

Lec 1

2nd course

Surgery

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**MULTIPLE ALLELES,
BLOOD GROUP
and Rh FACTOR**



Blood and its components

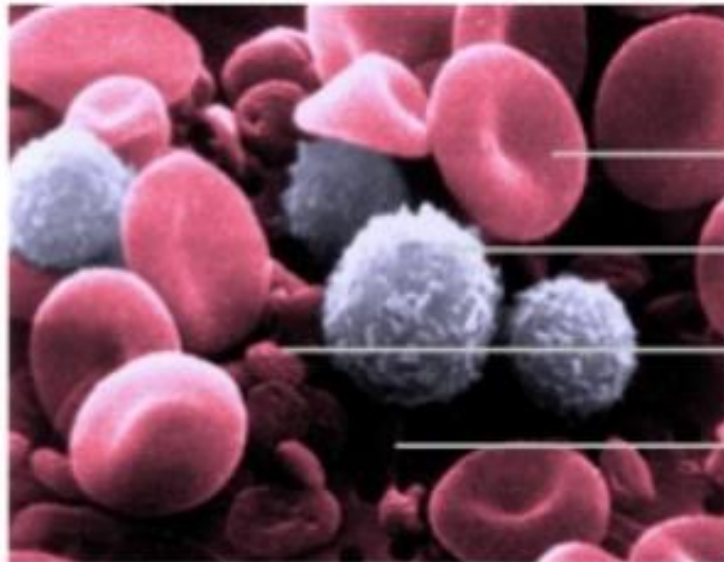


- Liquid fluid consisting of following components:

a. Cells (45%)

b. Plasma (55%)

c. Serum=plasma-fibrinogen



Red blood cells

White blood cells

Platelet

Plasma



Antigen-Antibody



- **Antigen:**

The foreign substance that triggers the production of antibodies.

- **Antibodies:**

The substances produced in response to antigens.



Agglutination



- The reaction between the antigen and antibody
- Clumping of red blood cells occur in some cases and in some cases do not



Introduction to Blood Group Systems



- 35 blood group systems are recognized
- Most important ABO blood group system and Rh system
- M-N system also has little importance
- Classification is based on inherited antigenic substances



Multiple Alleles



- A set of three or more altered form of a gene
- An individual posses only two of these allelic forms
- Example: Alleles encoding the ABO blood group system



ABO Blood Type



- Blood group A
- Blood group B
- Blood group AB
- Blood group O



ABO Blood Type



- Determined by the ABO gene, located on chromosome no . 9
- The gene has three allelic forms I^A I^B and i
- These determine four types of blood groups



ABO Blood Group Types



- If A antigen is present, blood group will be A
- If B antigen is present, blood group will be B
- If both A and B antigens are present, blood group will be AB
- If neither A nor B antigen is present, blood group will be O

ABO BLOOD GROUP SYSTEM

ABO Blood Group System



A



B



AB



Antibodies Against ABO Antigens













- The immune system form antibodies against whichever ABO blood group antigens are present
- For example a person with blood group A will have B antibodies and so as other



Antigens Vs Antibodies



	GROUP A	GROUP B	GROUP AB	GROUP O
Erythrocytes	 A	 B	 AB	 O
Antibodies	 Anti-B	 Anti-A	none	 Anti-A Anti-B
Antigenes	 A antigen	 B antigen	 A and B antigen	none



CROSSES OF ABO BLOOD



Allele from Parent 1	Allele from Parent 2	Genotype of offspring	Blood types of offspring
I^A	I^A	$I^A I^A$	A
I^A	I^B	$I^A I^B$	AB
I^A	i	$I^A i$	A
I^B	I^A	$I^A I^B$	AB
I^B	I^B	$I^B I^B$	B
I^B	i	$I^B i$	B
i	i	ii	O



Importance of ABO Blood Group System



- Most important test because:
- Antibodies of ABO system present in every person
- Incompatible blood transfer causes the intravascular hemolysis of RBCs leading to death



Change In Phenotypic Expression of ABO Gene



Bombay Phenotype:

- The individuals possess neither A nor B antigens on their surface
- Phenotypic expression is like O blood group type



Universal Donors Vs Universal Acceptors



Universal Donor:

- Can donate their blood to anyone
- Have O negative blood group

Universal Acceptors:

- Can accept blood from anyone
- Have AB positive blood group



Rh Blood Group System



- This system also discovered by Karl Land Steiner(1940)
- Second important blood group system
- The main cause of hemolytic disease of new born(HDN)



Rh Blood Group



- Consists of 49 antigens
- Most significant are D,C,E,c and e
- Commonly used term Rh factor refer to D antigen on RBCs surface



Types of Rh Blood Group System



- **Rh Positive:**

Posses Rh antigen on surface of RBCs

- **Rh Negative:**

Lack Rh antigen on surface of RBCs



Erythroblastosis Fetalis



- Hemolytic disease of new born

Occurrence:

- If a mother with Rh⁻ have a fetus with Rh⁺
- Mother develop Rh⁻ antibodies against fetus Rh⁺
- These antibodies will react with subsequent Rh⁺ fetus
- Lead to bursting of RBC's



Treatment For Erythroblastosis Fetalis



- Steps are taken to prevent antibodies production against fetus antigens
- Usually a shot of Rh antibodies are given to mother within 72 hours of delivery
- Blood Transfusion



