RBC disorders 3

Anemia of blood loss (1)

- Anemia of blood loss, hemorrhage
- Hemolysis
  - extrinsic
    - Immune hemolytic anemia
    - Hemolytic anemia resulting from mechanical trauma to the red cells
    - Infection

1- Other than anemia, one of the following can be seen in the setting of anemia of hemorrhage:

A. Leukocytopenia
B. Neutropenia
C. Leukocytosis
D. Lymphocytopenia
E. Thrombocytopenia

2- Which one of the following is most helpful to differentiate between intravacular and extravscular hemolysis:

A. LDH
B. Haptoglobin
C. Bilirubin
D. Hemoglobiuria

3- Warm antibody immune hemolytic anemia is most commonly caused by:

A. IgM
B. IgA
C. IgG
D. IgD
E. IgE

4. Which one of the following is a characteristic finding in microangiopathic hemolytic anemia:

A. Target cells
B. Sickle cells
C. Spur cells
D. Ecchinocytes
E. Schistocytes

5. Which one of the following can cause cerebral malaria:

A. P.vivax
B. P. ovale
C. P. falciparum
D. P. malarie

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- intrinsic
  - Hereditary
    - Membranopathies-spherocytosis
    - Hemoglobinopathies-thalassemia and sickle cell disease
    - Enzymopathies-G6PD deficiency
  - Acquired
    - Paroxysmal nocturnal hemoglobinuria.

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Anemia of blood loss

- It has two types
  - Acute
  - Chronic

- Acute: resulting from external (wound) or internal (rupture aortic aneurysm) hemorrhage.
- If the blood loss is less than 20% of the total volume, healthy patients can tolerate that with a few symptoms
- If it exceeds 20% the immediate threat is from hypovolemia not anemia.

- The full effect of anemia starts to appear after 2-3 days when the fluid shifts into the intravascular space.
- Erythropoietin will be released recruiting more stem cells to proliferate and differentiate into red cells.

- Normochromic normocytic anemia
- Leukocytosis
- As Red cell production increases, it turns into slightly macrocytic anemia
- Thrombocytosis upon recovery.

- Anemia of chronic blood loss is iron deficiency anemia, discussed earlier.

Hemolysis-general

- Increase destruction of red cells resulting in decreased RBC survival.
- Elevated erythropoietin levels
- Accumulation of hemoglobin degradation products, bilirubin and iron.
- Erythroid precursor hyperplasia in the bone marrow and reticulocyte counts in the blood.

- Extravascular or intravascular.
  - Extravascular: spleen or liver
    - No hemoglobinuria or hemoglobinemia
    - Low haptoglobin
    - High LDH
    - Splenomegaly.
    - Jaundice; high bilirubin and possibly gallbladder stones.

- Intravascular
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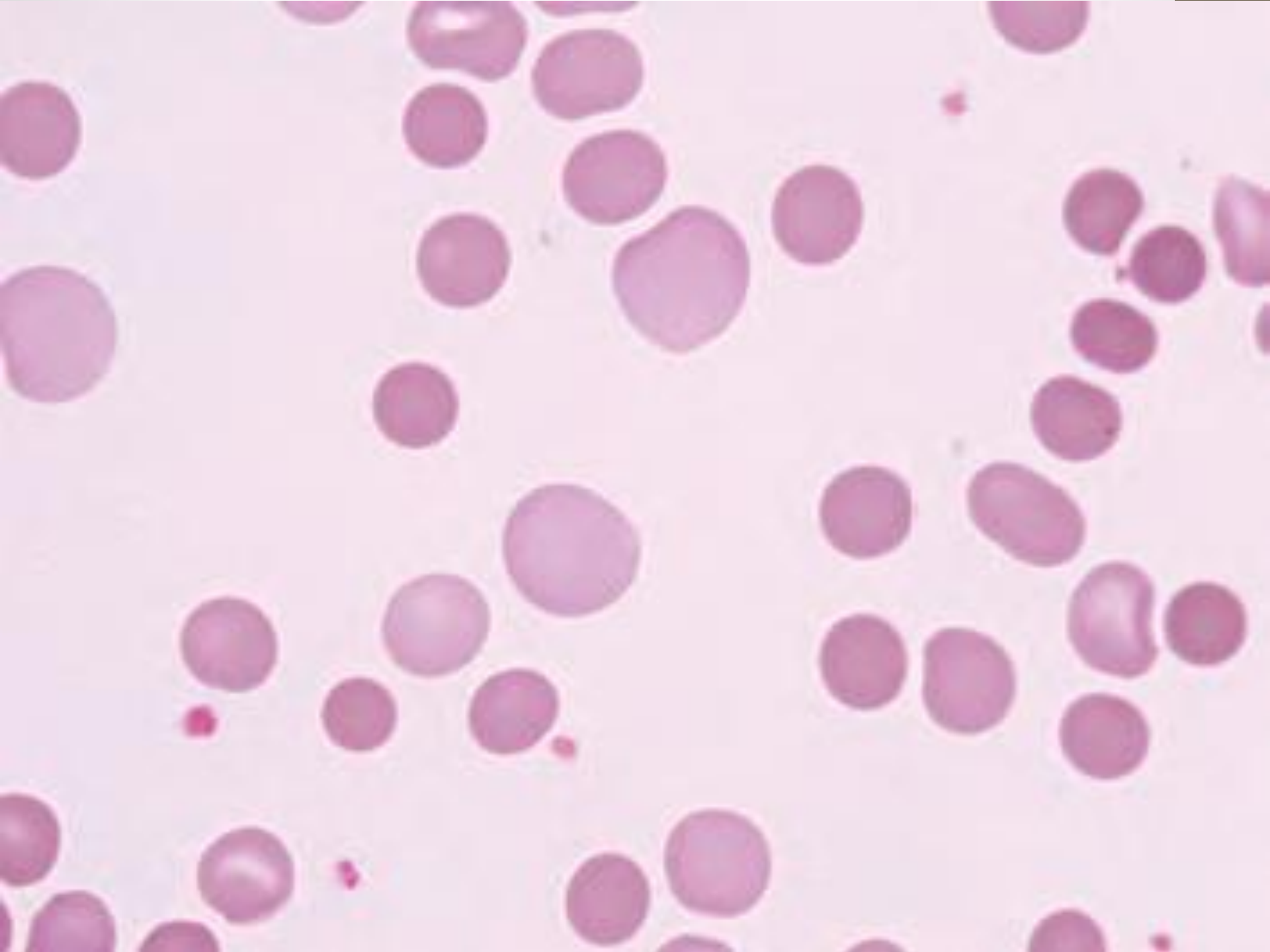

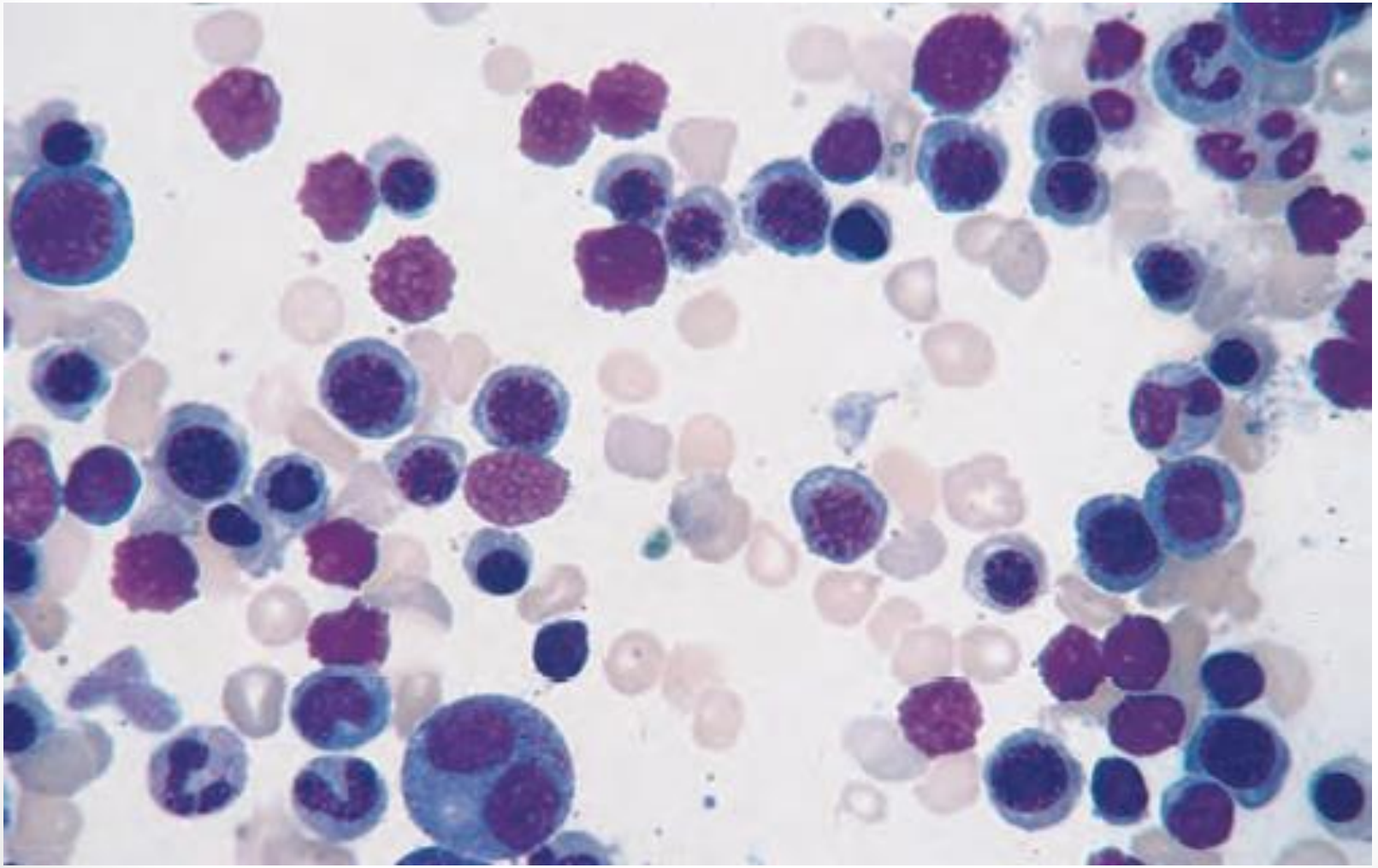

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- **Hemolysis**
  - **extrinsic**
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Immune hemolytic anemia

Hemolytic anemias in this category are caused ***by antibodies that bind to red cells****, leading to their premature destruction.*

Warm Antibody Type

Primary (idiopathic)

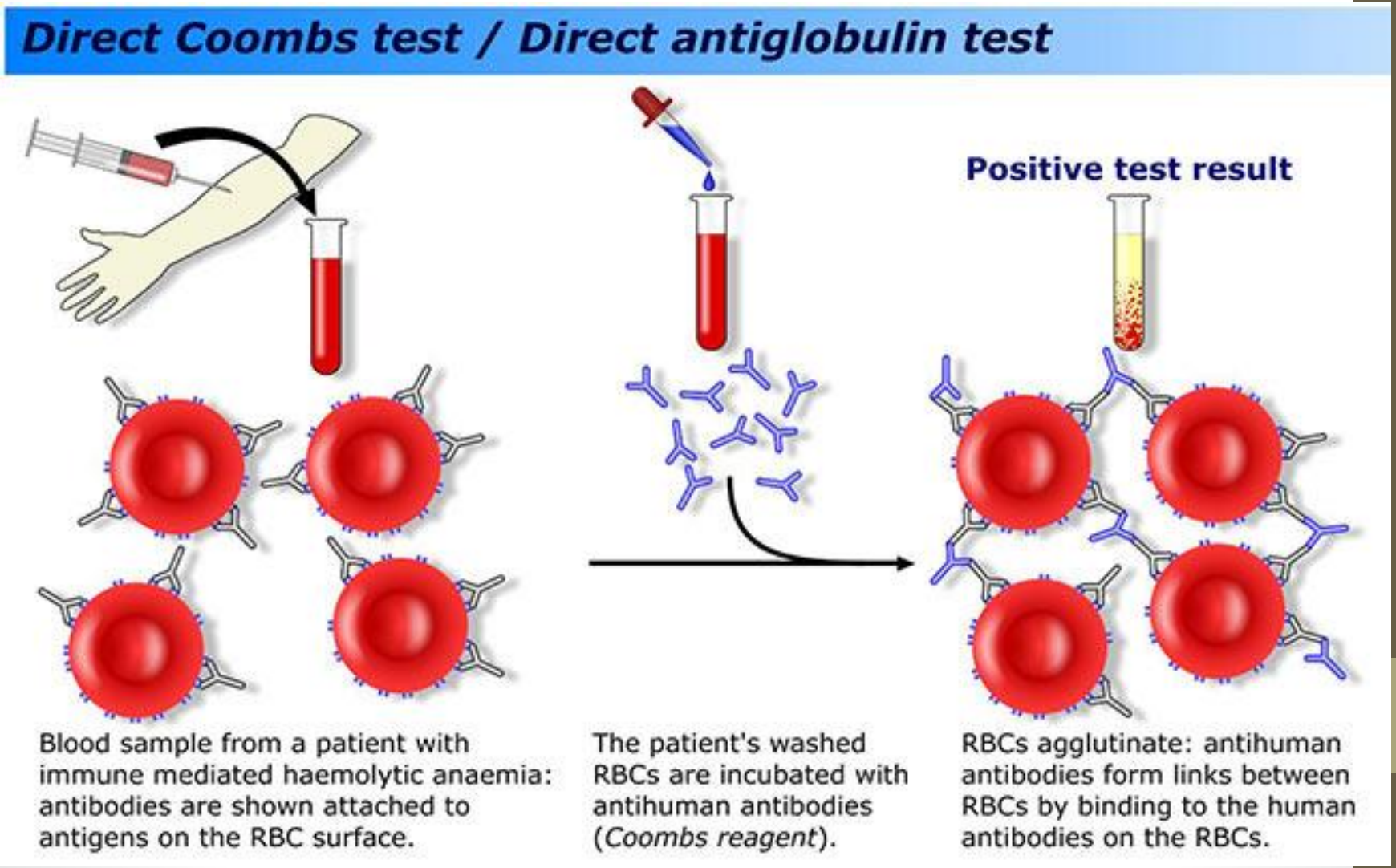
Secondary: B cell neoplasms (e.g., chronic lymphocytic leukemia), autoimmune disorders (e.g., systemic lupus erythematosus), drugs (e.g., α-methyldopa, penicillin, quinidine)

Cold Antibody Type

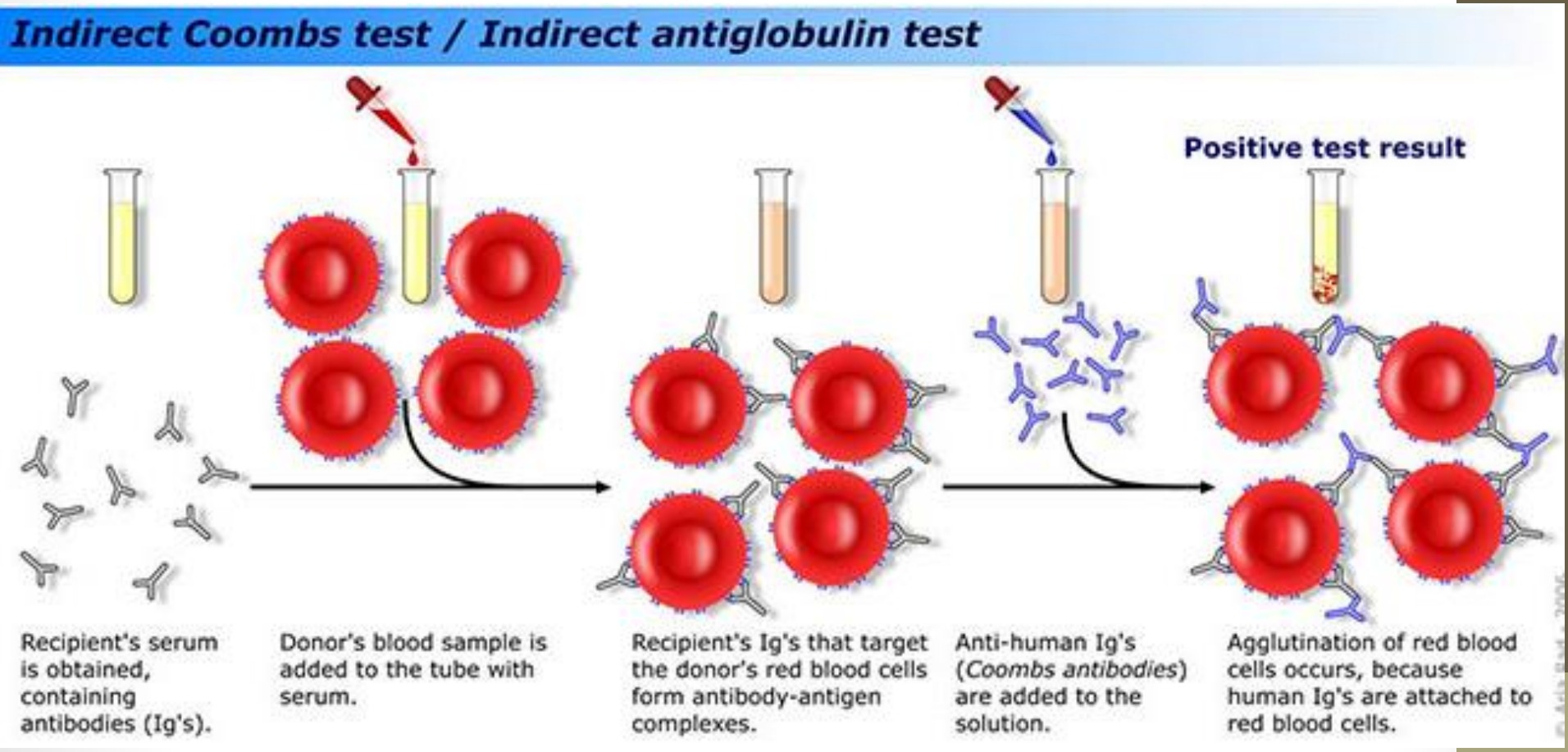
Acute: Mycoplasma infection, infectious mononucleosis

Chronic: idiopathic, B cell lymphoid neoplasms (e.g., lymphoplasmacytic lymphoma)

Coombs test-direct

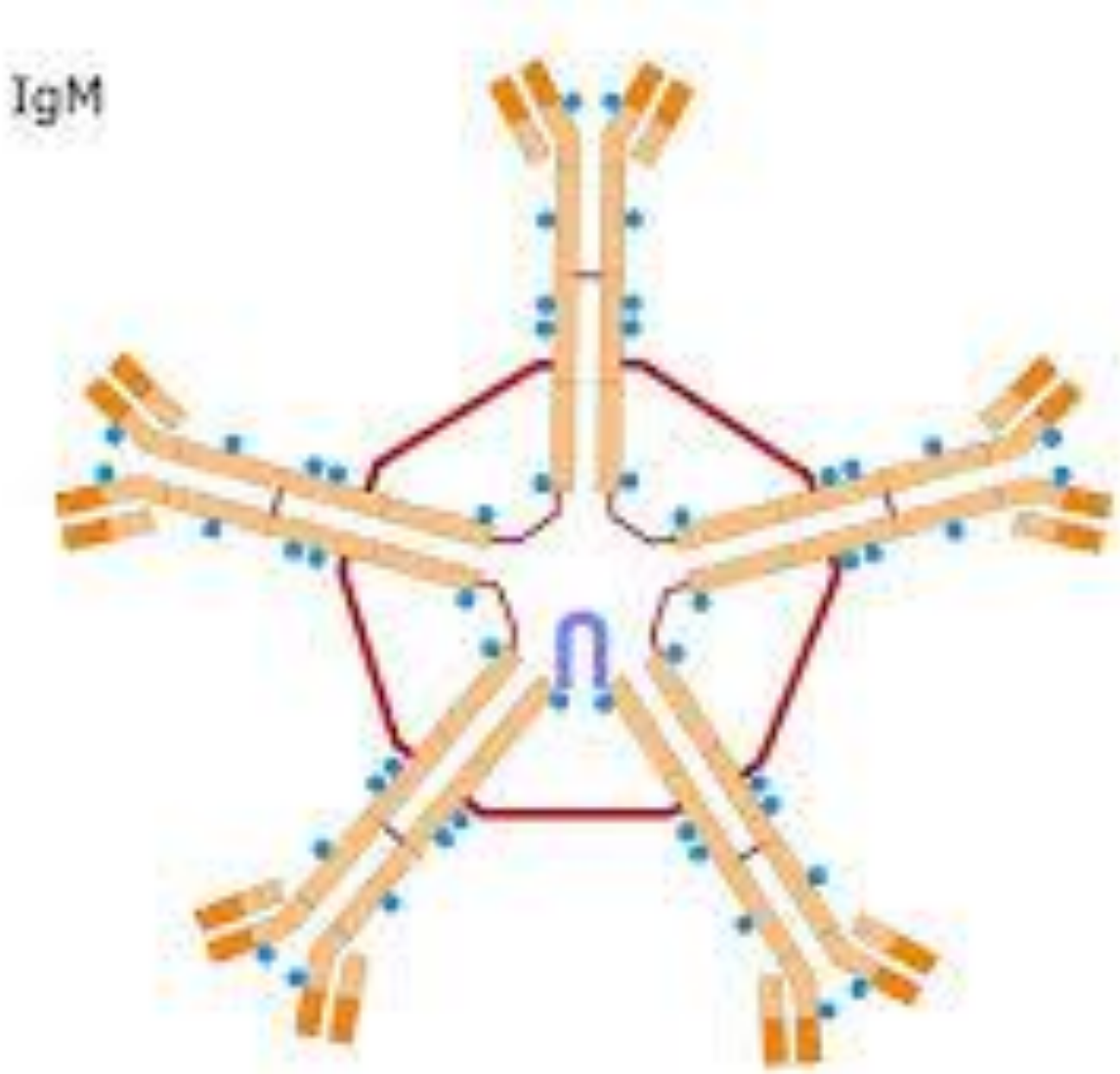


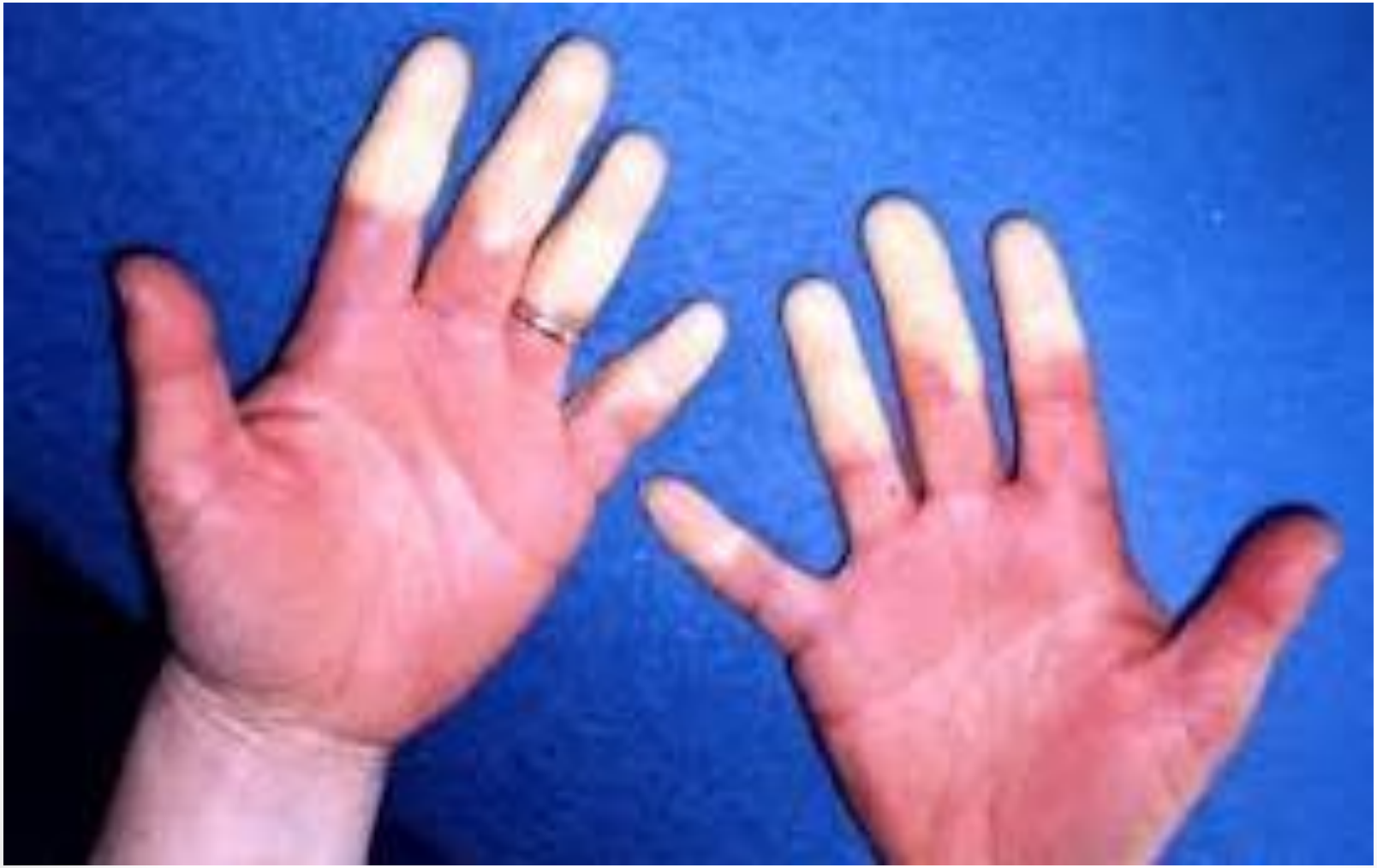
Coombs test-indirect



- Warm immunohemolytic anemia:
  - IgG and rarely IgA
  - 37 C°
  - Over 60% idiopathic.
  - Remaining minority is caused by autoimmune diseases (SLE), B cell neoplasms (CLL), or drugs (methyl-dopa, penicillin).
  - Most patients have mild anemia with splenomegaly and require no treatment.

- Cold immunohemolytic anemia:
  - IgM
  - Low temperatures in cold weather
  - Extravascular hemolysis.
  - Could be idiopathic
  - Secondary to mycoplasma, infectious mononucleosis, B cell neoplams (lymphoplamsacytic lymphoma)
  - Usually mild without clinical significance.


IgM



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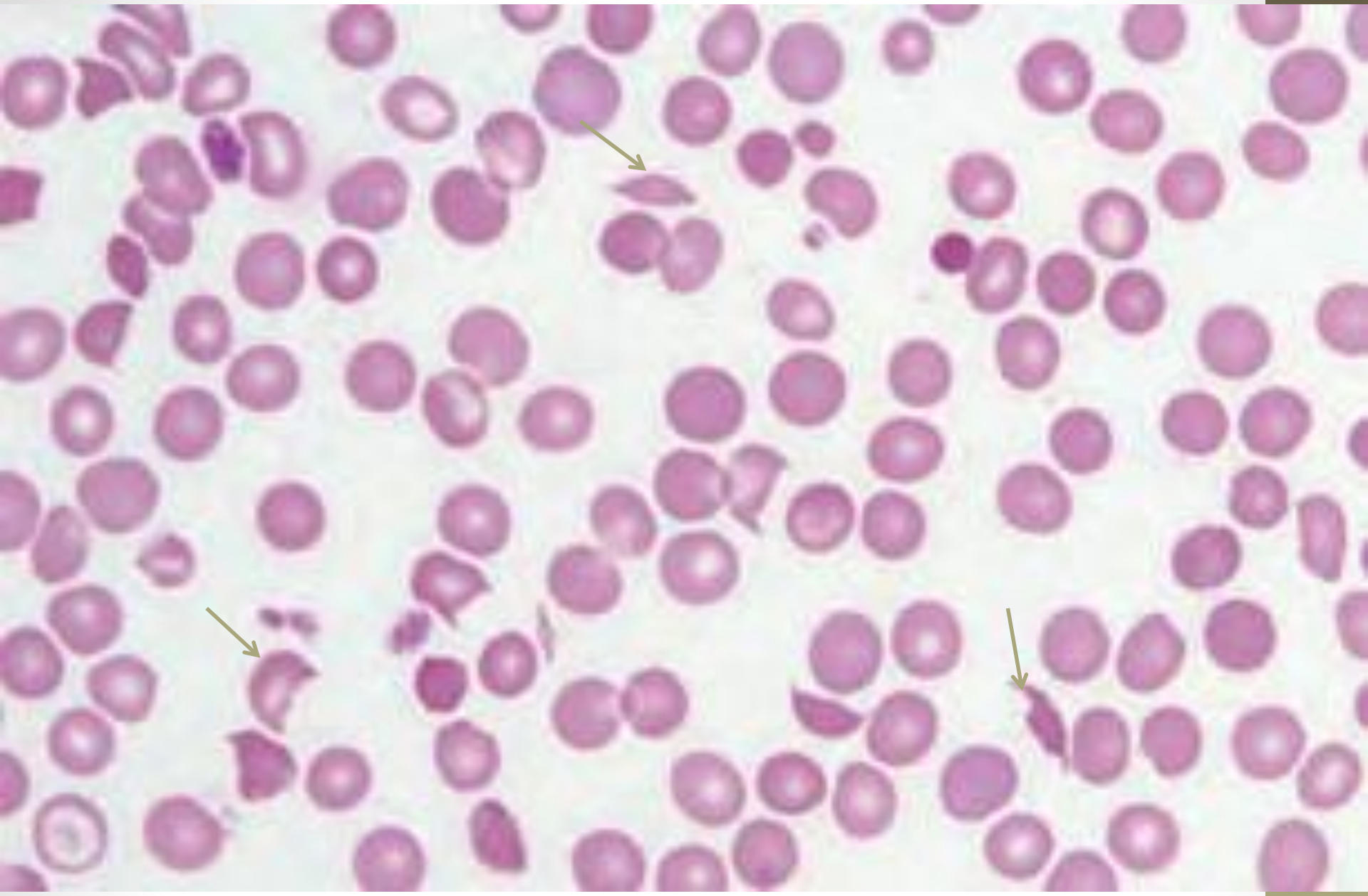
Hemolytic anemia resulting from mechanical trauma to the red cells

- Repeated physical activity
- Cardiac valves
- Microangiopathic hemolytic anemia
  - DIC, most commonly
  - Malignant hypertension
  - SLE
  - Thrombotic thrombocytopenic purpura
  - Hemolytic uremic syndrome
  - Disseminated cancer



schistocytes

- Microangiopathic hemolytic anemia is not, by itself, a serious disease, but it points to a serious underlying disorders.

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infection

- Malaria:
  - Parasites within the RBCs, rupture resulting in hemolysis and episodic symptoms
  - Hematin released from the RBCs results in brown pigmentation of the spleen, liver and bone marrow
  - Massive splenomegaly and occasional hepatomegaly.
  - Falciparum can cause cerebral malaria which can be fatal.

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THANK YOU