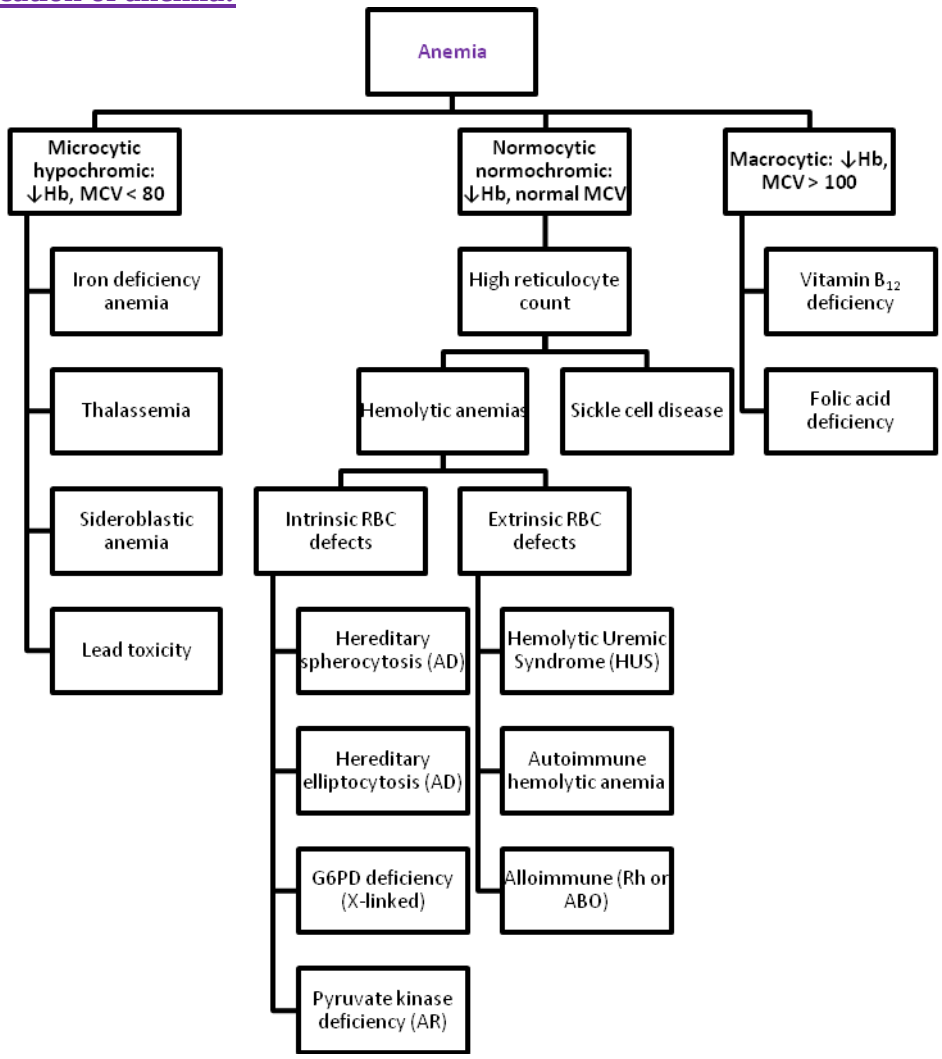
- **What is the definition of anemia?**
  - A decrease in the number of Red Blood Cells (RBCs), hemoglobin (Hb) or hematocrit more than 2 standard deviations below the age-specific value.
- **Classification of anemia:**

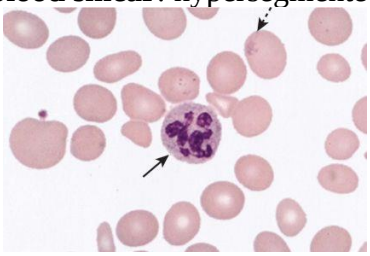


- **Physiologic anemia of infancy:**
  - Normal hemoglobin concentration at birth = 14-20 gm/dL
  - After birth, blood oxygen saturation increases resulting in decreased erythropiotine production → hemoglobin decline to reach a nadir of 10-11 gm/dL at about 8-12 weeks of age (7-9 gm/dL in preterms) → and this will result in restimulation of erythropiotine release.
- **Iron deficiency anemia:**
  - **Importance of iron**: to carry oxygen in hemoglobin and function of anymes in mitochondria of cells.
  - **Epidemiology:**
    - ✓ 30-47% in pre-school age.
    - ✓ 25% in school age.
  - **Causes of iron deficiency anemia:**
    - ✓ Nutrition deficiency (reduced intake especially between 6-24 months of age).
    - ✓ Increased requirements:
      - ❖ Terms: 1mg/kg/day.
      - ❖ Preterms: 2mg/kg/day.

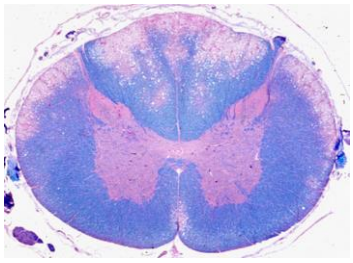
- ✓ Inadequate absorption: due to diseases in the first part of the duodenum.
- ✓ Blood loss due to: ulcers, menorrhagia in females, Meckel's diverticulum, IBD, cow's milk allergy or hookworms.

- **Clinical presentation:**
  - ✓ General: pallor, fatigue, irritability and delayed motor development.
  - ✓ Specific: pica and koilonychia (spoon nails).
- **Lab findings**: ↓ serum ferritin, ↓ serum iron, ↑Total Iron Binding Capacity (TIBC) and ↑ reticulocyte count.
- **Differential diagnosis (other causes of microcytic hypochromic anemia):**
  - ✓ α or β thalassemia.
  - ✓ Lead poisoning.
  - ✓ Hemoglobin E
  - ✓ Anemia of chronic inflammation.
- **Management:**
  - ✓ Elemental iron which is available in the form of tablets or syrup and is given with vitamin C (e.g. orange juice) to enhance intestinal iron absorption.
  - ✓ Treatments is continued at least for 3-5 months to replenish iron stores.
  - ✓ Improvement with treatment is followed up with reticulocyte count.

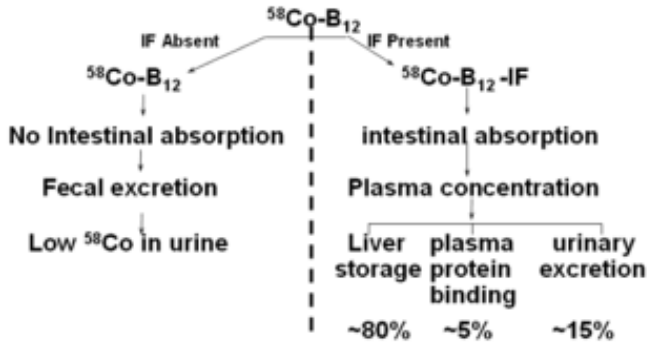
- **Megaloblastic anemias:**
  - **Examples**: vitamin B_{12} and folic acid deficiencies. They are important in synthesis of DNA of cells.
  - **Characteristic peripheral blood smear**: hypersegmented neutrophils.



  - ↑ **homocysteine (not converted to methionine)** → vitamin B_{12} or folic acid deficiency.
  - ↑ **L-methylmalonyl CoA (not converted to succinyl CoA)** → vitamin B_{12} deficiency.
- **Vitamin B_{12} deficiency:**
  - **Normal physiology**: dietary vitamin B_{12} must combine with intrinsic factor (produced by parietal cells of the stomach) and then absorption of this complex will occur in terminal ileum.
  - **What are the causes of vitamin B_{12} deficiency?**
    - ✓ Nutritional deficiency (strict vegetarian diet).
    - ✓ Defect in intrinsic factor secretion (pernicious anemia).
    - ✓ Inability to absorb vitamin B_{12} due to intestinal diseases (e.g. Crohn's disease).
  - **Clinical presentation:**
    - ✓ General: pallor and fatigue.
    - ✓ Specific: Smooth red tongue (glosssitis); Neurologic manifestations (e.g. subacute combined degeneration of spinal cord).



- **Schilling test principle:**



- **Management**: monthly intramuscular vitamin B_{12} injections.

- **Folic acid deficiency:**

- **Causes:**
  - ✓ Nutritional deficiency (notice that goat's milk is deficient in folic acid).
  - ✓ Decreased absorption due to diseases affecting small intestine.
- **Clinical presentation:**
  - ✓ General: pallor and fatigue.
  - ✓ In addition, patients may have failure to thrive, chronic diarrhea and irritability.
- **Diagnosis**: low serum folic acid.
- **Management**: dietary folic acid or supplementation.