Clinically significant antibodies and the provision of blood

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Aims

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

- Increased destruction of red cells (or platelets) due to presence of an antibody
  - Alloantibody - directed against someone else's red cells e.g. anti-D in D- patient = Transfusion reaction
  - Autoantibody - directed against patient's own red cells e.g. anti-D in a D+ patient = AIHA
- Destruction of fetal cells from maternal antibody = Haemolytic Disease of the Newborn (HDN)
The science bit... Laboratory pre-transfusion testing

• Aim of pre-transfusion testing
  • Determine ABO and D type
  • Identify any irregular antibodies
  • Check patient details/results vs. historical record
Pre-transfusion testing

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

<table>
<thead>
<tr>
<th>Sample and request form requirements</th>
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</thead>
<tbody>
<tr>
<td><strong>Sample</strong></td>
</tr>
<tr>
<td><strong>Request form</strong></td>
</tr>
<tr>
<td>NHS Number</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>First and last name spelt correctly</td>
</tr>
<tr>
<td>Date of Birth</td>
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<tr>
<td>Hospital Number or temporary unique</td>
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<tr>
<td>identification number</td>
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<tr>
<td>Address</td>
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<td>Date</td>
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<tr>
<td>Time</td>
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<tr>
<td>Signature</td>
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<tr>
<td>Requesting institution</td>
</tr>
<tr>
<td>Requesting Clinician</td>
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<tr>
<td>Signature of requester</td>
</tr>
<tr>
<td>Clinical Information/test required</td>
</tr>
<tr>
<td>Sample source if not peripheral blood</td>
</tr>
</tbody>
</table>
Book into LIMS system

- Allows checks with any historical record
Centrifuge sample

- Separate into packed cells and plasma
Test using automation

- Fully automated walkaway system
- Electronic transfer of information - no human intervention = patient safety
- Tested for:
  - ABO and D type
  - Antibody screen
ABO and D type

- Test cells for antigen - A, B or AB
- Test plasma for antibody - anti-A, anti-B or anti-A,B
- Allows check of group
Antibody screen

- Test patient plasma with 3 reagent red cells of known types
- If positive - antibody identification panel of 10 cells required
- Allows identification of most antibodies
Investigation process

Receive sample
- ABO and D type
  - Antibody screen
    - Crossmatch – EI / serological
  - Referral to NHSBT
    - Serological crossmatch
    - Transport of blood
  - Antibody identification

- ABO and D type
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 Intravasular Haemolysis.
Why RhD type red cells

- D is very immunogenic
  - 30% of D- 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 D- blood if they are D-
- MUST receive K- blood unless K+
If antibody detected....

- Not all antibodies are clinically significant:
  - N, Lea, Leb, P1
  - No additional selection criteria required
Clinically significant antibodies

- Commonly encountered antibodies
  - Rh – anti-D, -C, -c, -E, -e
  - K – anti-K
  - Jk – anti-Jk^a, anti-Jk^b
  - Fy – anti-Fy^a, anti-Fy^b
  - 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-, 36400 in average national blood stock = 9 out of every 10 units – always available in hospital blood bank.
- 17% population Fy(b-), 6800 in average blood stock = 1 in 5 units. (not all units Fyb typed) - would need special order from NHSBT.
Antibody formation

- People who form 1 antibody 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 huge number of other red cells antigens/antibodies

• High frequency antibodies
  
  • <3% of population is negative for antigen

  • These people can form antibody

  • If antibody has been formed need antigen negative blood

• Groups not routinely screened for
Rare antibodies

- 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 benefit vs risks
- If antibody detected - need 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
We are here to help

• RCI Laboratory
  – 0113 820 8655

• Thank you for listening

• Questions?