CROSS MATCHING IN BLOOD BANKS

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Introduction:

- Cross Matching is a procedure performed prior to a blood transfusion to determine whether donor blood is compatible (or incompatible) with recipient blood.
- Compatibility is determined through matching of different blood group systems, the most important of which are the ABO and Rh system, and/or by directly testing for the presence of antibodies against a sample of donor tissues or blood.

Purpose of Cross Matching

- The crossmatch is routinely used as the final step of pretransfusion compatibility testing. The purposes of compatibility testing are to detect: irregular antibodies; errors in ABO grouping, and clerical errors in patient identification and result recording.
- The crossmatch will detect the following:
- **1. Most recipient antibodies directed against antigens on the donor red blood cells.**
  2. Major errors in ABO grouping, labeling, and identification of donors and recipients.

Principle

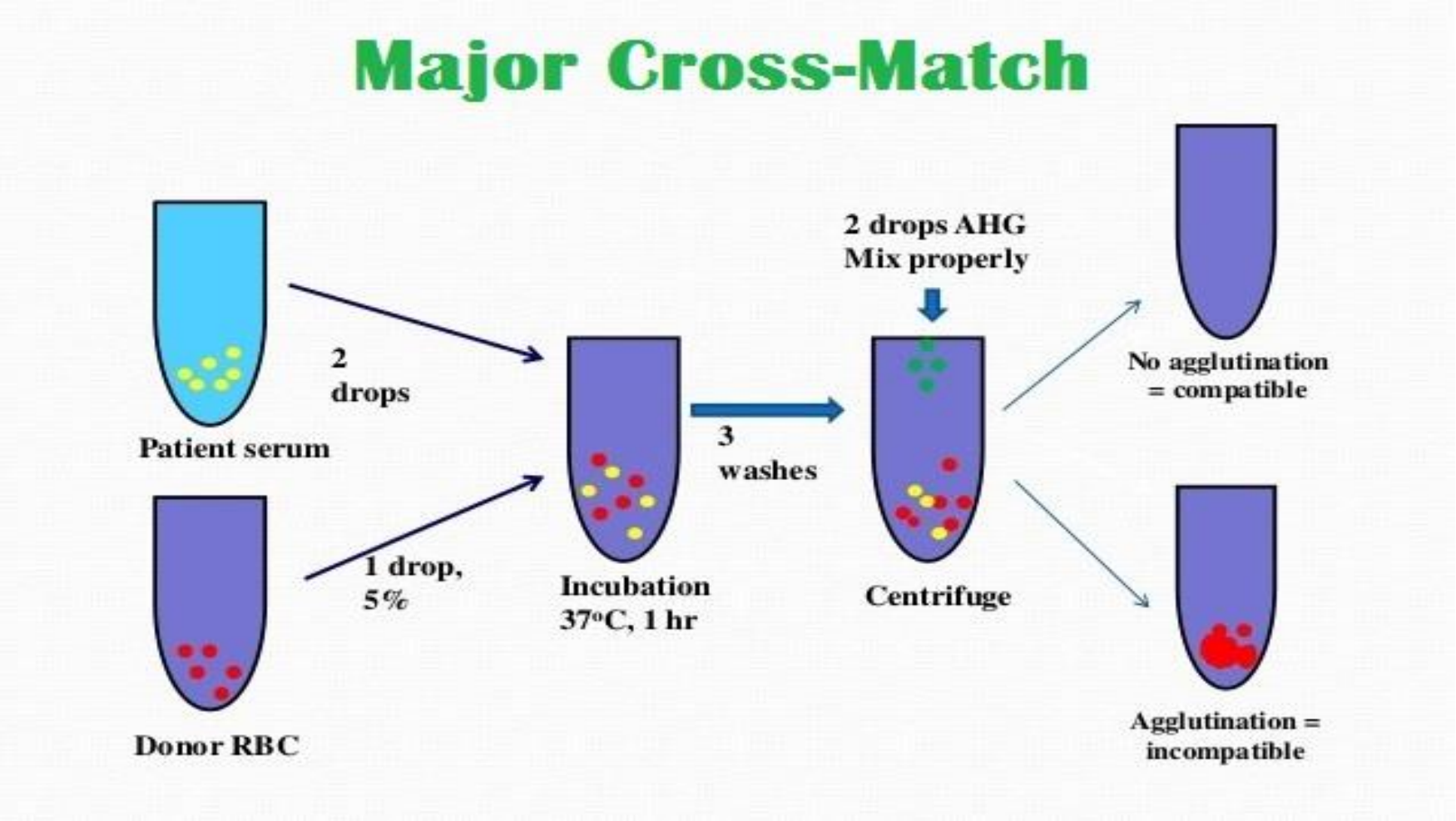
- Cross-matching will detect incompatibilities between the donor and recipient that will not be evident on blood typing. There are two types of cross-matches: Major cross-match and Minor cross-match.
- The **major crossmatch** involves testing the patient's serum with donor cells to determine whether the patient has an antibody which may cause a hemolytic transfusion reaction or decreased cell survival of donor cells. This is the most important cross-match.
- The **minor crossmatch** involves testing the patients cells with donor plasma to determine whether there is an antibody in the donor's plasma directed against an antigen on the patient's cells.

Procedure

- Prepare donor and recipient blood samples:
  For Major crossmatch : Donor's red cell and recipient serum or plasma
  For Minor crossmatch : Recipient red cells and donor's serum or plasma
- Prepare 3 – 5% cell suspensions of red cells.
- **Major Crossmatch**:
  Label a test tube. Add two drops of the patient serum and one drop of the appropriate donor cell suspension.
- **Minor Crossmatch**:
  Label a test tube. Add two drops of the appropriate donor serum and one drop of the patient cell suspension.
- Mix the tubes and incubate at 37°C for about 45 minutes.
- Add two drops of AHG (Antihuman globulin) and mix well.
- Centrifuge for 1 minute at 1500 rpm
- Read macroscopically and microscopically and record the results

Interpretation:

The mixture of erythrocytes and serum are observed for hemolysis or microscopically for agglutination. Any evidence of hemolysis/agglutination indicates an incompatible cross-match. Negative results are taken to indicate compatibility.

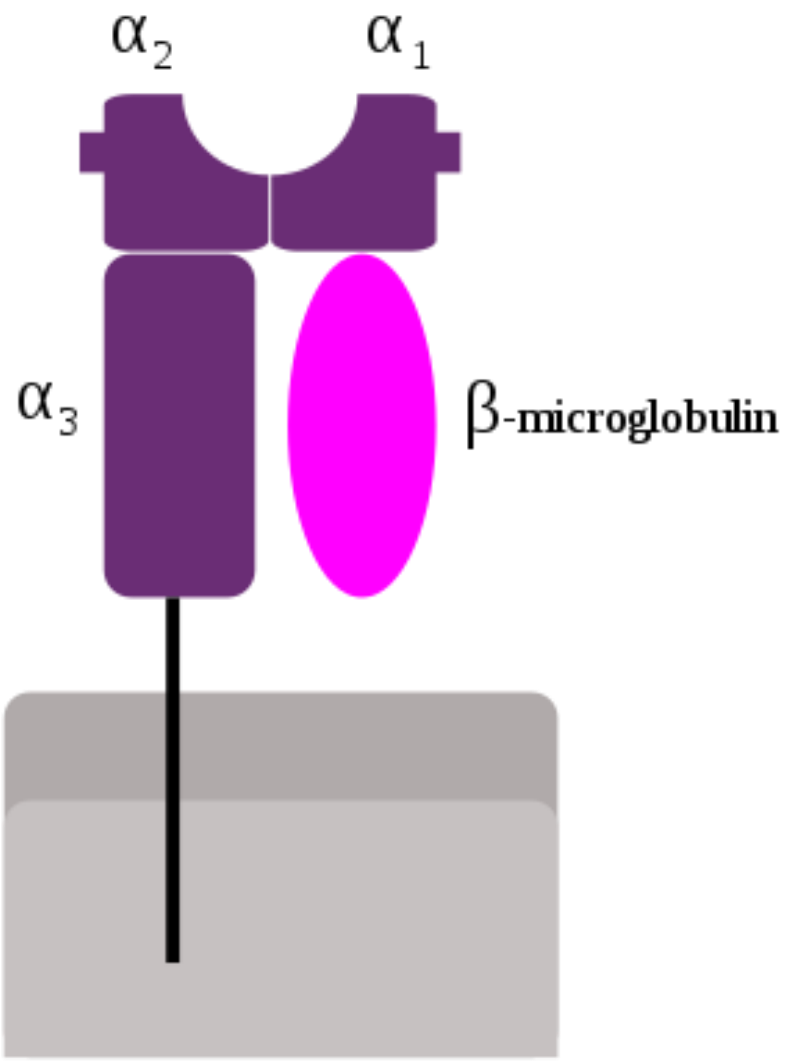


Compatible Blood Groups

Blood Group	Antigens	Antibodies	Can give blood (RBC) to	Can receive blood (RBC) from
AB	A and B	None	AB	AB, A, B, O
A	A	B	A and AB	A and O
B	B	A	B and AB	B and O
O	None	A and B	AB, A, B, O	O

HLA compatibility (Introduction)

- The **human leukocyte antigen** (**HLA**) system or complex is a gene complex encoding the major histocompatibility complex (MHC) proteins in humans. These cell-surface proteins are responsible for the regulation of the immune system in humans. The HLA gene complex resides within chromosome 6p21.



- HLAs corresponding to MHC class I (**A**, **B**, and **C**) which all are the HLA Class1 group present peptides from inside the cell. For example, if the cell is infected by a virus, the HLA system brings fragments of the virus to the surface of the cell so that the cell can be destroyed by the immune system. These peptides are produced from digested proteins that are broken down in the proteasomes. Foreign antigens presented by MHC class I attract killer T-cells (also called CD8 positive- or cytotoxic T-cells) that destroy cells.

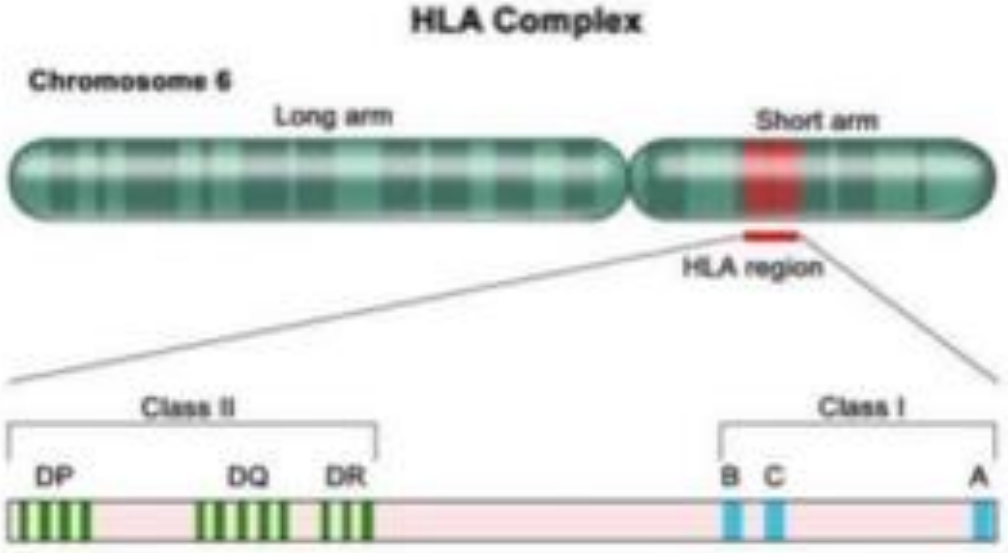
- HLAs corresponding to MHC class II (**DP**, **DM**, **DO**, **DQ**, and **DR**) present antigens from outside of the cell to T-lymphocytes. These particular antigens stimulate the multiplication of T-helper cells (also called CD4 positive T cells), which in turn stimulate antibody-producing B-cells to produce antibodies to that specific antigen. Self-antigens are suppressed by regulatory T cells.

- HLAs corresponding to MHC class III encode components of the complement system.

- HLAs have other roles. They are important in disease defense. They are the major cause of organ transplant rejections. They may protect against or fail to protect (if down-regulated by an infection) against cancers. Mutations in HLA may be linked to autoimmune disease (examples: type I diabetes, coeliac disease).

The HLA system

- Human leukocyte antigens otherwise known as MHC molecules
- Highly polymorphic Glycoprotein complexes
- ~ 200 genes on chromosome 6
- 3 clusters:
  MHC class I – HLA-A, HLA-B, HLA-C
  MHC class II – HLA-DR, HLA-DP, HLA-DQ
  MHC class III – Soluble components



- Thank you.