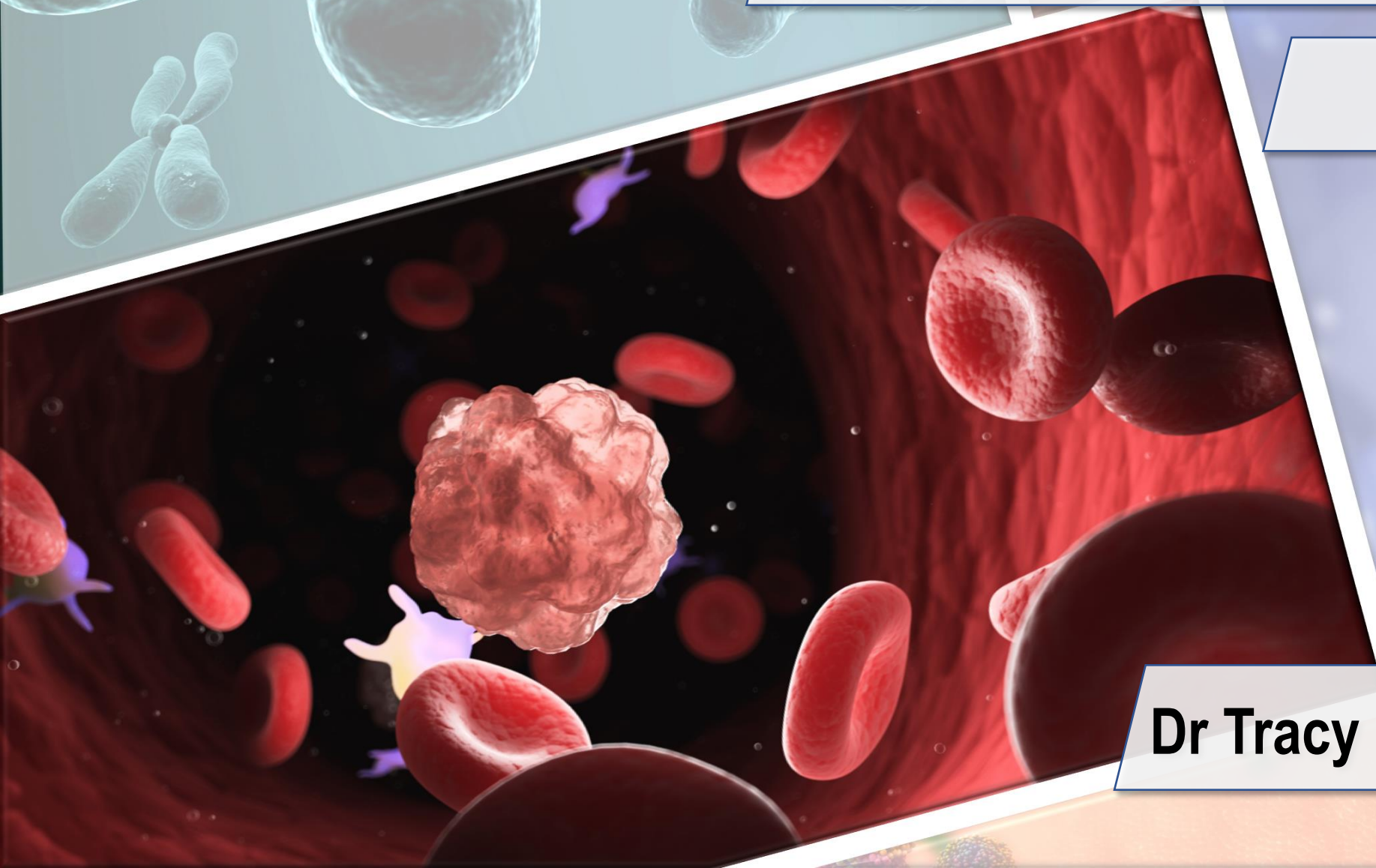
Imperial College London

TBL 4: Transfusion

PART 3



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Session plan

Part 1 – Blood groups and their clinical significance

- Blood group systems
- RBC antigens and antibodies against RBC antigens
- Haemolytic transfusion reaction
- Haemolytic disease of the fetus and newborn
- Naturally occurring antibodies
- Acquired alloantibodies

Part 2 – ABO and Rh blood group systems

- ABO – Antigens, Antibodies, Selecting blood components for transfusion
- RH – Antigens, Antibodies, Selecting blood components for transfusion
- Other blood group systems

Part 3 – Pre-transfusion compatibility testing

- ABO grouping
- RhD grouping
- Antibody screen
- Crossmatch

Part 4 – Donor selection and testing

- Blood donors
- Tests undertaken on donations

Part 5 – Blood components and why we use them

- Whole blood donation
- Apheresis
- Red cells
- Platelets
- FFP
- Cryoprecipitate
- Plasma derived medicinal products

1- POM 2-5 Explain the clinical importance of major blood groups and the screening of blood donors and recall the blood components used in transfusion

Pre-transfusion compatibility testing

GROUP & SCREEN

- **ABO grouping**
- **RhD grouping**
- **Antibody screen**

CROSSMATCH
red cells

Pre-transfusion compatibility testing

GROUP & SCREEN

- **ABO grouping**
- **RhD grouping**
- **Antibody screen**

CROSSMATCH
red cells

ABO grouping

- **Forward group – To identify the ABO antigens on the RBCs**
  - A sample of the patient's RBCs is tested against reagent anti-ABO antibodies
  - Interaction between the reagent anti-A or anti-B with the ABO antigens on the RBCs will result in clumping (agglutination) of the RBCs which can be visualised

- **Reverse group – To identify the presence or absence of ABO antibodies in the plasma**
  - A sample of the patient's plasma is mixed with reagent A and B RBCs
  - Interaction between the patient's ABO antibodies and the ABO antigens on the reagent RBCs will result in agglutination which can be visualised

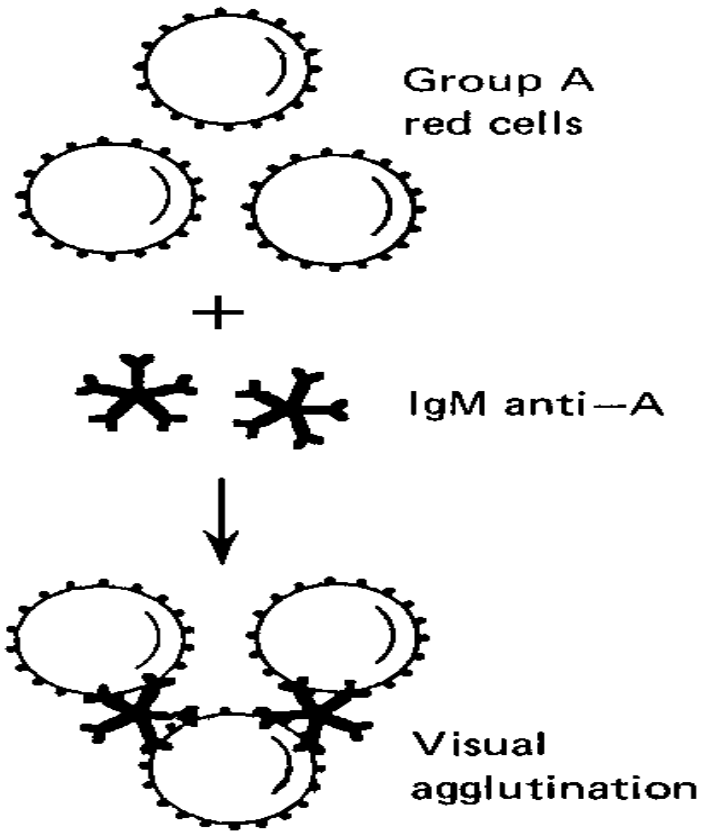

Figure: showing agglutination between blood group A RBCs and anti-A antibody

BLOOD GROUP	FORWARD GROUP Patient red cells + reagents			REVERSE GROUP Patient's plasma + reagents		
	Anti-A reagent	Anti-B reagent	*Antigen(s)on RBC*	Reagent A red cell	Reagent B red cell	*Antibody(ies) in plasms*
O	No reaction	No reaction	*No A or B antigen on RBC*	Agglutination	Agglutination	*Anti-A and anti-B in plasma*
A	Agglutination	No reaction	*A antigen on RBC*	No reaction	Agglutination	*Anti-B in plasma*
B	No reaction	Agglutination	*B antigen on RBC*	Agglutination	No reaction	*Anti-A in plasma*
AB	Agglutination	Agglutination	*A and B antigen on RBC*	No reaction	No reaction	*No anti-A or anti-B in plasma*

Figure: ABO forward and reverse grouping

Pre-transfusion compatibility testing

GROUP & SCREEN

- ABO grouping
- **RhD grouping**
- Antibody screen

CROSSMATCH
red cells

RhD grouping

- To determine a patient's RhD type, we identify the presence or absence of the D antigen on their RBCs by testing a sample of the patient's RBCs against reagent anti-D antibodies

- Interaction between the regent anti-D antibodies will results in agglutination that can be visualised

BLOOD GROUP	Patient red cells + reagent anti-D antibodies	
	Anti-D reagent	*Antigen on RBC*
RhD positive	Agglutination	*D antigen on RBC*
RhD negative	No reaction	*No D antigen on RBC*

Figure: RhD grouping

Pre-transfusion compatibility testing

GROUP & SCREEN

- ABO grouping
- RhD grouping
- **Antibody screen**

CROSSMATCH
red cells

Antibody screen

- Performed to detect the presence of any acquired alloantibodies the patient may have developed
- The patient's plasma is tested against panels of RBCs which together are known to express all of the clinically relevant RBC antigens
- If there is an interaction between an antibody in the patient's plasma and an antigen on the RBCs, agglutination will occur (i.e. antibody screen positive)
- However, in this case, the agglutination cannot be directly visualised and requires the addition of another reagent (anti-human globulin) before it can be seen
  - This is because acquired alloantibodies are IgG antibodies (not IgM)

Pre-transfusion compatibility testing

GROUP & SCREEN

- ABO grouping
- RhD grouping
- Antibody screen

CROSSMATCH red cells

Crossmatch

- This is an additional step for red cells transfusion before the unit of red cells selected for transfusion can be issued to the patient
- The selected unit of donor red cells needs to be ABO group and RhD compatible with the patient's ABO and RhD group, as well as, antigen negative for any alloantibody(ies) they may have
- A crossmatch is performed by testing the patient's plasma against a sample of red cells from the unit of red cells selected for transfusion
    - If there is no agglutination seen, this unit of red cells is compatible and can be transfused
    - If there is agglutination seen, this unit of red cells is incompatible and cannot be transfused
- **In emergencies, where emergency group O RhD negative red cells are required, a crossmatch <u>does not</u> need to be performed**