
Approach to Anemia

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Important to Remember:

Anemia is a symptom and not a disease

Look for the Primary Cause!

First Question:

- **Acute vs chronic**
- Clues:
 - Hemodynamic stability
 - Previous CBC
 - Overt blood loss

Acute vs Chronic Anemia:

- Symptoms from anemia depend on:
 - Decrease O₂ carrying capacity
 - Change in blood volume
 - Rate of development
 - Associated manifestations of underlying disease
 - Cardiovascular/respiratory capacity

Acute vs chronic anemia:

- Either due to acute blood loss or acute hemolysis
- Symptoms often due to loss of circulating volume
- Symptoms in chronic anemia due to lack of O₂ carrying capacity
- Tolerated better due to compensatory mechanisms

Second question in chronic anemia:

- **What is the mean corpuscular volume (MCV) ?**
- Classify chronic anemia as:
 - Microcytic (decreased MCV)
 - Normocytic (normal MCV)
 - Macrocytic (increased MCV)

Microcytic anemia

- Microcytic anemias usually as result of defective hemoglobin synthesis
- Differential:
 - Iron deficiency
 - Thalassemia trait
 - Anemia of chronic disease
 - Sideroblastic anemia
 - Lead poisoning

Case Presentation 1

- 24 year old female, asymptomatic
- Routine bloodwork for health insurance
- CBC:
 - Hb - 110 gm/dl
 - WBC- normal
 - Plats- normal
 - MCV- 65
 - RDW- 13

Iron deficiency vs Thalassemia

- Ethnic background
- Family history
- Hb vs MCV
- RDW
- Peripheral smear

Iron deficiency vs Thalassemia

	Hb	MCV	RDW
Thalassemia	Normal/ Slightly decreased	65	Normal
Fe deficiency	< 80	65	Increased

Normocytic anemia

- Wide differential:
 - Acute blood loss
 - Hemolysis (acute/chronic)
 - Anemia of chronic disease:
 - chronic inflammation: RA, SLE
 - chronic infection: TB, SBE, abscess
 - malignancy

Normocytic anemia

- Anemia of renal failure
- Liver failure
- Endocrinopathies
 - Addison's
 - hypothyroidism
 - hypogonadotropic states
- Early iron deficiency
- Pregnancy
- Bone marrow disorders

Case presentation 2

- 40 yr female

- 6 mt arthritis small joints of hand
- 1 mt facial rash
- 1 wk increasing fatigue and SOB
- 2 days “yellow” colour of eyes and skin

- On examination:

- BP: 100/70
- Pulse: 110/min
- Jaundiced
- Splenomegaly
- swollen MCP jts

Case presentation 2

- Laboratory investigations:
 - Hb: 60 gm/dl
 - MCV: 94
 - WBC: $18 \times 10^9/L$
 - Plts: $490 \times 10^9/L$
 - RDW: 19

Case presentation 2

- Reticulocyte count: 450
- Total bilirubin: 86
- Direct bilirubin: 2
- LDH: 690
- What is the differential and next investigations?

Case presentation 2

- Direct Anti-globulin Test (DAT) :
Positive
- Diagnosis:
 - Autoimmune hemolytic anemia
 - Secondary to SLE

Hemolytic Anemia: Two components for diagnosis:

- **Increased production**

- Elevated reticulocyte count
- Bone marrow erythroid hyperplasia

- **Red cell destruction:**

- Increased indirect bilirubin
- LDH
- decreased haptoglobin
- heme-hemopexin complexes
- hemoglobinuria

Differential Diagnosis

- *Congenital:*

- Membrane disorders
 - Hereditary spherocytosis
- Hemoglobinopathies
 - Thalassemias/Sickle cell disease
- Enzymes
 - G6PD deficiency

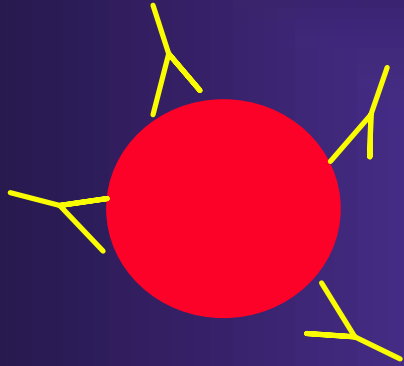
- *Acquired:*

- Immune
 - drugs, autoimmune
 - alloimmune
- Non-immune
 - microangiopathic
 - infections
 - toxins: copper
 - burns
 - drugs: oxidative hemolysis
 - liver/renal disease

Investigations for Hemolytic anemia

- Peripheral smear is the most important initial investigation
- Coombs test with anti-IgG and anti-complement

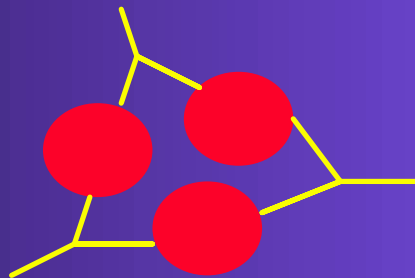
Direct Anti-globulin Test (DAT)



Patient's RBCs coated with antibody

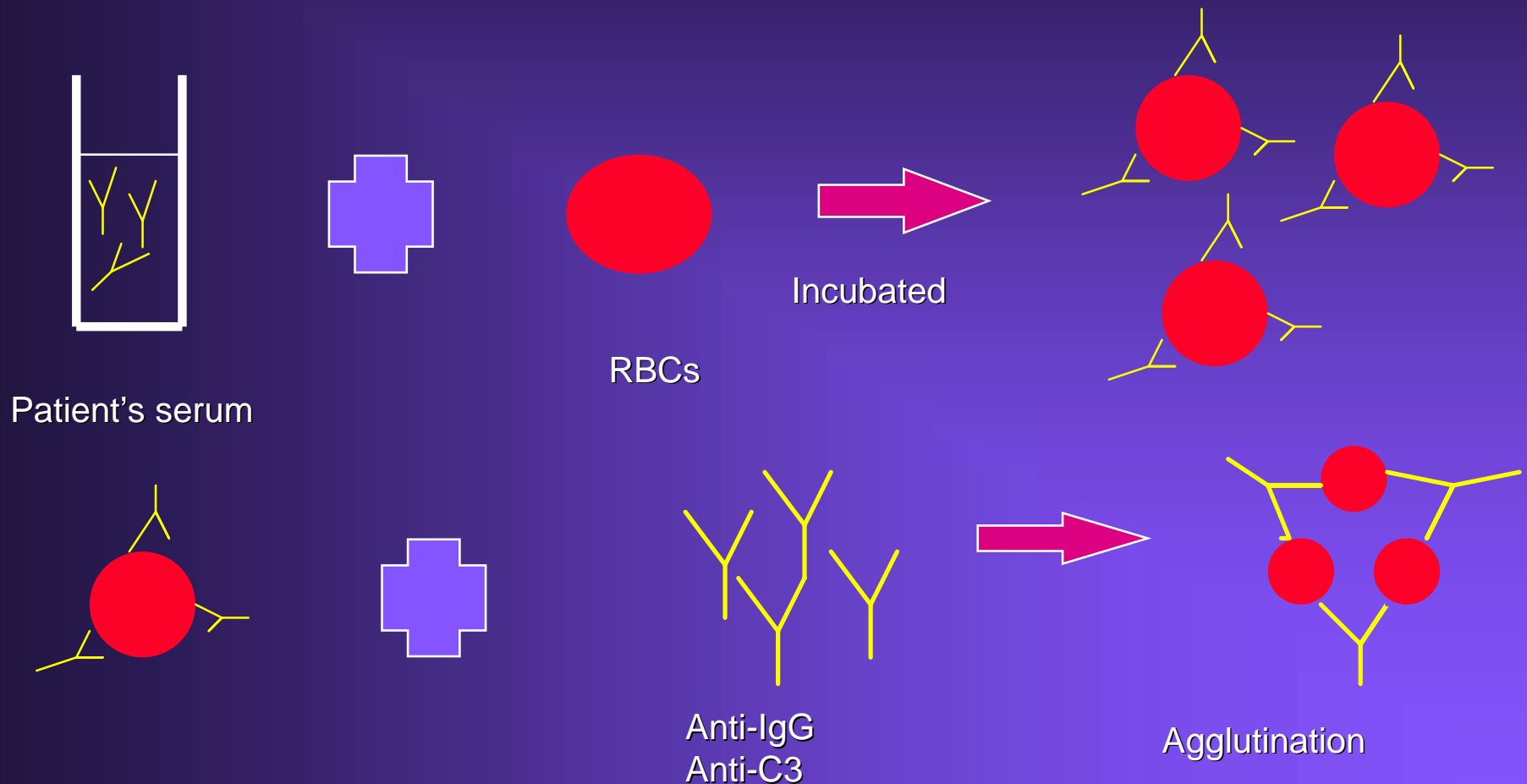


Anti-IgG and anti-C3
Coombs reagent



Agglutination

Indirect Anti-globulin Test (IAT)



Case Presentation 3

- 72 yrs male
 - 4 month hx 30 lbs weight loss
 - anorexia, nausea , fatigue
- On examination:
 - cachetic
 - abdominal mass

Laboratory investigations:

- CBC:
 - WBC: 1.2
 - Hb: 75 gms/dl
 - plts: 85
- What is the next investigation?

Macrocytic Anemia

- Differential diagnosis:
 - Megaloblastic anemia
 - Vitamin B12, Folate deficiency
 - Chemotherapeutic drugs
 - Myelodysplastic syndromes
 - Liver disease
 - Hypothyroidism
 - Increased reticulocyte count

Case presentation 4

- 72 yr male

- angina x 3 wks
- SOB x 1 wk
- Fatigue x 6 wks

- On examination:

- BP: 140/70
- pulse: 100
- “lemon-yellow” skin
- scleral icterus
- decreased vibration sense feet

Case presentation 4

- **Laboratory investigations:**
 - Hb: 40 gms/dl
 - MCV: 134
 - WBC: 1.6
 - Plts: 45
 - Retics: 25
 - LDH: 1600
 - TBili: 75 (direct: 4)

Case presentation 4

- **Diagnosis** : Megaloblastic anemia
- Likely B12 deficiency: Why?
- What should we find on peripheral smear?