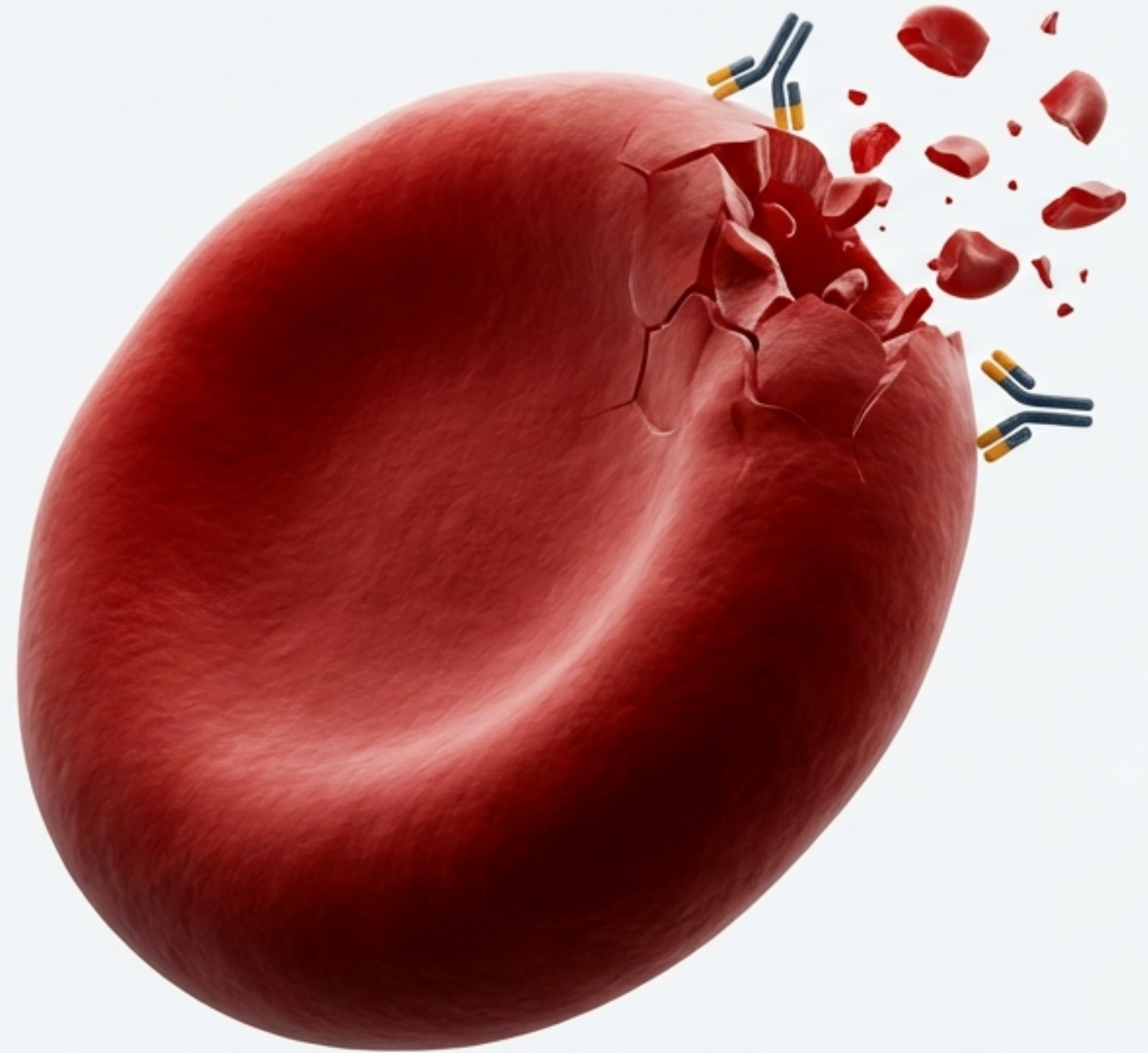


ACQUIRED HEMOLYTIC ANEMIA

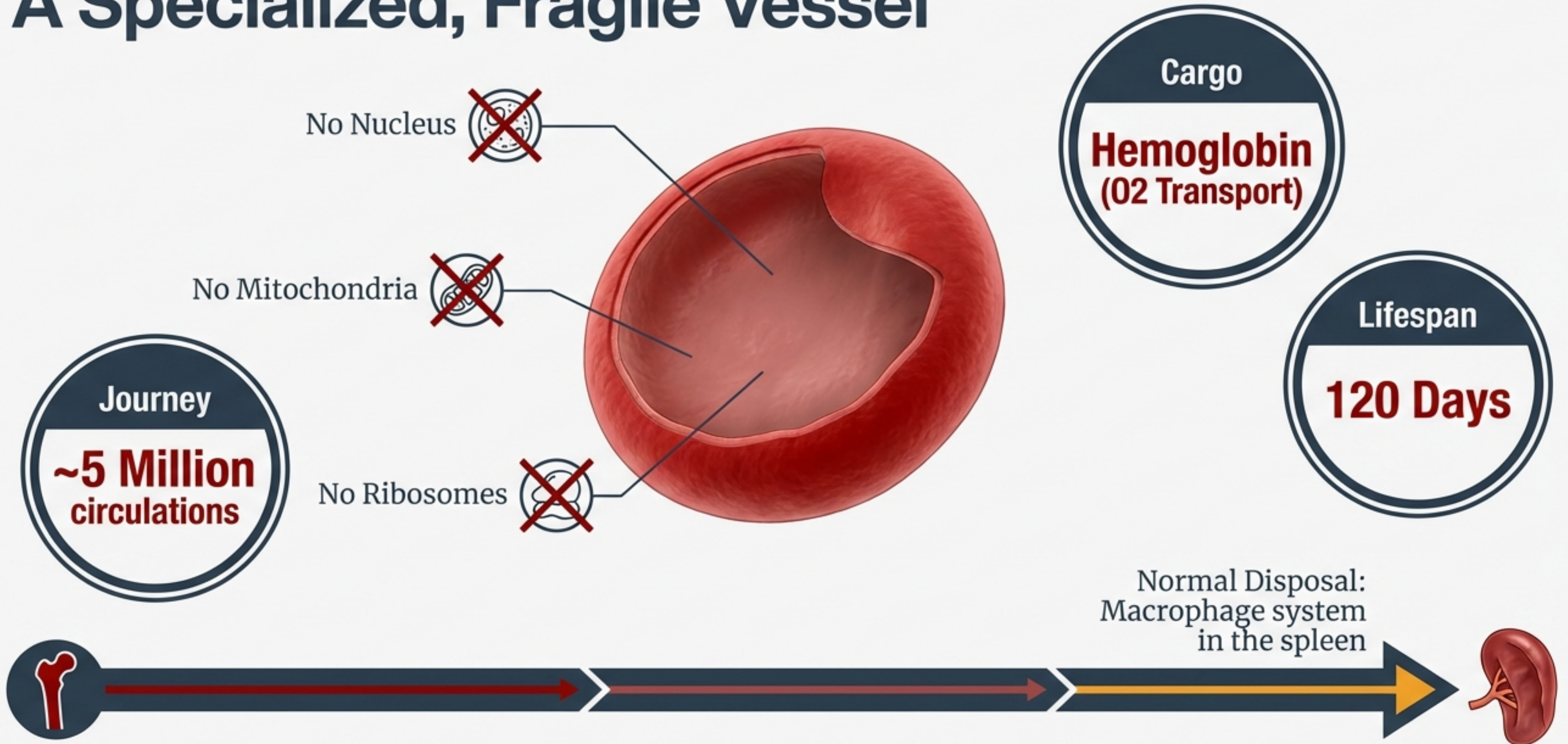
The RBC Under Attack: A Diagnostic Approach to AIHA & MAHA

This presentation investigates the pathophysiology, clinical evidence, and management of acquired hemolysis, distinguishing between immune-mediated destruction (AIHA) and mechanical fragmentation (MAHA).



The Victim:

A Specialized, Fragile Vessel

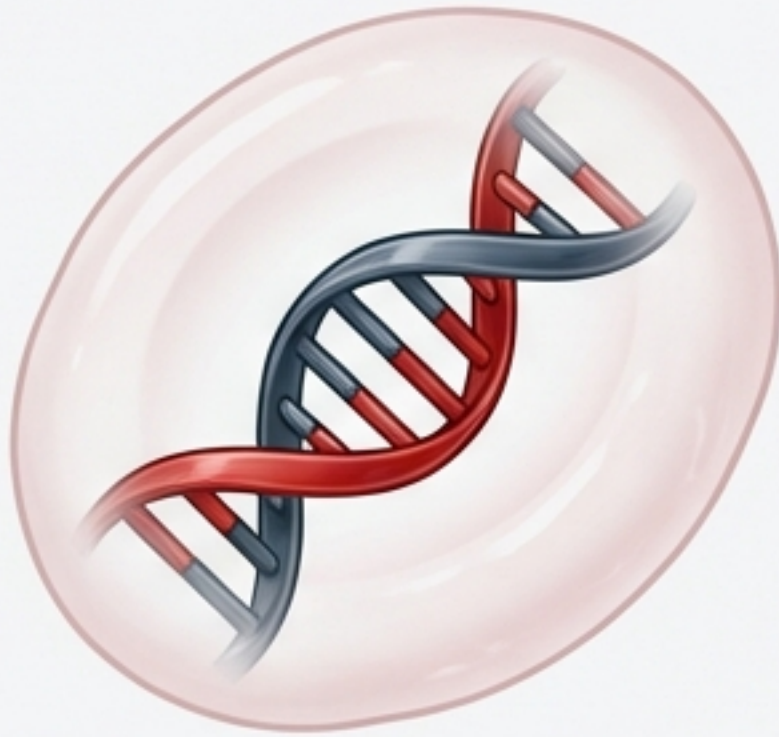


Hereditary vs. Acquired: The Origin of the Defect

Helvetica Now Display, Clinical Slate

Hereditary (Intrinsic Factors)

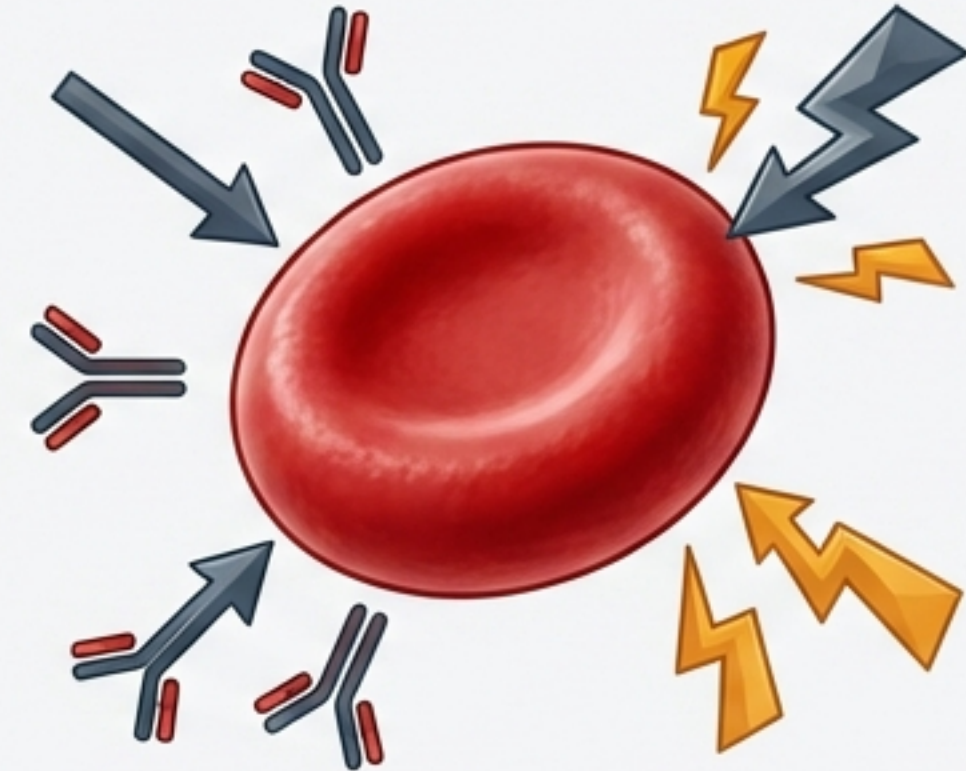
Helvetica Now Display



- Defective Blueprint (The Inside Job)
 - Hemoglobin: Sickle Cell, Thalassemia
 - Membrane: Spherocytosis
 - Enzymes: G6PD Deficiency

Acquired (Extrinsic Factors)

Helvetica Now Display

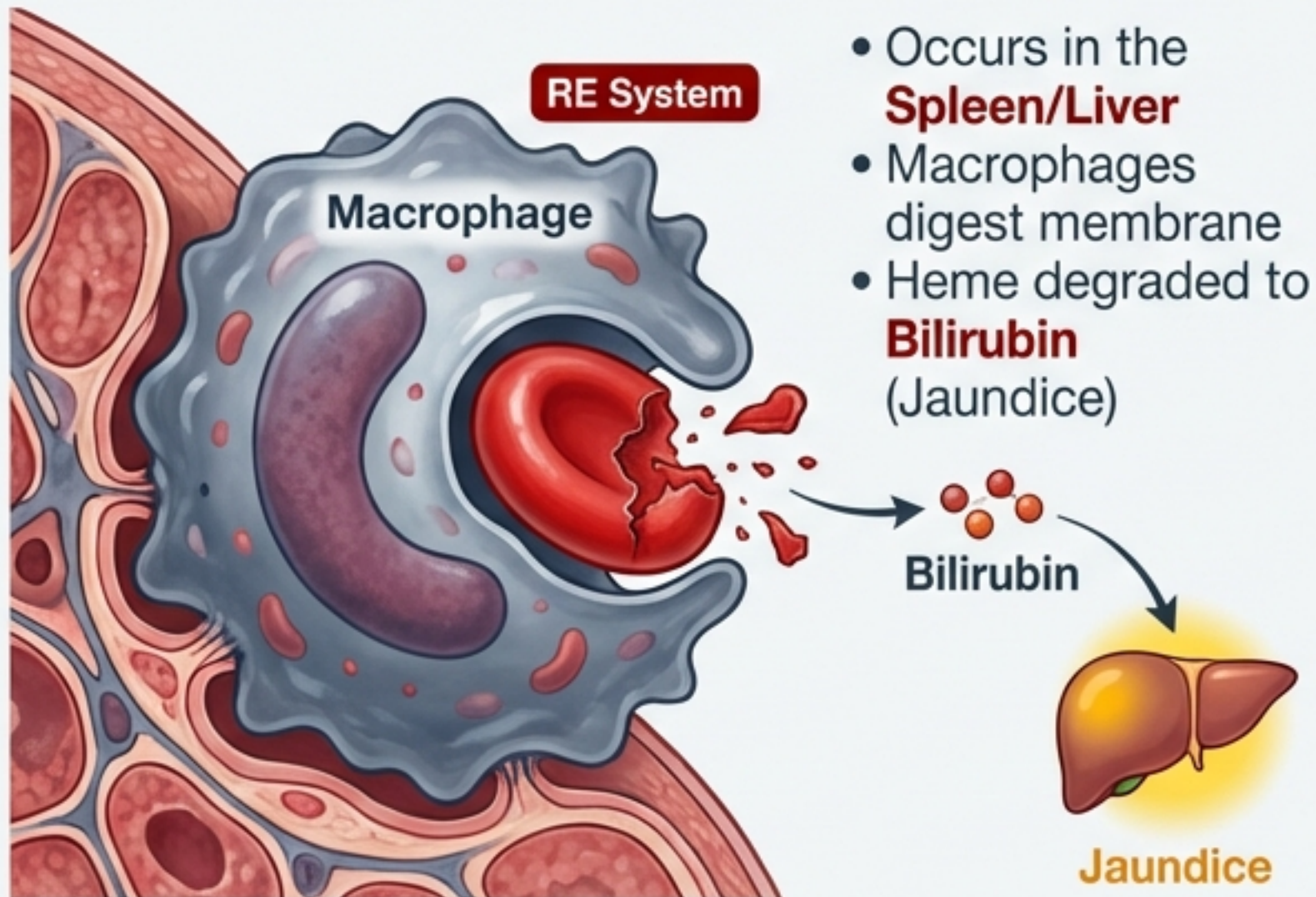


- Hostile Environment (The Outside Attack)
 - Immune: Antibodies (AIHA)
 - Mechanical: Microangiopathy (MAHA)
 - Toxins/Infection: Malaria, Drugs

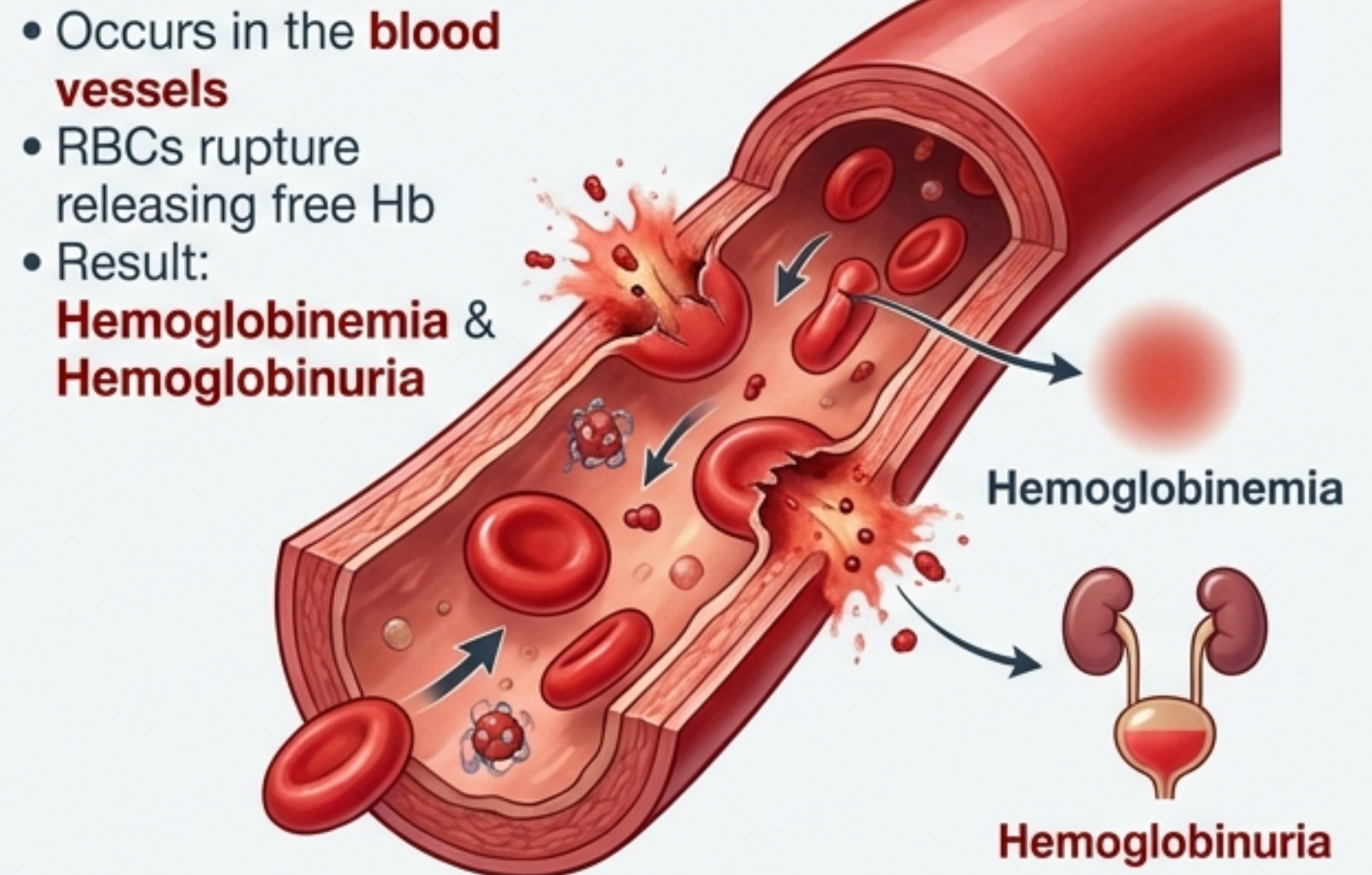
The Crime Scene: Extravascular vs. Intravascular

Pathophysiology of Destruction

Extravascular Hemolysis (The Spleen)



Intravascular Hemolysis (The Vessel)



Gathering Evidence: The Hemolysis Lab Panel



Reticulocytes



2.5 $\mu\text{g/L}$

Marrow compensation (Polychromasia).



LDH (Lactate Dehydrogenase)



230.0 $\mu\text{g/L}$

Enzyme leaked from burst cells.



Unconjugated Bilirubin



0.05 cn/g

Heme breakdown product.



Haptoglobin



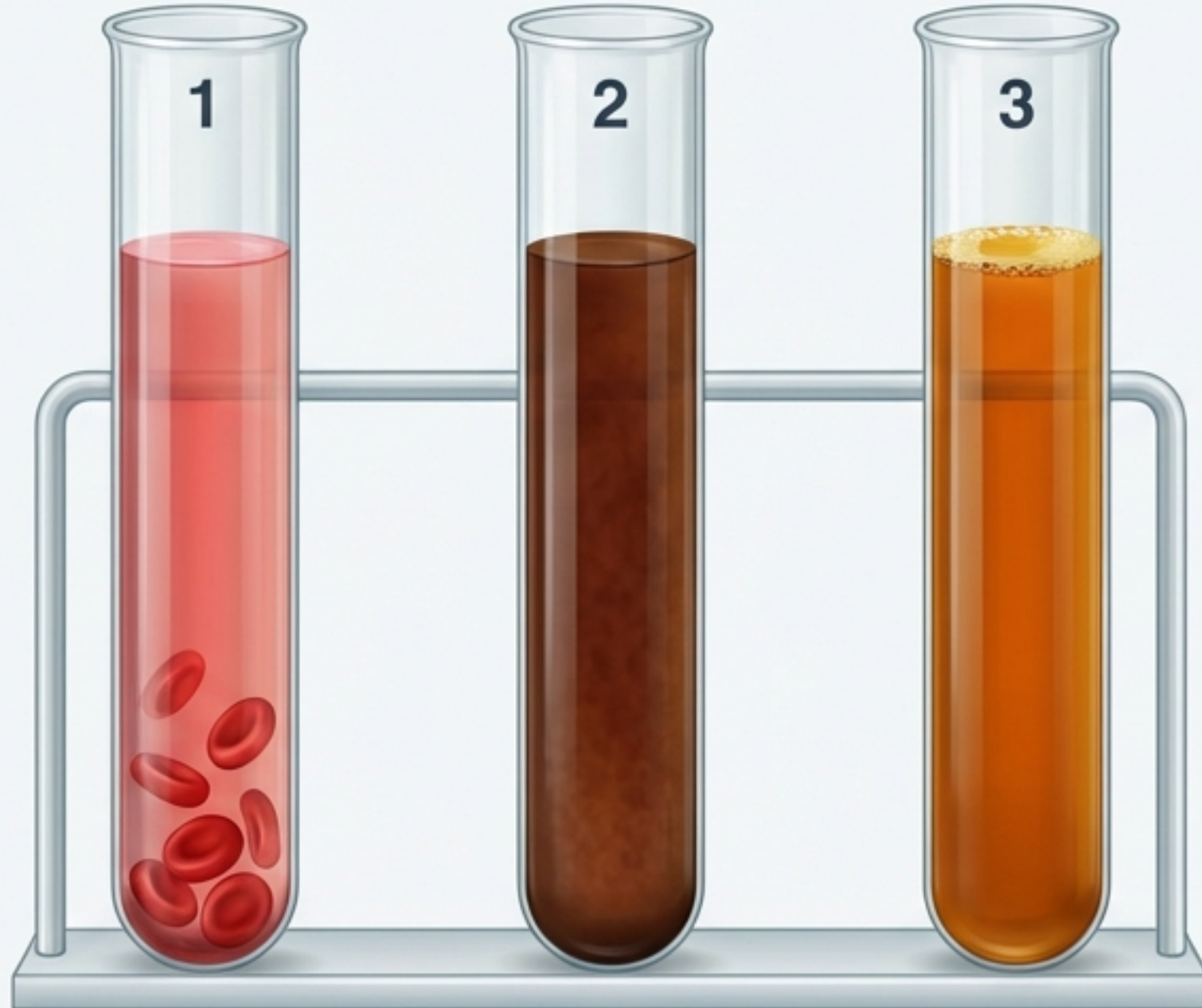
Used up binding free Hemoglobin.



Note

Haptoglobin drops significantly in Intravascular Hemolysis as it acts as the cleanup crew.

Clinical Pearl: Decoding Urine Color



Hematuria
Intact RBCs present

Hemoglobinuria
Free Hemoglobin/Hemosiderin.
Sign of Intravascular Hemolysis.

Bilirubinuria
Conjugated Bilirubin
(Obstructive process)

Dark urine is a non-specific finding. Distinguishing between blood (hematuria), free hemoglobin (hemolysis), and bilirubin (biliary obstruction) is critical for diagnosis.

Key Insight

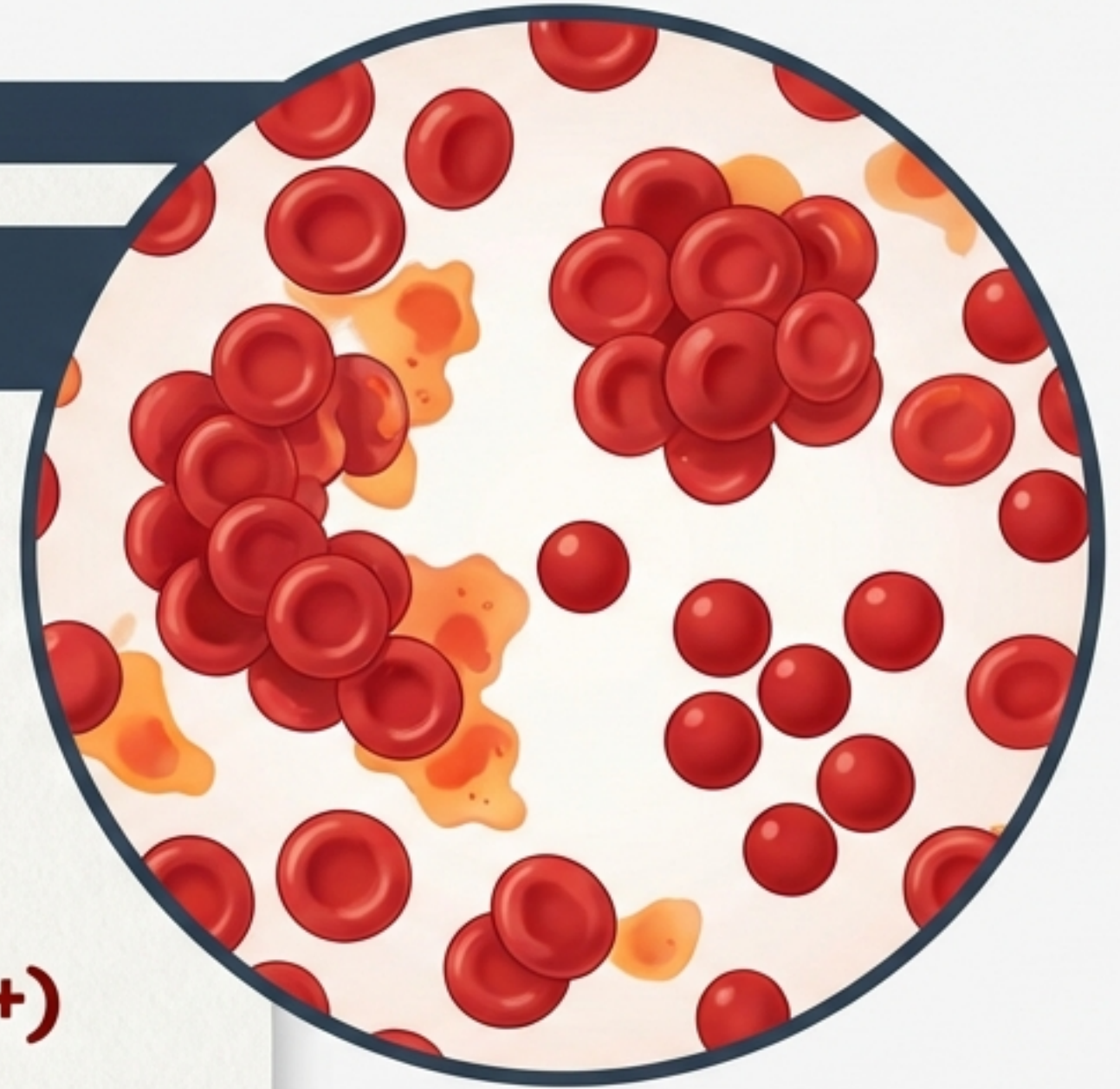
High Urobilinogen = Specific indicator for Hemolytic Anemia

Suspect #1: The Immune System (AIHA)

Patient Case File

CASE STUDY: 41-Year-Old Female

- **Presentation:** Dyspnea, abdominal pain.
- **Hb:** 7.3 g/dL (Low)
- **Reticulocytes:** 16% (High)
- **Haptoglobin:** <8 mg/dL (Undetectable)
- **Critical Finding:** Direct Coombs **Positive (+)**



Autoimmune Hemolytic Anemia (AIHA): The body produces antibodies that specifically target RBC surface antigens.

“Classifying AIHA: Warm vs. Cold Antibodies”

WARM AIHA



Antibody: IgG (Small)

Site: Extravascular (Spleen)

Associations: SLE (Lupus),
CLL, Drugs (Penicillin)

COLD AIHA



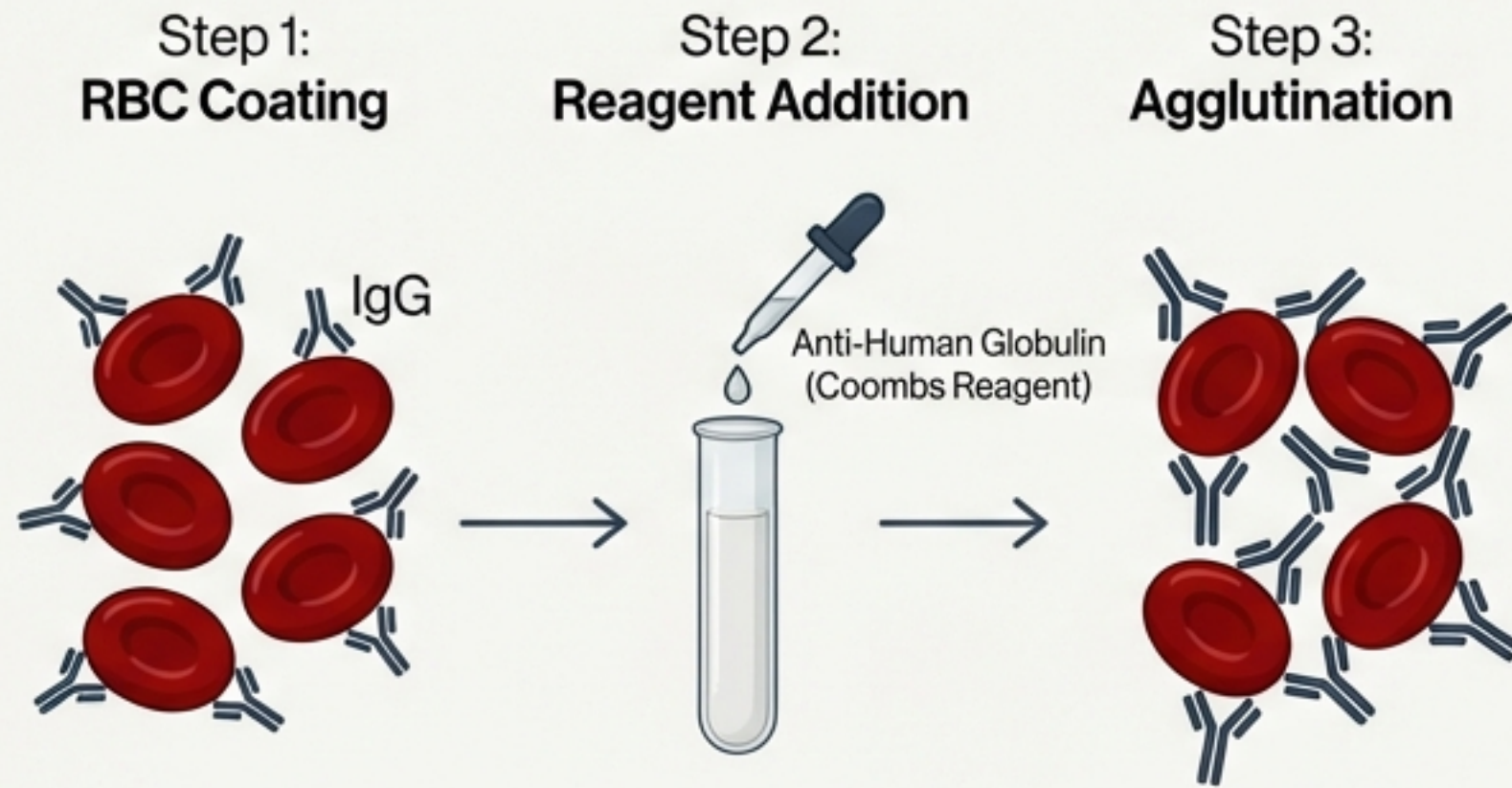
Antibody: IgM (Large Pentamer)

Site: Intravascular
(Fixes Complement)

Associations: Mycoplasma,
Mononucleosis, Lymphoma

The Diagnostic Standard: The Coombs Test

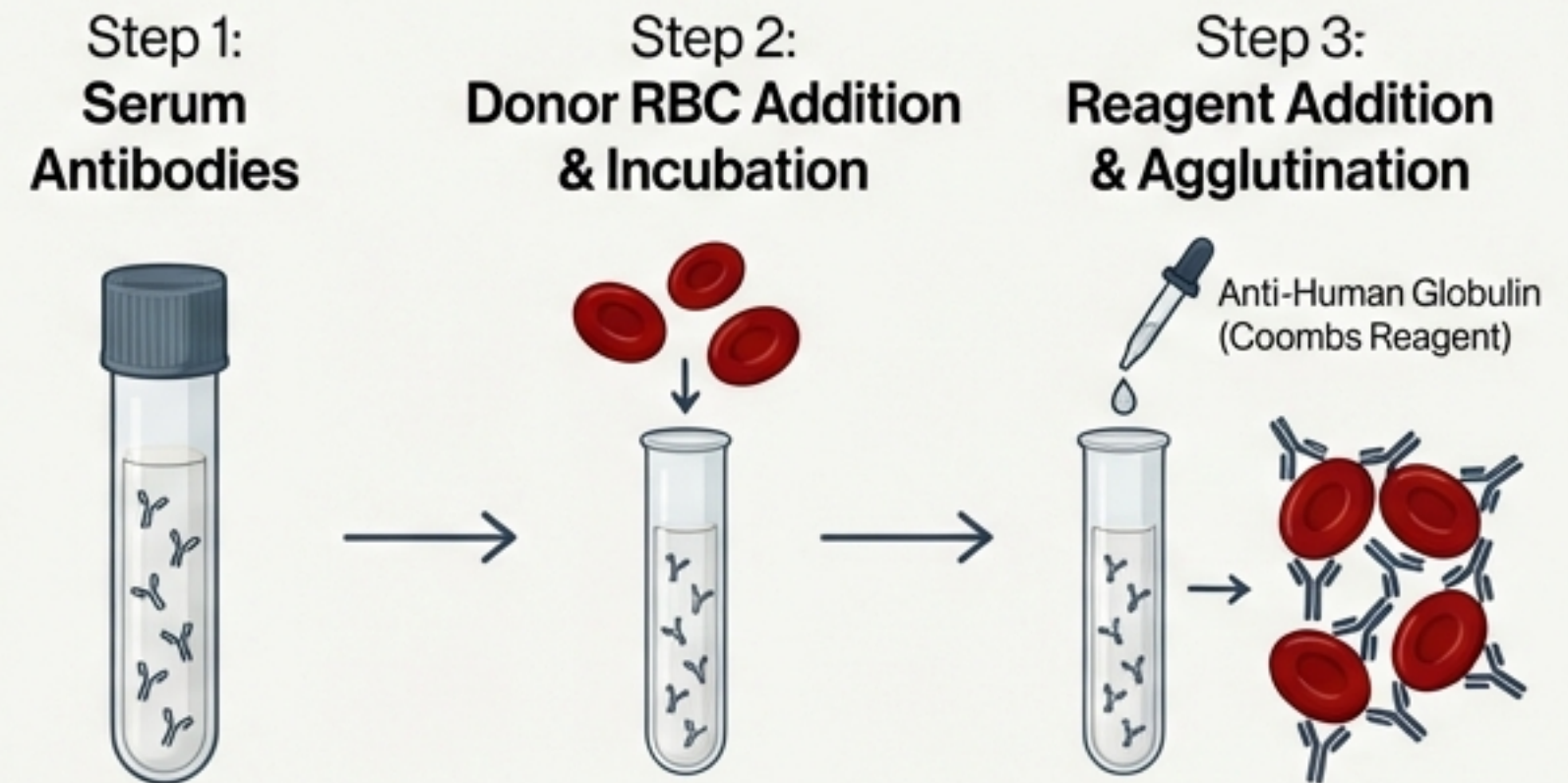
Direct Antiglobulin Test (DAT)



Detects antibodies attached **TO** the cell

! Positive = AIHA Confirmed

Indirect Antiglobulin Test (IAT)



Detects antibodies floating **IN** the serum

Used for **Cross-matching / Transfusion safety**

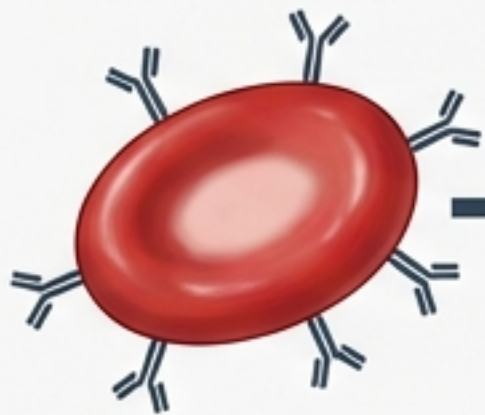
Visual Evidence: The Microspherocyte



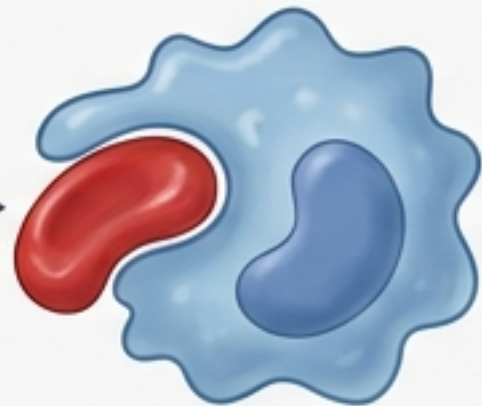
Normal RBC



Microspherocyte



1. Antibody (IgG) coats the cell.



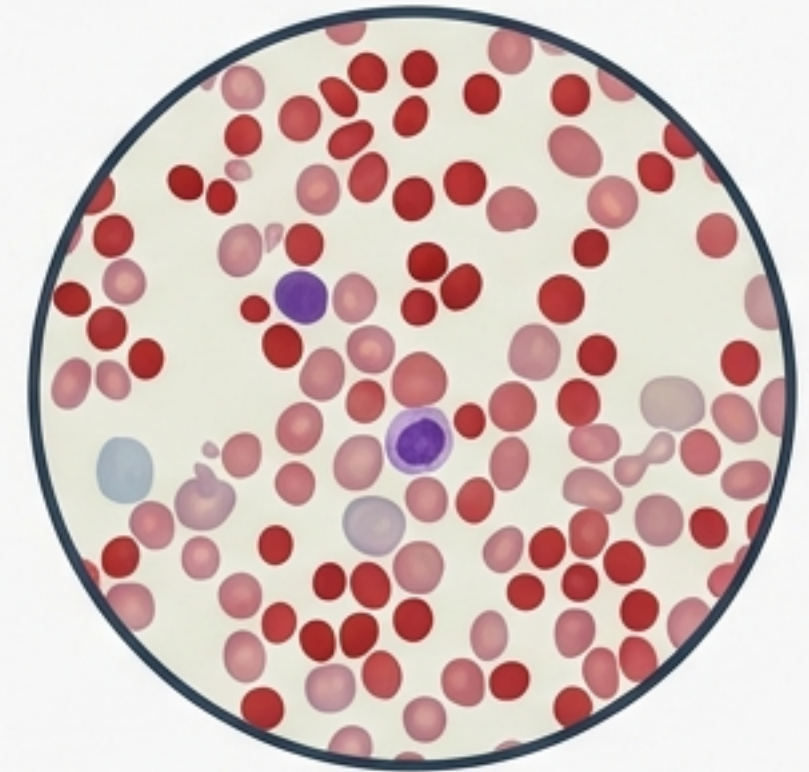
2. Splenic Macrophage takes a 'bite' of the membrane.



3. Membrane surface area is lost; cell becomes a rigid sphere.



4. Result: Trapped and destroyed in the spleen.



Microscope View: Blood Smear

Suspect #2: Mechanical Trauma (MAHA)

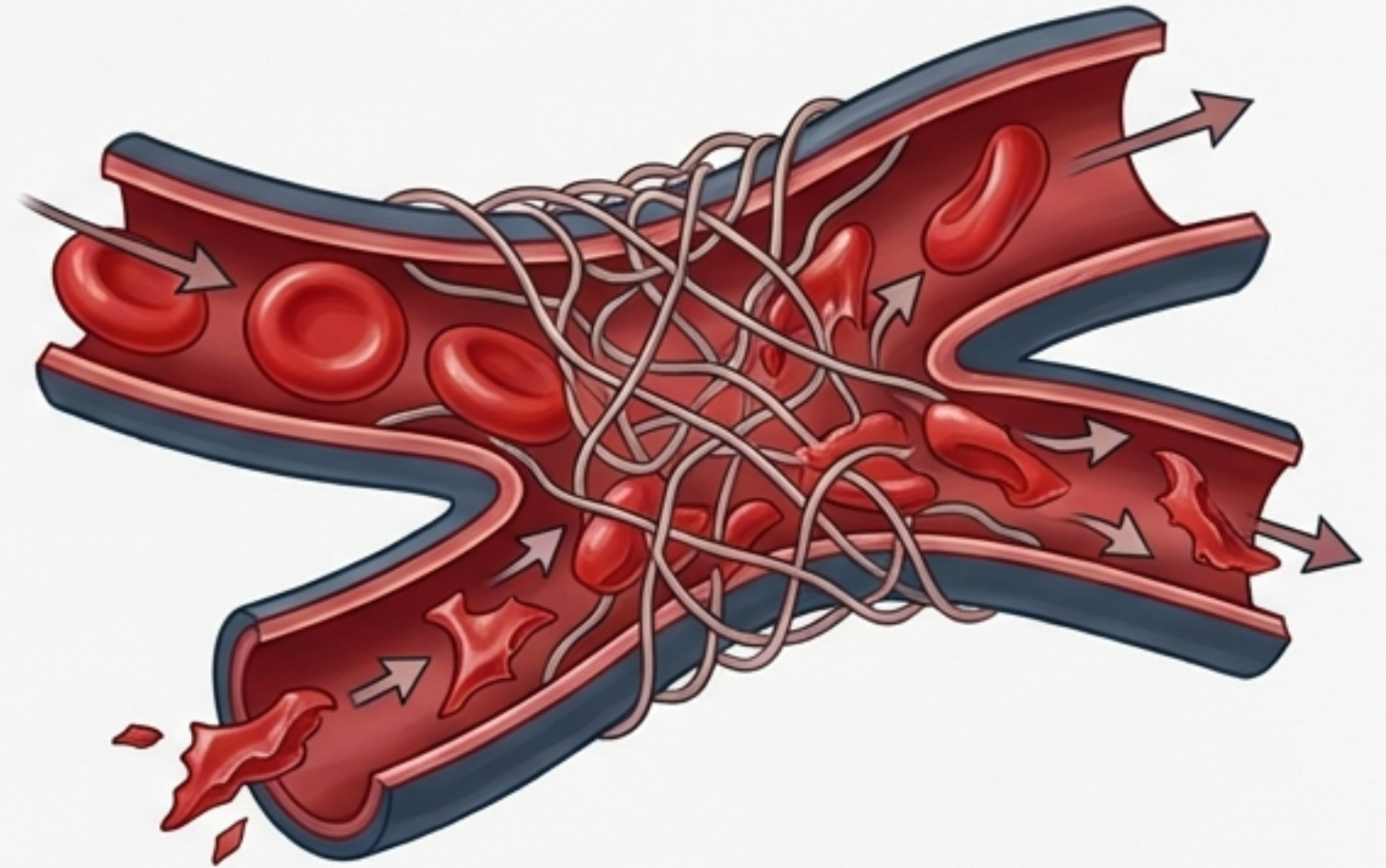
Patient Case File

CASE STUDY: 25-Year-Old Female with SLE

- **Presentation:** Severe headache, abdominal pain.
- **Hb:** 7.3 g/dL
- **Platelets:** 50 (Thrombocytopenia)
- **Critical Finding:** Direct Coombs Negative (-)
- **Finding:** Schistocytes on smear.

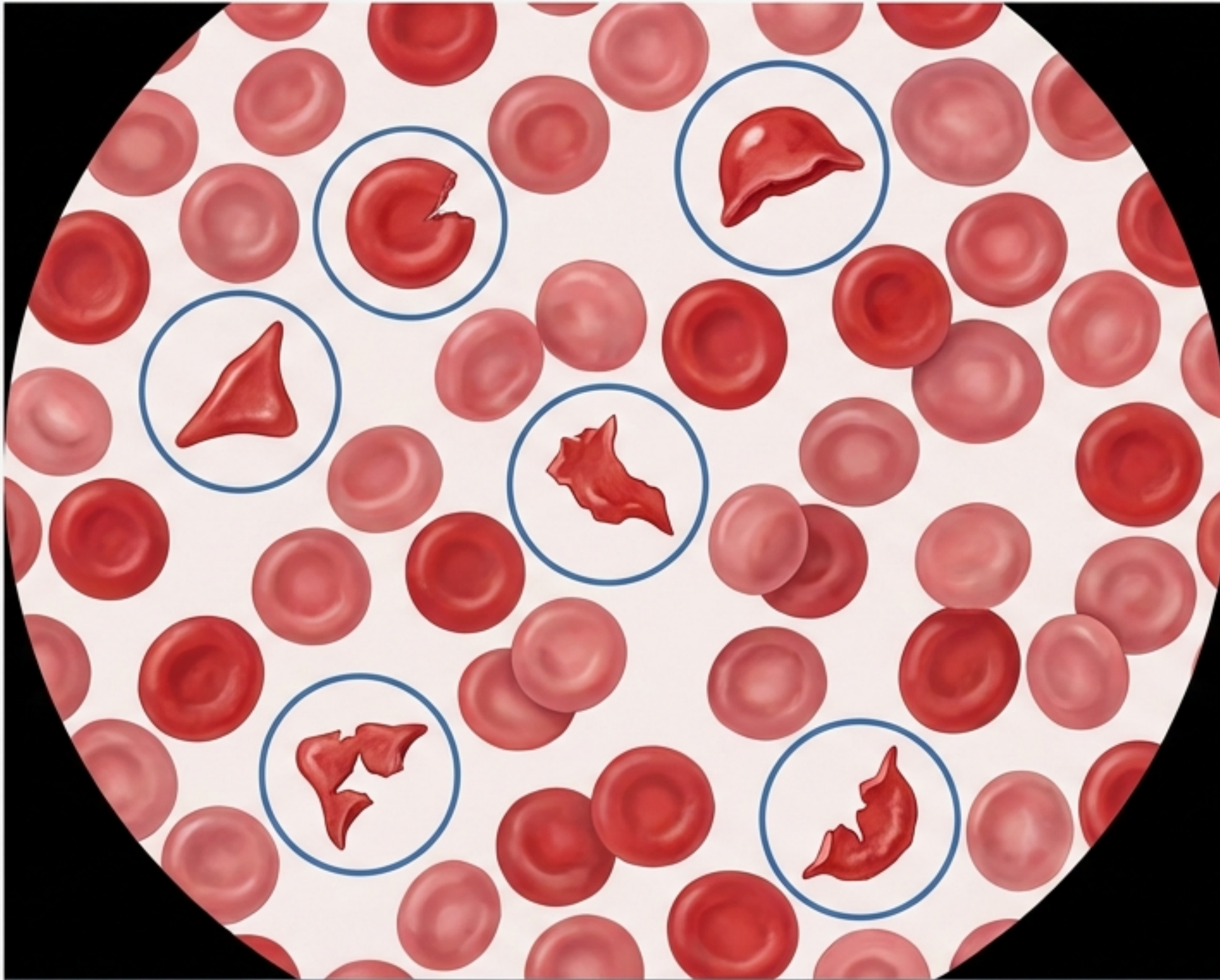


The Mechanism



Micro-Angiopathic Hemolytic Anemia (MAHA): Physical destruction of RBCs in the small vessels.

Visual Evidence: The Schistocyte



Morphology

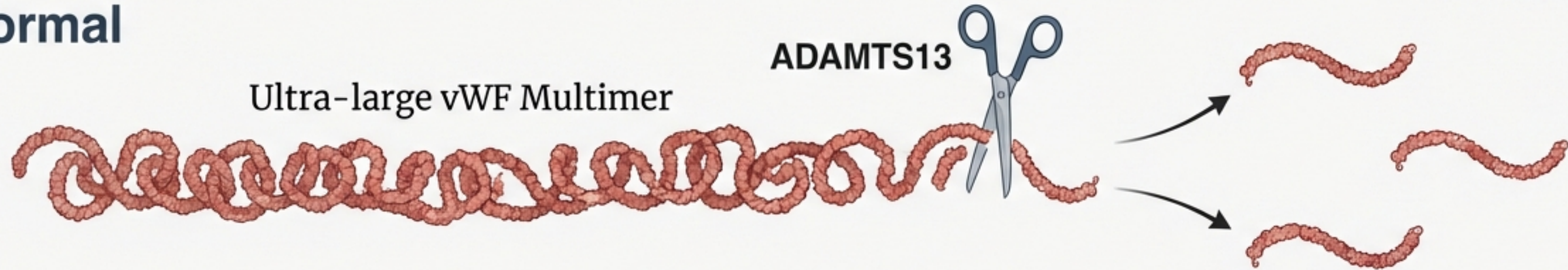
- Fragmented, “Helmet” or triangular shapes.
- Result of high shear forces slicing the cell.

Differential Diagnosis

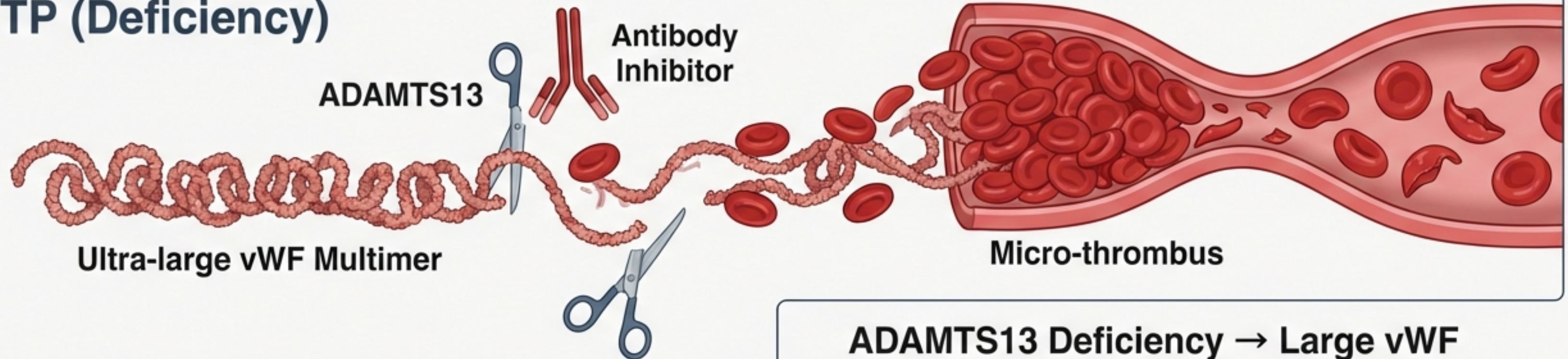
- TTP (Thrombotic Thrombocytopenic Purpura)
- HUS (Hemolytic Uremic Syndrome)
- DIC (Disseminated Intravascular Coagulation)

Deep Dive: TTP Pathophysiology

Normal



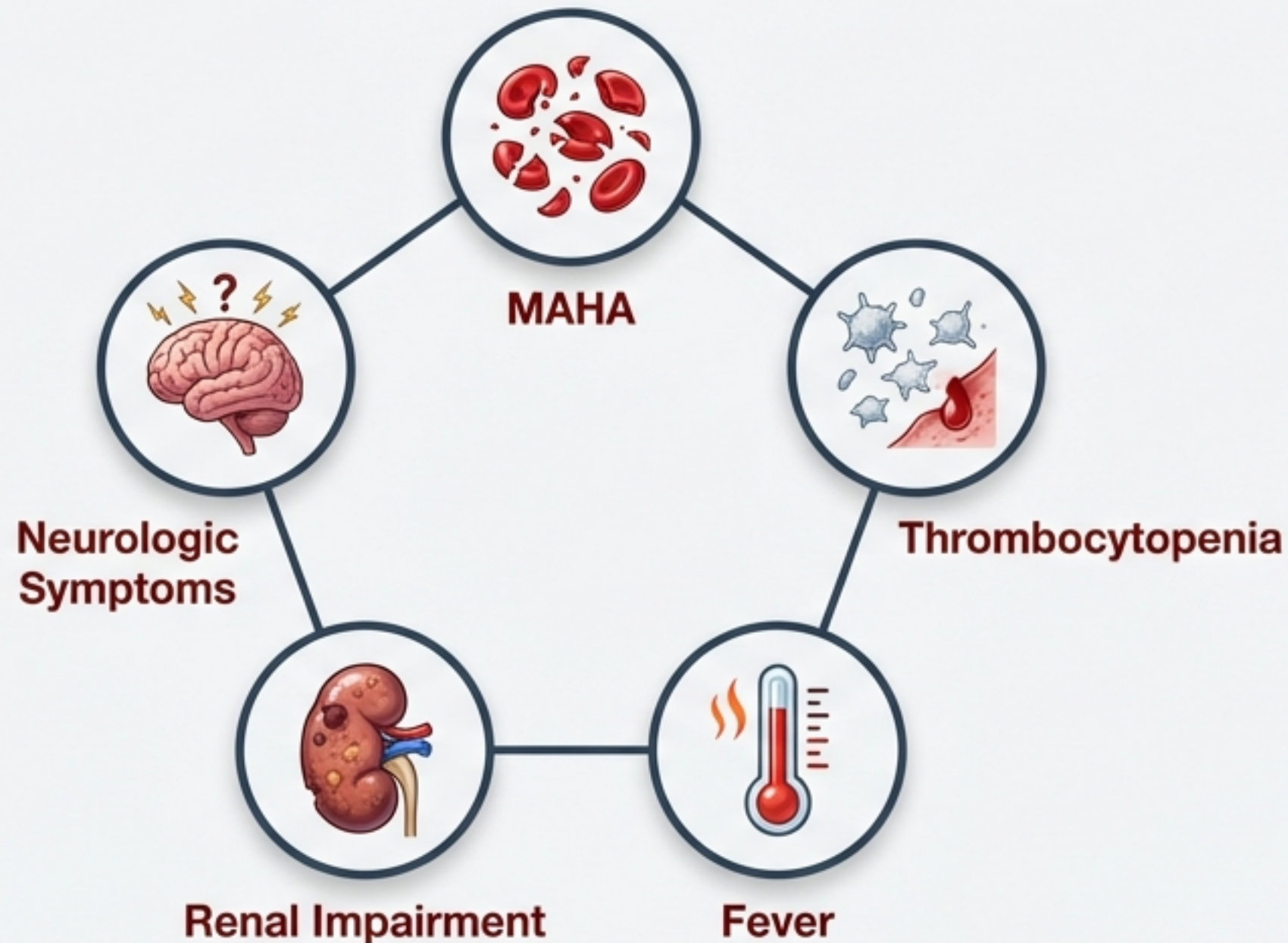
TTP (Deficiency)



**ADAMTS13 Deficiency → Large vWF
→ Platelet consumption & RBC fragmentation.**

TTP: Presentation & Management

Clinical Slate The Clinical Pentad



Clinical Slate Urgent Management

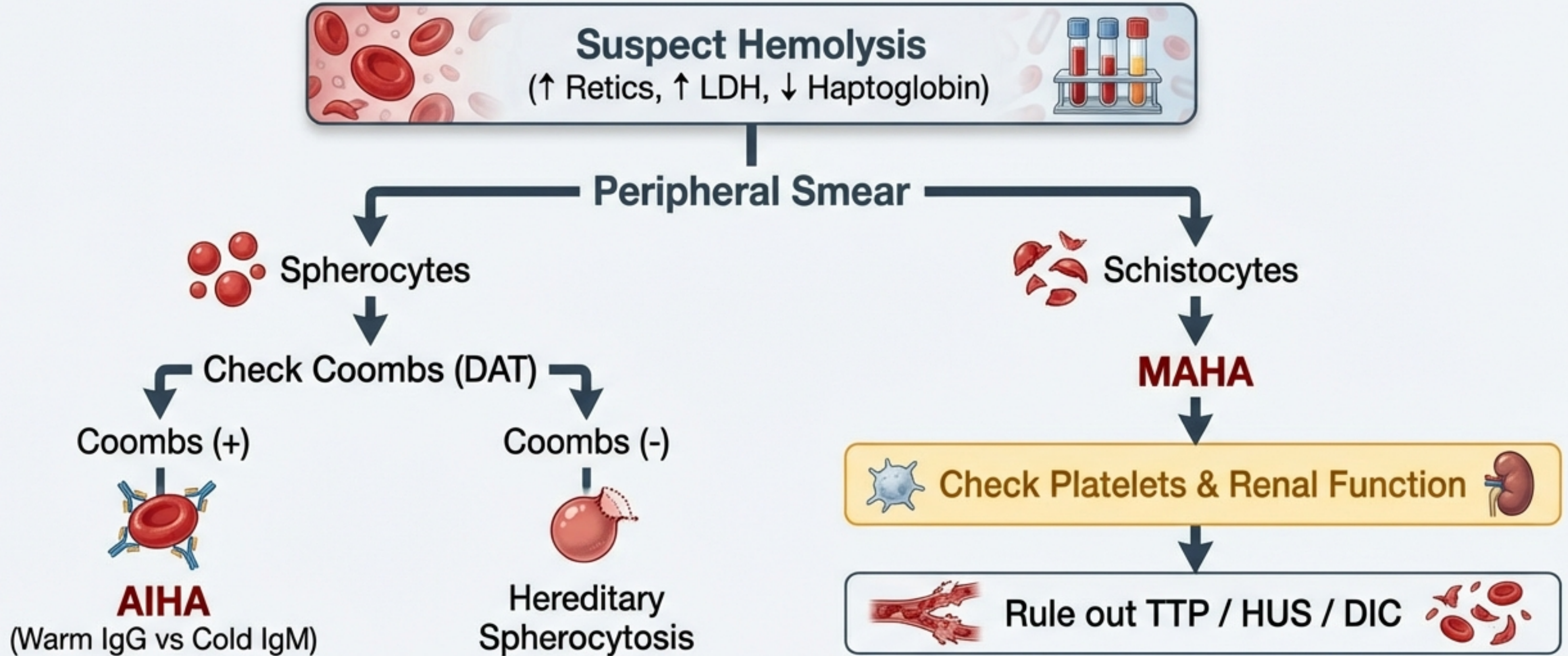
Gold Standard
**PLASMA
EXCHANGE
(PEX)**



Adjunct
Immunosuppression (Steroids/Rituximab)

 Hemoglobin Red
WARNING: Do NOT transfuse platelets (worsens thrombosis).

Summary: The Diagnostic Algorithm



Key Takeaway: The Smear + Coombs Test separates the Immune from the Mechanical.