce red blood cells these 4 components are necessary in adequate amounts

- Iron (food)
 - essential part of hemoglobin and is critical for oxygen transport
- Erythropoetin (kidney)
- Intrinsic factor (stomach)
- Folic acid (food)



Iron Loss & Absorption

- Average loss 1mg/day + 0.5mg/day in females + 15mg with menses
- 10% of total Fe⁺⁺ ingested is absorbed
- Absorption increased with
 - gastric acidity and ascorbic acid (Vit C)
 - pregnancy and growth spurts
 - deficiency present



Deficiency Risks

- **Infants**
 - Use of cow's milk before 1 yr age
 - Formulas are fortified with iron & vitamins
 - < 2yrs age
- **Adolescents**
 - Growth spurts
 - Poor nutritional intake
- **Women 20%**
 - Pregnancy 50%
 - Menses
- **Men 3% and elderly**



Dietary Iron

- **Average good diet contains 12-15mg day**
 - 10% of total ingested is absorbed unless iron deficiency present then absorption increases
- **Sources**
 - Best--animal (liver and organ meats)
 - Good--cereals, dried peas/beans/fruit, green leafy vegs, shellfish, enriched grains (wheat germ, whole grains), breads, nuts and seeds (cashews, pistachios, walnuts, pumpkin) and molasses
- **Fortified food and formula for infants**



RDA for Iron p.779

- **Infant to 6 mos: 10mg**
- **6 mos to 3 yrs: 15mg**
- **4-10 yr: 10mg**
- **Male 11-18yr: 18mg**
- **Male 19+ yr: 10mg**
- **Female 11-50 yr: 18mg**
- **Female 51+ yr: 10mg**
- **Pregnancy, lactation: 30-60mg**



Iron Storage & Loss

- ~75% of iron in hemoglobin in the rbc
- 25% stored in liver, bone marrow and spleen as ferritin and hemosiderin
- Ferritin level reflects body stores of iron; when depleted stores must be built back up
- Iron is needed for O₂ transport, brain functioning, immune system & neurotransmitter functioning
- 75% of the iron deficiency is linked to blood loss, IDA or chronic anemia



Anemia Pathologic Causes

- Anemia is a SIGN not a diagnosis
- Must diagnose the ETIOLOGY in order to treat anemia correctly
- Etiology of Anemia:
 - decreased rbc production
 - increased rbc destruction
 - increased blood loss



Anemia Morphologic Classifications

- size & color of rbc determine type of anemia
- use rbc indices (listed under cbc) to determine type of anemia-MCH, MCV
 - macrocytic (increased size)
 - microcytic (decreased size)
 - normocytic (normal size)
 - hypochromic (decreased color)



Common Anemias

- **Microcytic-hypochromic (↓ MCV, ↓ MCH)**
 - Iron deficiency anemia (IDA)
- **Macrocytic Anemia (↑ MCV)**
 - B12 deficiency (pernicious anemia)
 - Folate deficiency (folic acid)



IDA (Microcytic) Iron Supplementation

- Need 200mg elemental Fe QD—only 10% absorbed
 - Ferrous sulfate has 20% elemental Fe
 - 325mg (65mg) = tid 180mg elem Fe
 - Ferrous gluconate has 10% elemental Fe
 - 325mg (35mg) = tid 100mg elem FE
 - Ferrous fumarate has 33% elemental iron
 - Ferrous absorbed 3x > than ferric
- PO, IM--test dose using “Z” track
- Continue Rx 3-6 mos
 - Retics increase 3-4 days (1st to react) peak 7-10day;
 - Hgb increase 1-2g/dL/wk; resolved 1-2 mos,



Iron+ Combinations

- Vitamin C, 1 gm increases Fe absorption by 10% more
- Suboptimal doses of stool softener in combo products to help with the constipation that develops



Iron

- Tetracycline & antacids bind iron-avoid 1hr
- SE: GI upset, dark stools, constipation
- Toxicity with 10 pills in kids
 - 4 stages—s/s, subside, return, organ damage if survives

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Iron Education

- Child proof container
- Food decreases absorption 40-50%
- Achlorydria decreases absorption
- Drink thru straw to avoid teeth discoloration
- Tablets cheapest
- Avoid sustained release types
- Need to check retic count for response

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Macrocytic - Hypochromic Anemia

- 1. Pernicious anemia
- 2. Folate deficiency
- Need to know etiology since FA deficiency can mask B12 deficiency
- Iron is NOT the treatment!

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Pernicious Anemia

- Due to lack of IF--can't absorb B12 orally
- Seen with ETOH abuse
- Numbness & tingling are signs
- B12 (cyanocobalamin) 1000 mcg IM Q MO for life
- Folic acid will correct B12 deficiency but not the myelin sheath problem
- Medicare covers for dx of PA not just to "boost energy".



Folate Deficiency (Folic acid p. 777 test)

- Dosing: 1mg/day 1-4 mos
- 50-200mcg absorbed from 500-700 mcg intake daily diet; IM available
- Maintenance 1mg day during pregnancy to prevent deficiency
- Retics increase in 2-3 days, Hgb up in 1-2 weeks
- OTC vitamins contain 0.4mg; Prenatal 1mg (script)
- Avoid same time as sulfa; rare SE: rash



Glucose 6 Phosphate Dehydrogenase Deficiency (G6PD)

- African (variant A less severe)
- Mediterranean descent
- Passes from mother to son
 - Klinger on M.A.S.H
- Hemolytic anemia results from use of certain drugs
 - ASA, vitamin C, Tylenol, sulfa, macrodantin, thiazides, antimalarials
- Test for G6PD if HIV + because Dapsone and Septra DS (sulfa) are given in HIV tx



Chronic Anemia

- **Causes:**
 - renal failure (elderly) with dec erythropoetin due to chronic disease
 - aplastic anemia
 - thrombocytopenia
- Need erythropoetin agents (IM only)
- Need iron for the new rbc's
- Must monitor rbc and Fe status



Erythropoetic Growth Factors

- Erythropoetin, G-CSF & GM-CSF
- Normally kidney produces
- Useful in chronic anemia, HIV, chemo tx, end stage renal disease
- Given SQ to effect stem cell response to produce mature rbc and wbc
- May need iron and B12 also
- Adverse reactions: seizures, allergic reactions, HTN
- Contraindication: uncontrolled HTN; Lithium
- Used by MD: Pregnancy C; need contraception


