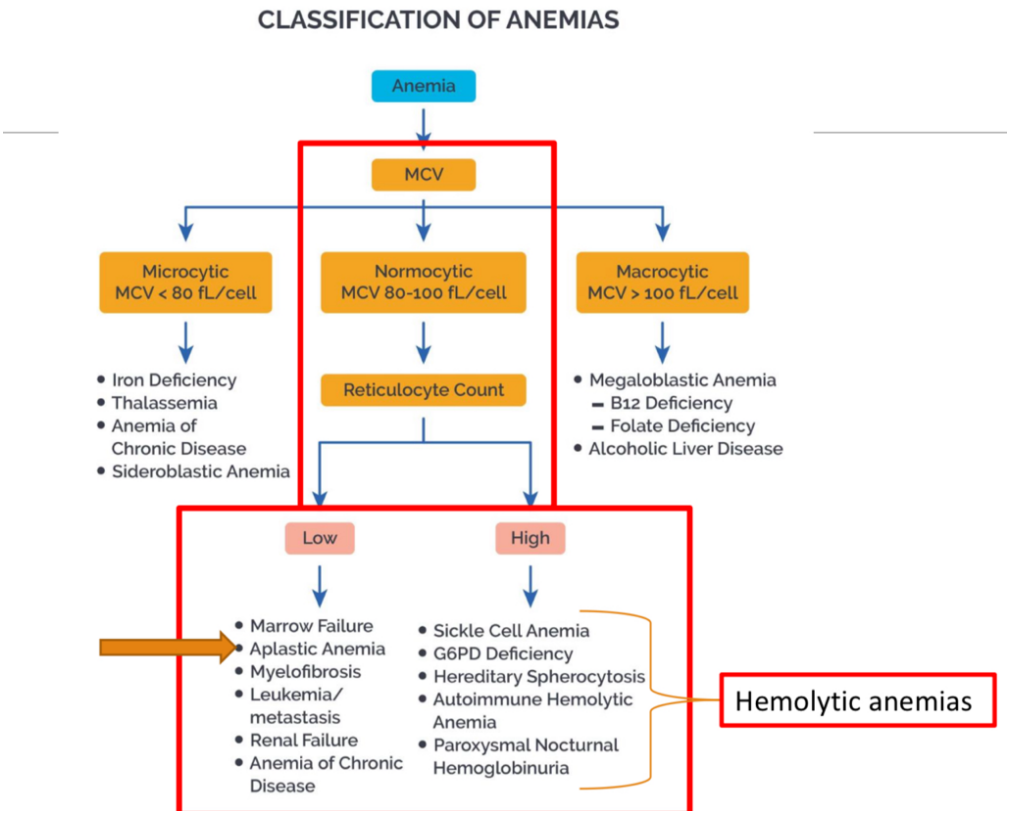
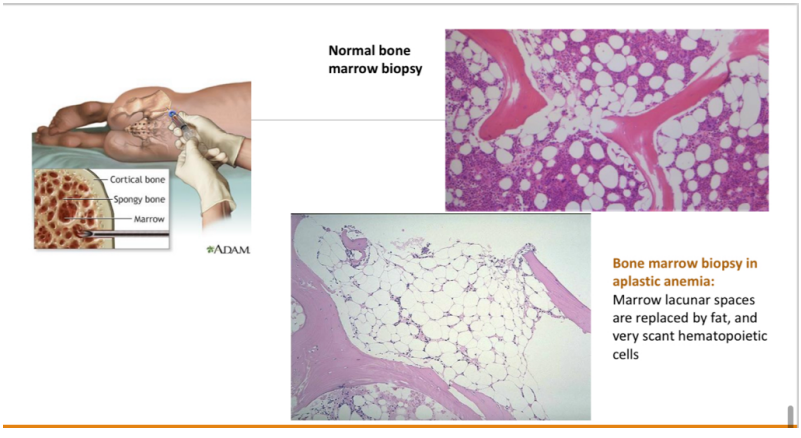


Aplastic Anemia**:

- **Cause**: Bone marrow disorder leading to ineffective hematopoiesis.
- **Etiology**: Acquired (infections, toxins, drugs, autoimmune diseases, idiopathic) or constitutional (e.g., Fanconi anemia).
- **Morphology**: Markedly hypocellular bone marrow with lacunar spaces replaced by fatty cells.
- **Clinical Features**: Pancytopenia, fatigue, shortness of breath, bleeding/bruising, frequent infections.
- **Treatment**: Bone marrow transplant, treating underlying cause, immunosuppression, transfusion support.

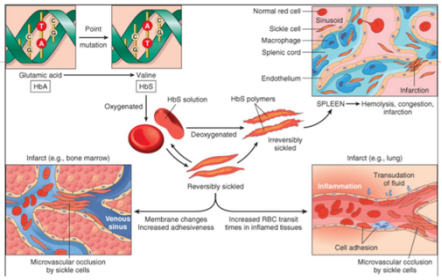


Hemolytic Anemia**:

- **Features**: Shortened RBC survival, elevated erythropoietin levels, reticulocytosis, increased unconjugated bilirubin and LDH.
- **Extravascular Hemolysis**: RBC destruction by reticuloendothelial system, presents with anemia, jaundice, splenomegaly.
- **Intravascular Hemolysis**: RBC destruction within blood vessels, presents with hemoglobinemia, hemoglobinuria, hemosiderinuria.
- **Marrow Response**: Erythroid hyperplasia, decreased myeloid:erythroid ratio, potential for extramedullary hematopoiesis.
- **Diagnosis**: Clinical presentation, serum markers (haptoglobin, LDH, bilirubin), hemolytic markers (e.g., schistocytes).
- **Treatment**: Address underlying cause, supportive care, splenectomy (in some cases).

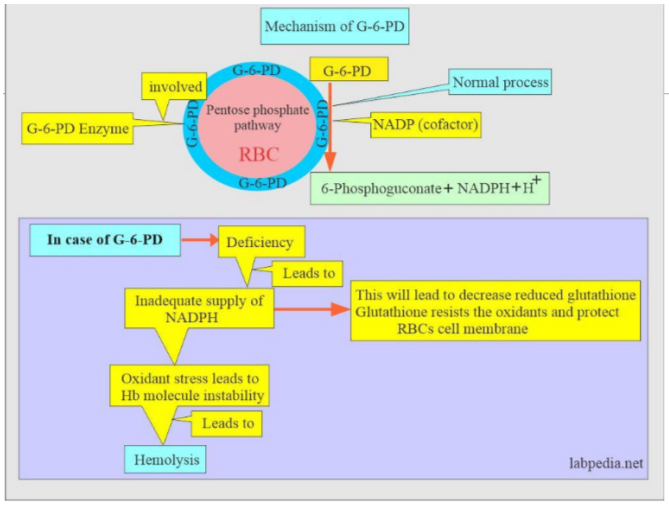
Sickle Cell Disease:

- **Pathogenesis**: HbS polymerization under deoxygenated conditions, leading to sickling of RBCs, vaso-occlusion, hemolysis.
- **Clinical Consequences**: Chronic hemolysis, ischemic manifestations (e.g., bone infarcts, autosplenectomy), acute chest syndrome, renal complications.
- **Diagnosis**: CBC, Hb electrophoresis (HbS), clinical symptoms.
- **Treatment**: Prophylactic antibiotics, hydration, pain relief, hydroxyurea therapy, exchange transfusion.



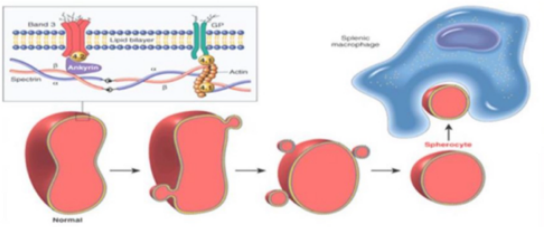
G6PD Deficiency:

- **Pathophysiology**: X-linked recessive disorder leading to hemolysis due to increased oxidative stress.
- **Triggers**: Drugs (e.g., antimalarials, sulfa drugs), favism (consumption of certain foods), infections.
- **Diagnosis**: Osmotic fragility test, detection of Heinz bodies.
- **Treatment**: Avoidance of triggering agents, supportive care during hemolytic episodes.



Hereditary Spherocytosis**:

- **Cause**: Autosomal dominant disorder characterized by defects in RBC membrane proteins (spectrin, ankyrin).
- **Clinical Features**: Anemia, jaundice, splenomegaly.
- **Diagnosis**: Peripheral blood smear showing spherocytes, osmotic fragility test.
- **Treatment**: Splenectomy to prolong RBC survival.



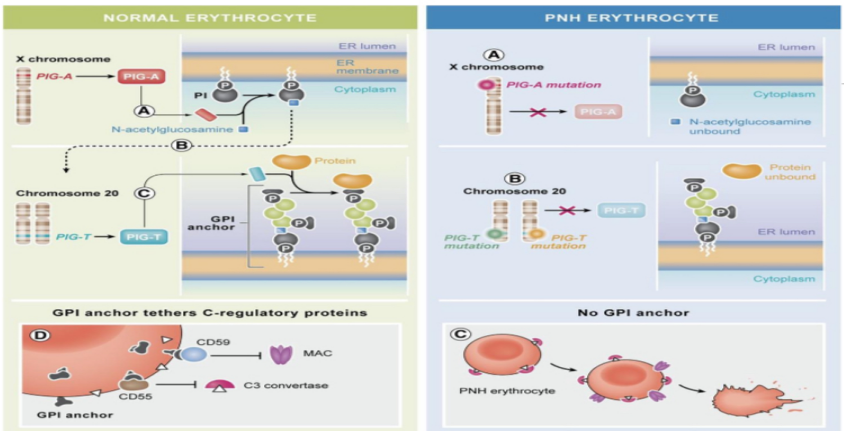
Spectrin and **ankyrin** are tethering proteins that attach RBC cytoskeleton

Immune Hemolytic Anemia:

- **Categories**: Alloimmune, autoimmune, drug-induced.
- **Pathophysiology**: Antibody-mediated destruction of RBCs (warm or cold antibodies).
- **Clinical Features**: Anemia, jaundice, splenomegaly.
- **Diagnosis**: Antibody testing, direct antiglobulin test.
- **Treatment**: Address underlying cause, corticosteroids, immunosuppressive therapy.

Warm Antibody: IgG/IgA type	Cold Antibody: IgM type
Activated at body temp. (37 c)	Active at 0-4°C IgM binds to RBC in cold temp (extremities)
IgG-coated RBC lysis in spleen (predominantly extravascular)	Clumping and complement fixation causes lysis in blood vessels and liver (intra- and extravascular)
Morphology: spherocytes (splenic macrophage phagocytose tagged RBC leading to formation of spherocytes)	IgM agglutination (hemolysis occurs in the hands & feet in cold weather)
80% of immune hemolytic anemias: Primary (50-70%) Secondary: - Lymphoproliferative disorders - Autoimmune diseases (SLE) - Drugs (penicillin and cephalosporins)	• Infectious mononucleosis (EBV) • Mycoplasma infection • Lymphoproliferative disorders

Paroxysmal Nocturnal Hemoglobinuria (PNH):
- **Cause**: Acquired mutation in PIGA gene, leading to deficiency of GPI-anchored proteins and susceptibility to complement-mediated hemolysis.
- **Clinical Features**: Hemoglobinuria, reticulocytosis, venous thrombosis.
- **Diagnosis**: Flow cytometry for absence of GPI-anchored proteins.
- **Treatment**: Eculizumab (complement inhibitor), supportive care.



Hemolysis occurs mostly at night when there is fixation of complement which is enhanced by decrease of blood PH during sleep

- ✓ Chronic intravascular hemolysis with hemoglobinemia, hemosiderinuria -/+ hemoglobinuria
- ✓ Reticulocytosis
- ✓ Venous thrombosis (hypercoagulability due to free Hb in blood)