

# Clinically Significant Antibodies and the Provision of Blood


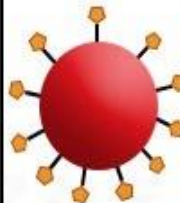
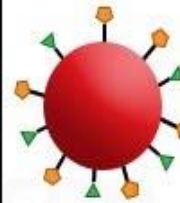
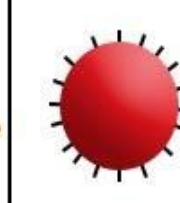






Victoria Waddoups

# Aims

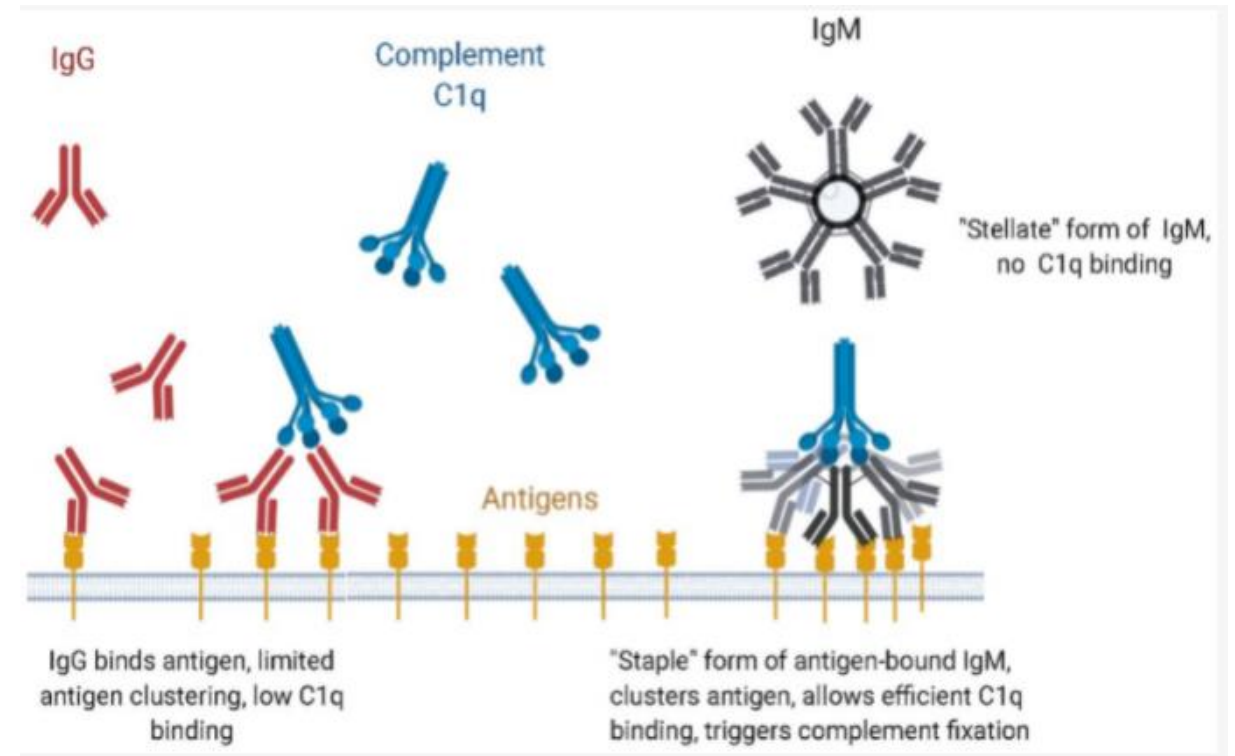
- What is a clinically significant antibody?
  - Pre-transfusion testing process
  - Which antibodies are a problem?
- How we provide blood for these patients

# Antibodies

An antibody can be defined as a protein (i.e. an immunoglobulin with specific antigen binding sites) produced as a result of the introduction of a foreign antigen, that has the ability to combine with (and, in many cases, destroy) the cells carrying the antigen that stimulated its production.

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in Plasma	 Anti-B	 Anti-A	None	 Anti-B and Anti-A
Antigens in Red Blood Cell	 A antigen	 B antigen	 A and B antigens	None

© Buzzle.com



# Clinically Significant Antibody

Usually judged by their capacity to shorten red cell survival by causing haemolytic transfusion reactions (HTR) or through their association with haemolytic disease of the newborn (HDN).

- Increased destruction of red cells (or platelets) due to the presence of an antibody
  - Alloantibody - directed against someone else's red cells e.g. anti-D in RhD-patient = Transfusion reaction
  - Autoantibody - directed against patient's own red cells e.g. anti-D in a RhD+ patient = AIHA
- Destruction of fetal cells from maternal antibody = HDN

# Laboratory Pre-Transfusion Testing

## Aim of pre-transfusion testing

- Determine ABO and RhD type
- Identify any irregular antibodies
- Check patient details/results vs. historical record

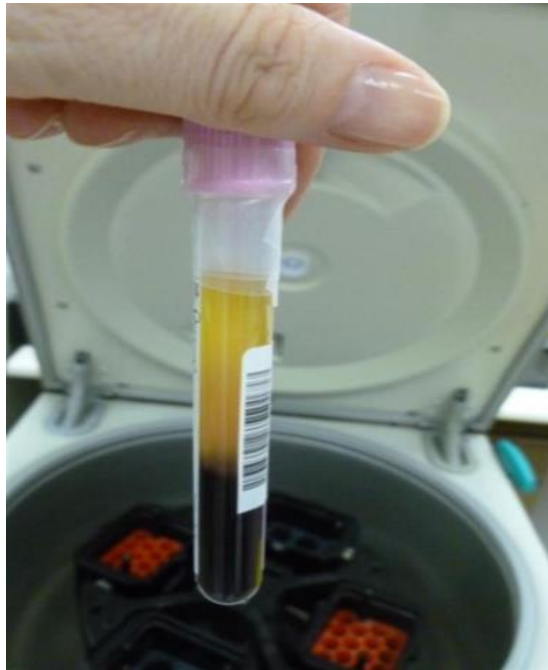
# Sample and Form Requirements

- Check Sample vs. Request form
- Must be NO discrepancies
- Error = increased risk of WBIT
- We need enough sample to test!

	Sample	Request form
NHS Number	<i>Essential (if available)</i>	<i>Essential (if available)</i>
Name First and last name spelt correctly	<i>Essential</i>	<i>Essential</i>
Date of Birth	<i>Essential</i>	<i>Essential</i>
Hospital Number or temporary unique identification number	<i>Optional (must be used if NHS number is not available)</i>	<i>Desirable (must be used if NHS number is not available)</i>
Address	<i>Optional</i>	<i>Optional</i>
Date	<i>Essential</i>	<i>Essential</i>
Time	<i>Essential</i>	<i>Essential</i>
Signature	<i>Essential</i>	<i>Essential</i>
Requesting institution	<i>Not required</i>	<i>Essential</i>
Requesting Clinician	<i>Not required</i>	<i>Essential</i>
Signature of requester	<i>Not required</i>	<i>Essential</i>
Clinical Information/test required	<i>Not required</i>	<i>Essential</i>
Sample source if not peripheral blood	<i>Essential</i>	<i>Essential</i>

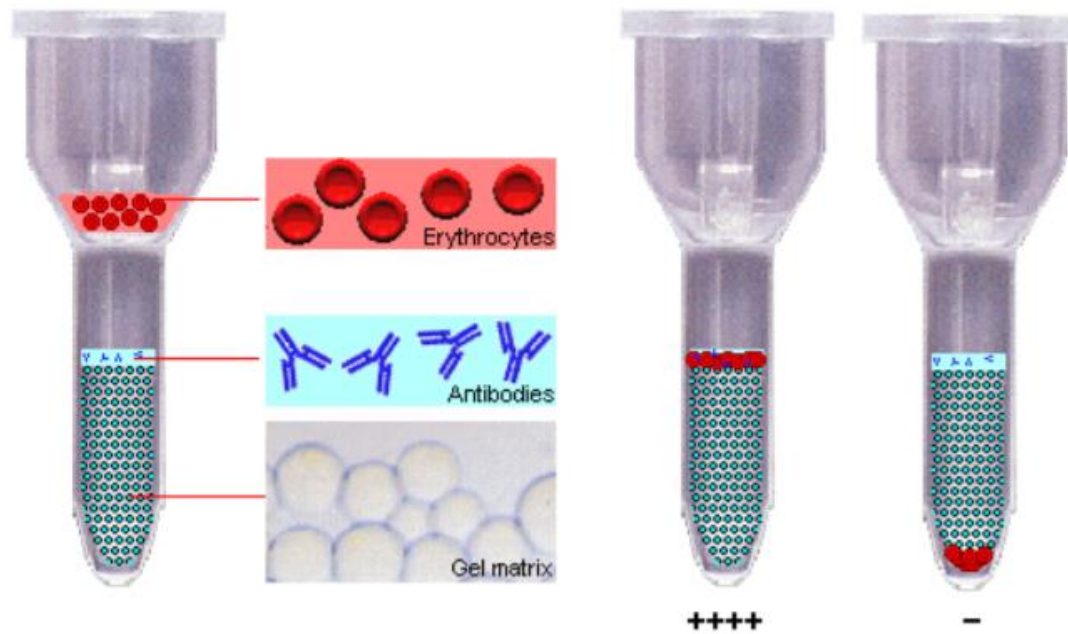
# Sample Processing

- Sample is booked onto LIMS system to check for historical record
- Sample is centrifuged to separate into packed red cells (ABO/RhD typing) and plasma (antibody screening)
- Analyser is a fully automated walkaway system - Electronic transfer of information - no human intervention = patient safety.

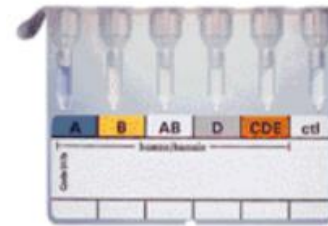


# How the Gel Test works

## Principle of the Gel Test



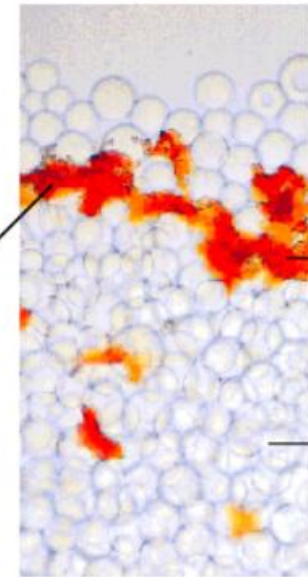
## Gel Technique



Gel card for blood group determination



Microtube



Agglutination

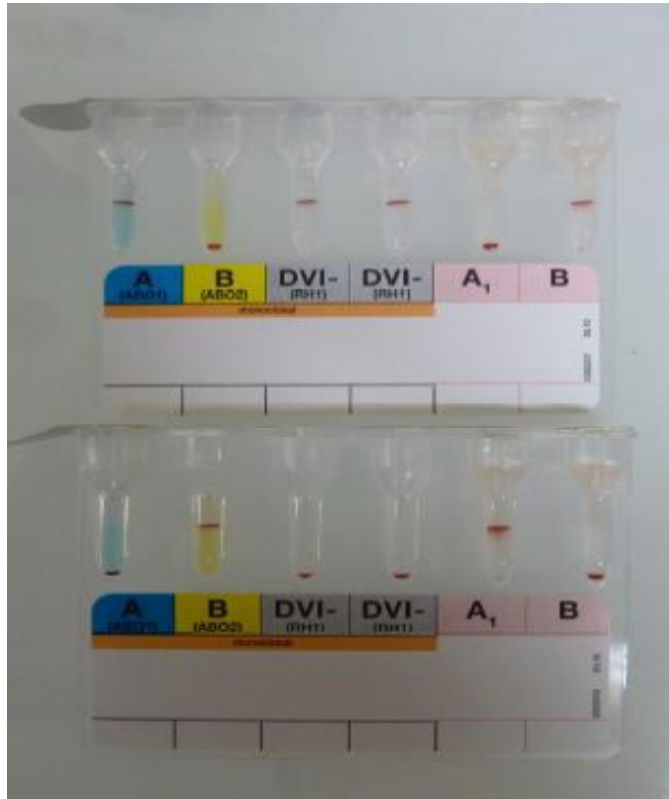
Gel



# ABO / RhD Typing & Antibody Screening

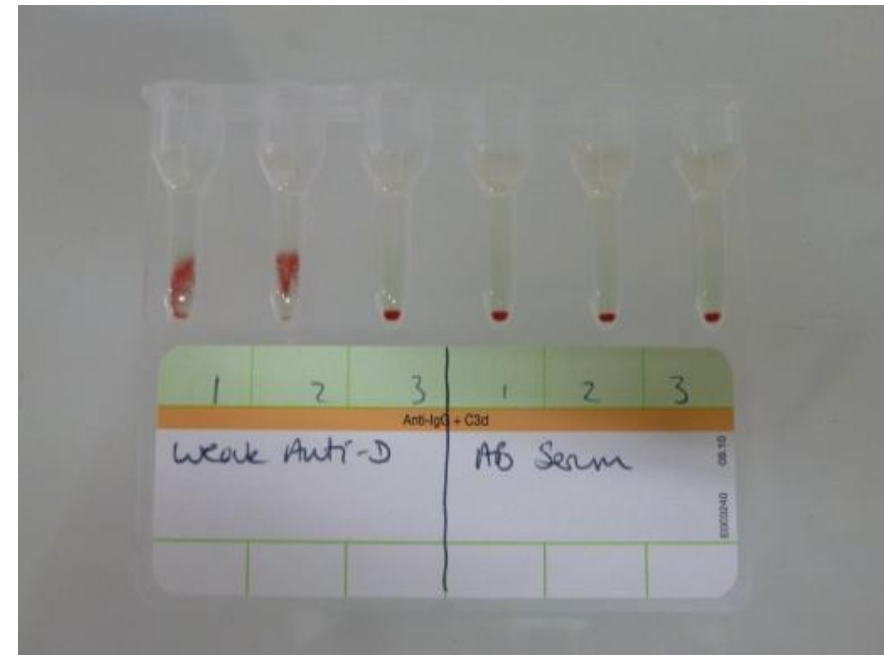
Test red cells for antigen -A, B or AB

- Test plasma for antibody -anti-A, anti-B or anti-A,B
- Allows check of group

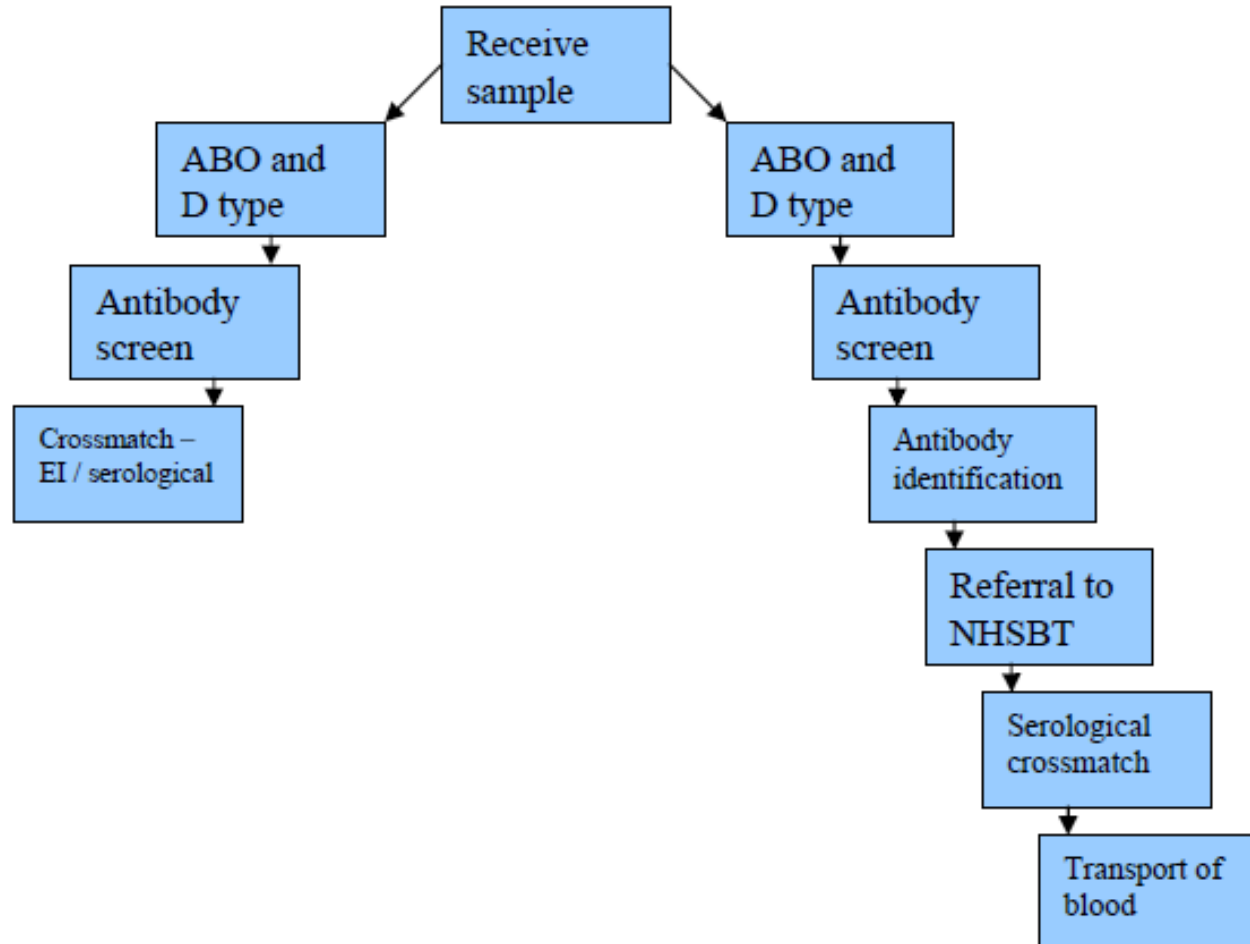


Test patient plasma with 3 reagent red cells of known types

- If positive – antibody identification panel of 11 cells required
- Allows identification of most antibodies



# Investigation Process



# Antibody Present

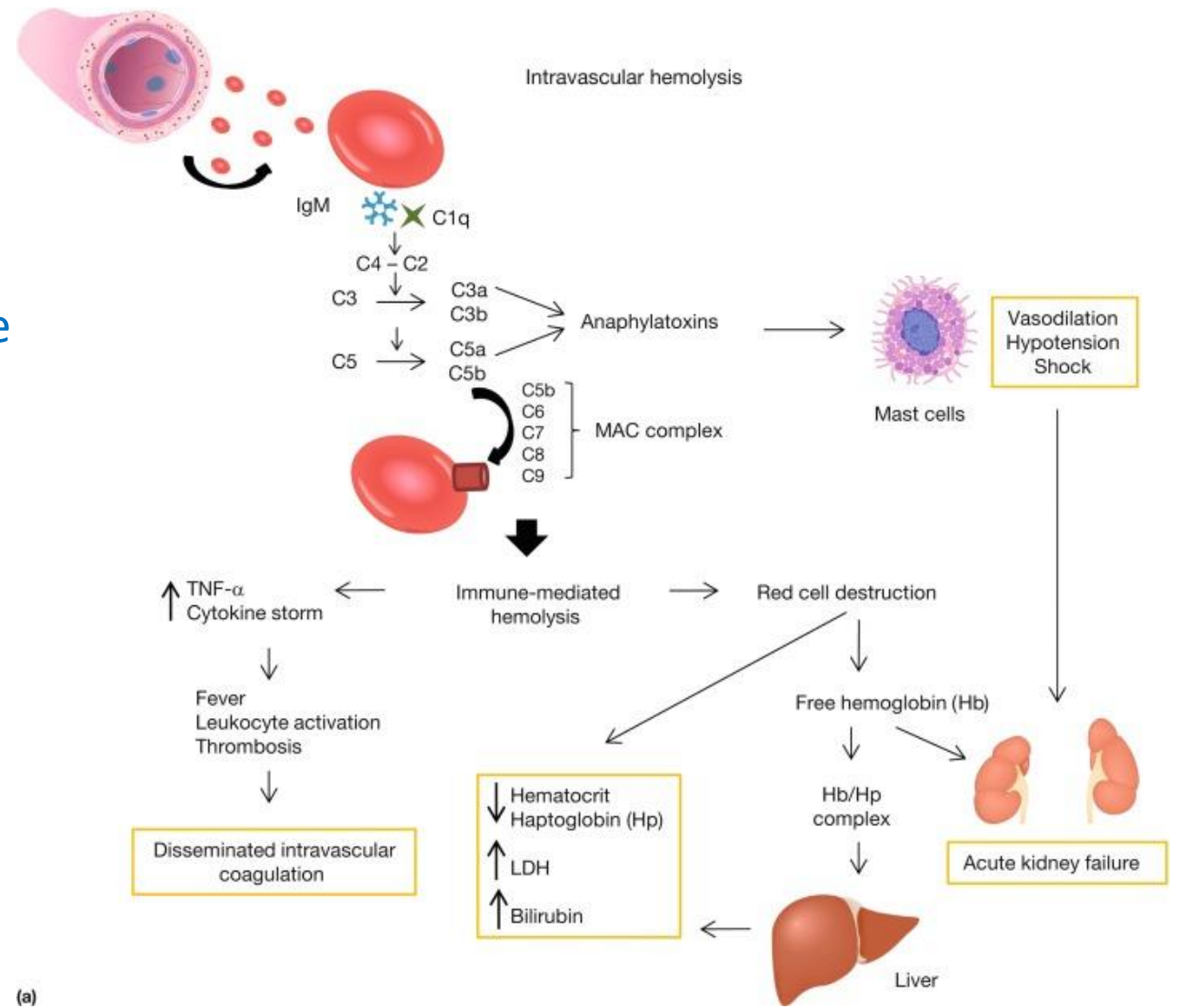
- Causes delay in provision of blood
- Need communication of clinical urgency vs delay in testing
- May be resolved in hospital blood bank
- May need referring to NHSBT -hours of delay!
- Delay depends upon specificity of antibody

# Red Cell Antibody Production

- For patients to have formed irregular antibody, they must have been previously exposed to foreign red cells –either transfusion or pregnancy
- No previous transfusion/pregnancy = no clinically significant red cell antibody
- Except....

# ABO....but why?

- Naturally occurring antibody ALWAYS present antigen not on red cells
- Only 3% population group AB, 97% have anti-A, anti-B or anti-A, B
- Over 50% of population have A or B (or both) antigens on red cells
- Antibody is capable of destroying incompatible red cells by Complement activation = Immediate Intravascular Haemolysis



# Why RhD Typing ?

- D is very immunogenic
- 30% of RhD- people would form anti-D
- Capable of causing transfusion reaction
- Causes severe / fatal HDN

# GENERAL BLOOD PROVISION

- Antibody screen = negative
  - Select ABO matched
  - D matched where possible
  - Can be EI or serological crossmatch
- Woman of child bearing potential
  - MUST receive RhD- blood if they are RhD-
  - MUST receive K- blood unless K+

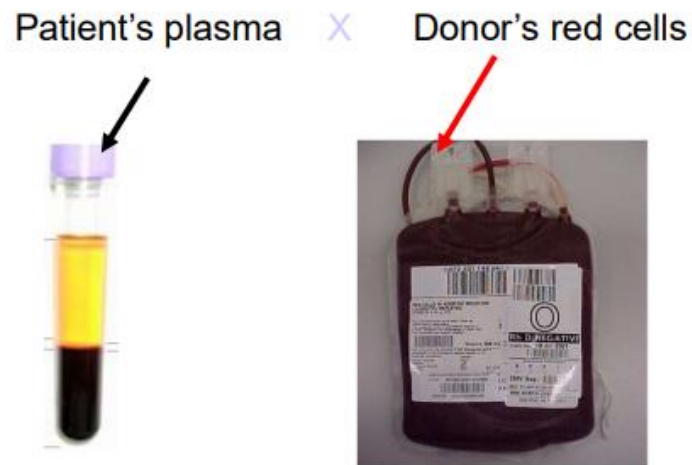
# Electronic Issue

- Electronic Issue of red cells for transfusion is the selection of donor units from blood bank stock of the same ABO/D type
- This form of red cell selection is only suitable for patients when
  - Testing and result entry is fully automated
  - There are no blood group discrepancies
  - The antibody screen is negative
- Computer software must be validated to ensure that ABO incompatible blood cannot be reserved or issued



# Serological Crossmatch

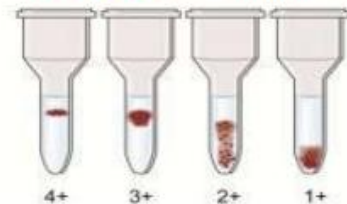
- Suitable for all patients
- Reacting plasma from the patient with the red cells from the proposed donor unit
- Must be ABO/D suitable and if required antigen negative for any known antibodies.



Negative crossmatch



Positive crossmatch



# If an antibody is detected .....

- Not all antibodies are clinically significant:
  - N, Le<sup>a</sup>, Le<sup>b</sup>, P<sub>1</sub>
  - No additional selection criteria required

## Clinically significant antibodies

Commonly encountered antibodies

- **Rh** – anti-D, -C, -c, -E, -e
    - K – anti-K
    - **Jk** – anti-Jk<sup>a</sup>, anti-Jk<sup>b</sup>
    - **Fy** – anti-Fy<sup>a</sup>, anti-Fy<sup>b</sup>
  - **MNS** – anti-M, anti-N, anti-S, anti-s
- Must select antigen negative units
  - Availability depends on specific type

# Provision of units

Different blood groups have different frequencies

- 91% population K-
  - Average national blood stocks = 9 out of every 10 units – always available in hospital blood bank
- 17% population Fy<sup>b</sup>-
  - Average national blood stocks = 1 in 5 units (not all units are Fy<sup>b</sup> typed) – would need special order from NHSBT.
- People who form 1 antibody are more likely to form additional ones
- Each additional selection requirement reduces availability of units.

# Example .....

- Group O patient: anti-D+K+Jka+Fya
- 322 units out of 40,000 (1 in 125) would be suitable for patient
- May need to import from another centre

# Rare antibodies

- A high number of other red cells antigens / antibodies
- High frequency antibodies
  - <3% of population is negative for antigen
  - These people can form an antibody – require antigen negative blood
- Dependent on population:
  - Caucasian population <1% Fy (a-b-
  - Black population 66% Fy (a-b-)
- Some very very rare in all populations - e.g. Rh null – less than 50 individuals ever identified worldwide.

# Blood provision for rare cases

- National blood stock – maybe available
- Rare donor panel
- Frozen blood bank in Liverpool
- International donor panels.

# Summary

- Red cell antibodies can cause significant destruction of transfused red cells
- Identification of the antibody may cause delays in blood provision
- All transfusions should be benefits vs risks
- If an antibody is detected there must be clear communication between medical and laboratory staff – provision of clinical need vs. availability of compatible blood

**Transfusion of compatible  
blood to a corpse is not a  
successful outcome of  
transfusion**