

ABO System

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ABO BLOOD GROUP SYSTEM

- Discovered by Karl Landsteiner; locus on chromosome 9
- Single most important blood group for the selection and transfusion of blood
- Widely expressed → tissues & body fluids including red cells, platelets & endothelial cells

- **Three antigens:** A, B, H
- **Two major antibodies:** anti-A and anti-B
- **Four phenotypes:** A, B, AB, O.
- A & B antigens autosomal co-dominant
and O phenotype autosomal recessive
(most frequent)

ABO Antigens

- Present on the surface of red cells, white cells and platelets as well as tissue and endothelial cells in the body.
- Found in soluble form in plasma & other body secretions in people known as *secretors* (80% of the population who possess secretor genes)

- Inherited in simple Mendelian fashion from an individual's parents
- 3 possible genes that can be inherited: A, B, O
- A and B genes produce a detectable product
- O gene does not produce a detectable product

H Antigen

- Required to produce either A or B antigens
- Possible genetic combinations: HH, Hh, or hh
- HH or Hh (+) → produce H Ag → 99.99% of
Caucasians

- hh → does not produce H Ag → Bombay phenotype (Oh).
- anti-H antibodies rare – found only in individuals with **Bombay** phenotype.

- The A and B genes control the synthesis of specific enzymes responsible for the addition of single carbohydrate residues to the H substance:
- N-acetyl galactosamine for group **A** and
- D-galactose for group **B**

ABO Antibodies

- Natural antibodies → antigenic stimulus is environmental → exposure occurs from birth
- - bacteria, plants, and animals
- Newborns → without ABO antibodies of their own; begin to produce Ab with detectable titer at 6 months of age.

- Because A and B antigens also are expressed on most tissue cells, ABO compatibility is a significant consideration in solid organ transplantation.

- Based on the ABO system, the population is divided into four groups:

<u>group</u>	<u>antigen</u>	<u>antibody</u>
A	A	B
B	B	A
AB	A+B	----
O	-----	A+B

Distribution:

A	42%
B	9%
AB	3%
O	46%

- **There are six combinations of genes:**

- AA AO BB BO AB OO

- **A person may be:**

homozygous(genes from the same type)

or heterozygous(genes are different)

- The genes code for A and B antigens are dominant over the gene codes for O

Genotype

AA

AO

BB

BO

AB

OO

Phenotype

A

B

AB

O

Sub-groups

- There are two major subgroups of A (A₁ and A₂).
- **Differentiation:**
 - A₁ and A₂ are differentiated using antisera specific for A₁ Ag (anti-A₁ lectin) prepared from seed known as *Dolichos biflorus* → (+) reaction with A₁ but not A₂
 - Anti-A → reacts with both A₁ & A₂ but more strongly with A₂

**THANK YOU FOR
ATTENTION**