THE ANEMIAS

Inadequate Construction

Vs

Excessive Destruction
Levels Of Anemia

- Hemoglobin less than 11
- Hemoglobin less than 9: Moderate
- Hemoglobin less than 7: Severe
Hypoxia

• Low $P_{O2}$

• Oxygen Content = Hemoglobin + $P_{O2}$

• Acute signs/symptoms:
• Chronic signs/symptoms:
Cyanosis

- Five grams of hemoglobin are FULLY desaturated
Two ways to approach Anemia...
(1) Check RETICULOCYTE COUNT
ANEMIC

Low RETICULOCYTE count
• Hypoproliferative
• (1) Something is MISSING from the bone marrow or...
• (2) Bone marrow is suppressed

High RETICULOCYTE count
• Hyperproliferative
• Hemolytic Anemia
  – Intravascular
  – Extravascular
Hemolytic Anemia

**Intravascular Hemolysis**
- Vasculitis in progress
- Schistocytes
  - Burr Cells
  - Helmet Cells
- Low Haptoglobin

**Extravascular Hemolysis**
- Abnormal membrane structure
- Splenomegaly
Extravascular Hemolysis

- **Mcc:** Autoimmune hemolysis: Do coombs test
Drugs that cause extravascular Hemolysis

- Penicillins
- Cephalosporins
- Sulpha
- Dapsone
- Alpha Methyl Dopa
- PTU
- HIPPPE
Paroxysmal Nocturnal Hemoglobinuria

- First described in military recruits
- RBCs are sensitive to hemolysis by acidosis
- HAMS test
Hereditary Spherocytosis

- Autosomal Dominant
- SPECTRIN defect
- Osmotic fragility test
Hereditary Elliptocytosis

- Autosomal Dominant
Some RBCs can talk...
...Here is what they have to say
Reticulocyte
Spherocyte
Elliptocyte
Schistocyte
Tear Drop Cell
Target Cell
Heinz Body
Basophilic Stippling
Acanthocytes
Anisocytosis
Poikylocytosis
The second way to approach Anemia

- Check a CBC with differential
- MCV
- MCH
- MCHC
Microcytic Hypochromic

- Low MCV
- Low MCH
- Impaired hemoglobin PRODUCTION
Microcytic Hypochromic Anemias

- Iron Deficiency
- Chronic Disease, late
- Lead poisoning
- Thalassemias
- Hemoglobinopathies
- Sideroblastic anemia
Microcytic Hyperchromic

- Low MCV
- High MCHC (MCH/MCV)
- The cells are too small
Microcytic Hyperchromic Anemias

• Hereditary Spherocytosis
Normocytic Normochromic

- Normal MCV
- Normal MCH
- NOTHING is wrong with the RBCs...
- You do not have enough of them
Normocytic Normochromic
Anemias

- Acute Hemorrhage (less Than 4 days)
- Chronic disease, early
- Renal failure
- Hypothyroidism, early
Macrocytic Anemia

- High MCV
- Impaired nuclear division
Macrocytic Anemias

- B12 Deficiency
- Folate Deficiency
- Hypothyroidism, severe
- Reticulocytosis
- Alcohol
- Chemotherapy drugs
- Anticonvulsants
Anticonvulsants

- Phenytoin
- Ethusuximide
- Valproic Acid
- Carbamezapine
Organization is the key!