Understanding Blood Groups and Antibodies

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To cover:

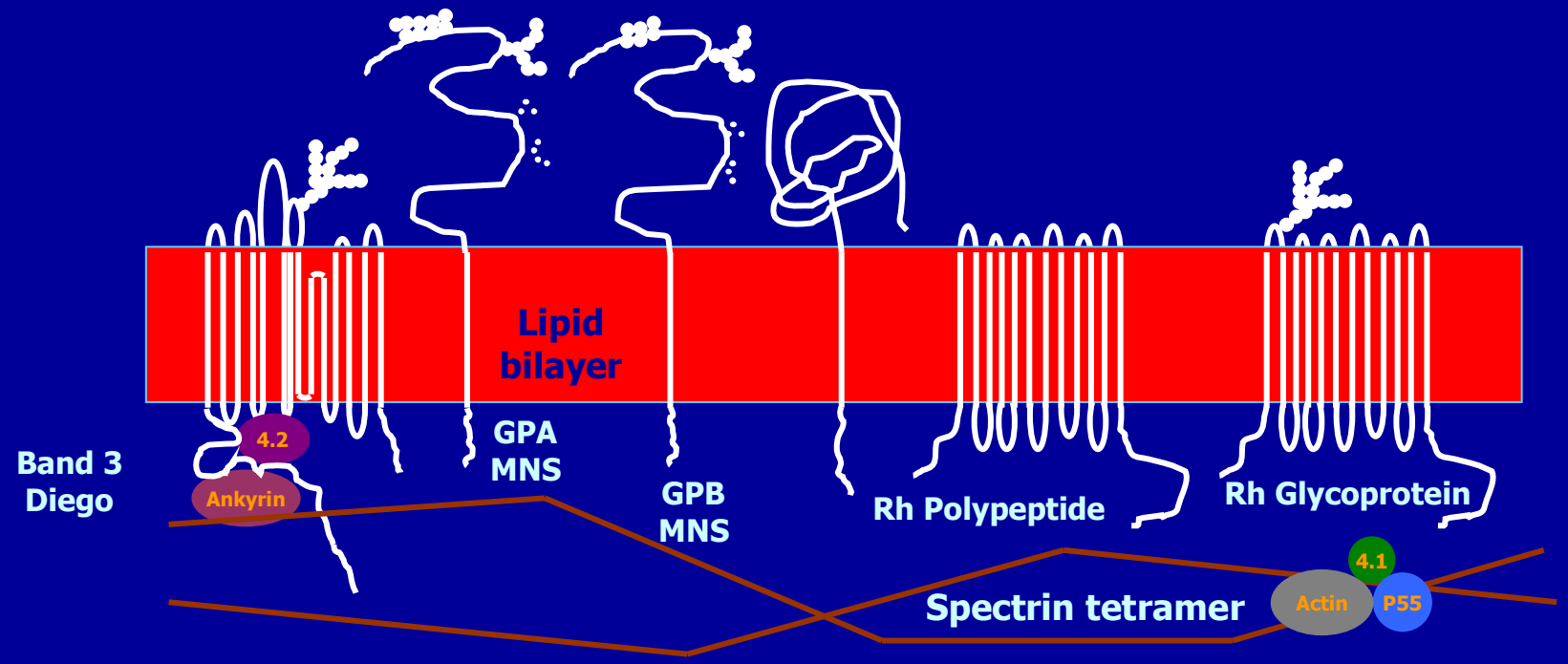
- What is a red cell antigen?
- What is a red cell antibody?
- What do they mean for blood provision?
- Why are haematology patient samples the most challenging?

An antigen

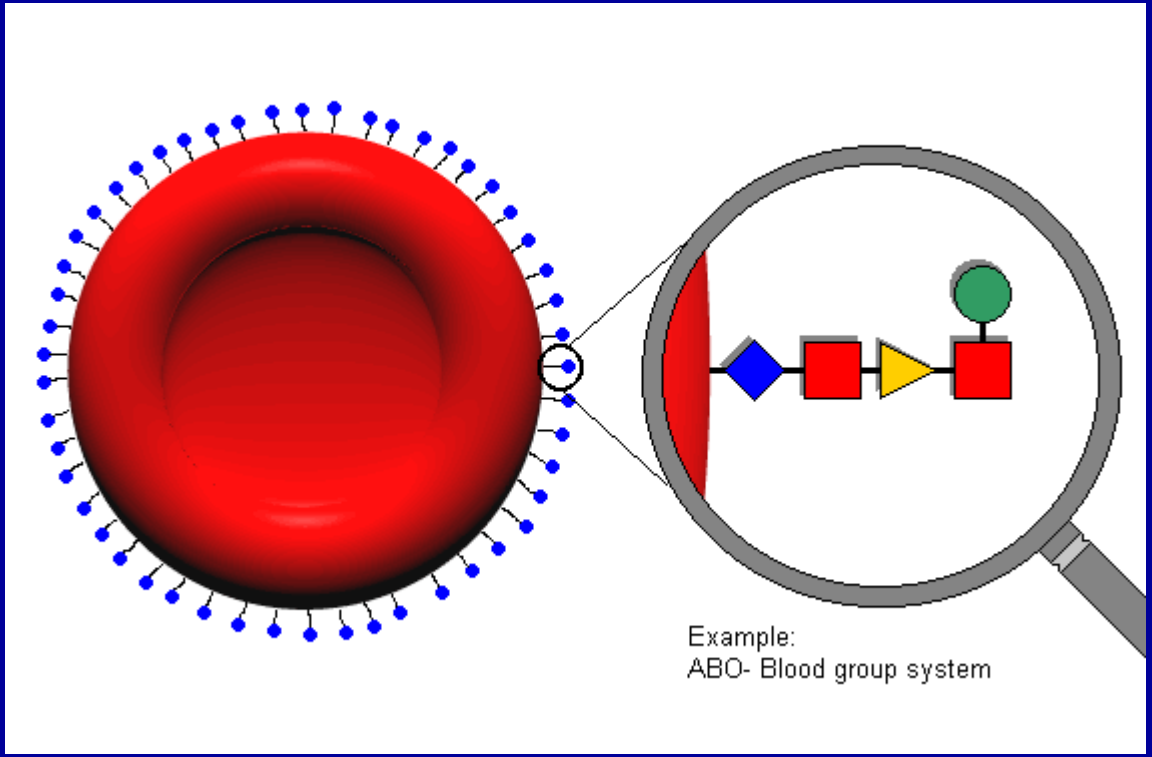
- An antigen can be defined as **a substance** that, when introduced into the circulation of an individual lacking that antigen, can **stimulate the production of a specific antibody**.

- Red cell antigens

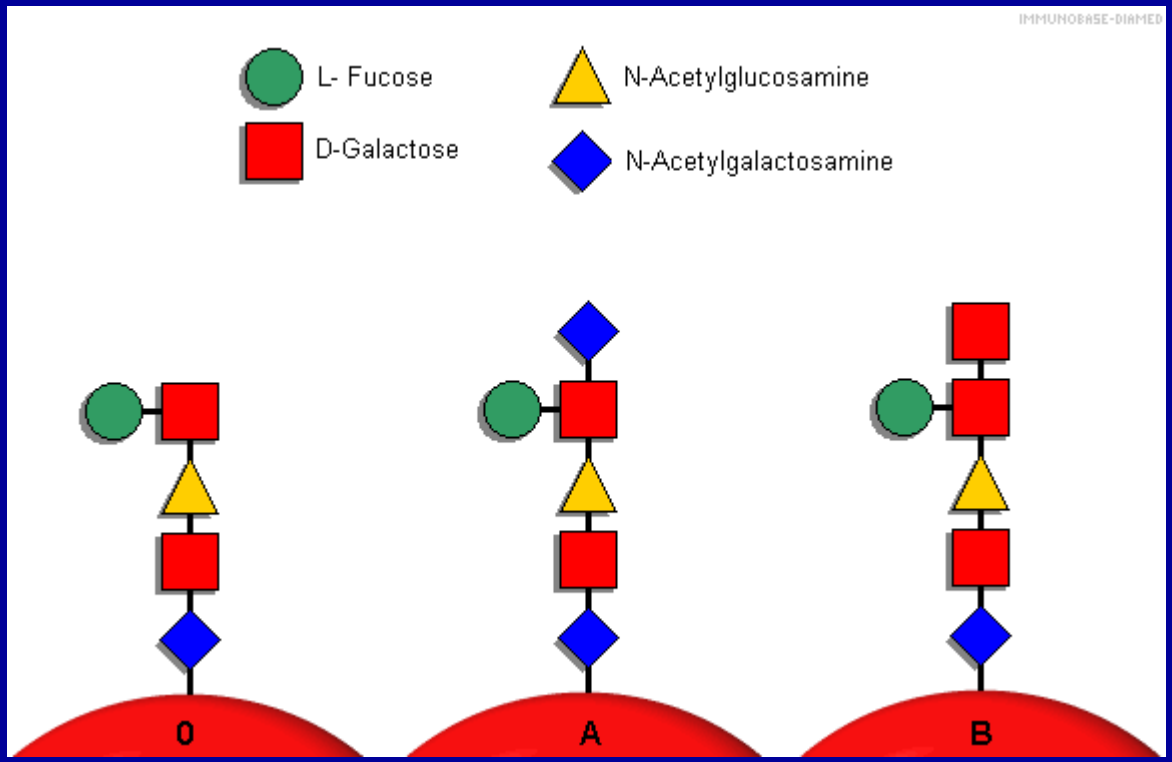
Blood group antigens



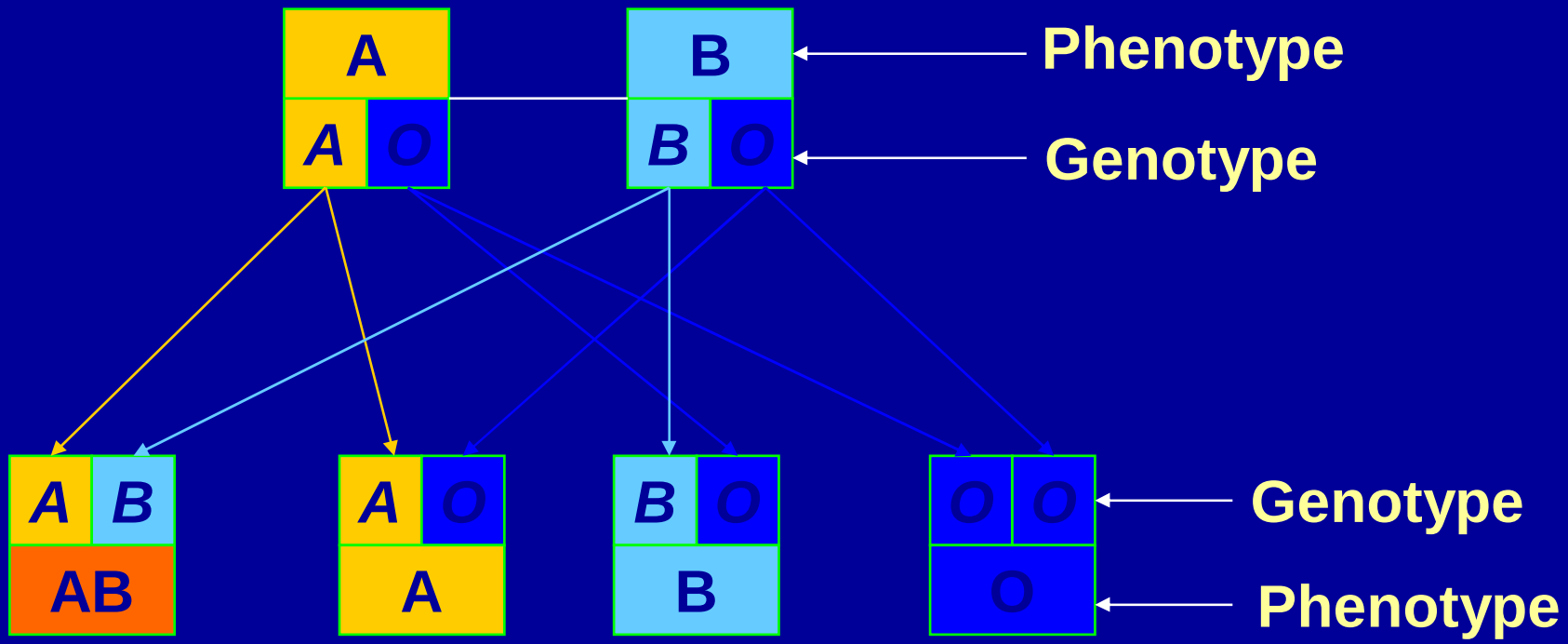
ABO antigens



A close up


L- Fucose
D-Galactose
N-Acetylglucosamine
N-Acetylgalactosamine
O
A
B

Inheritance



An antibody

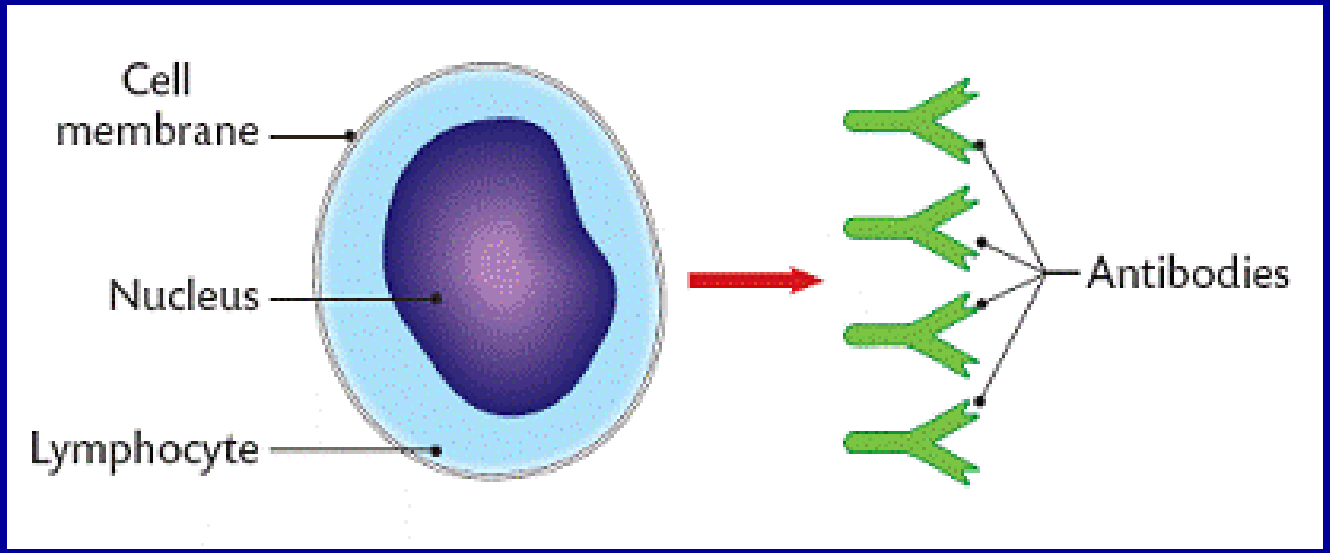
- An antibody can be defined as a **serum protein** (*i.e.* an immunoglobulin with **specific antigen binding sites**) produced as a result of the introduction of a **foreign antigen**, that has the ability to combine with (and, in many cases, destroy) the cells carrying the antigen that stimulated its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

Red cell antibodies (allo-antibodies)

Produced when exposed to foreign **blood**:

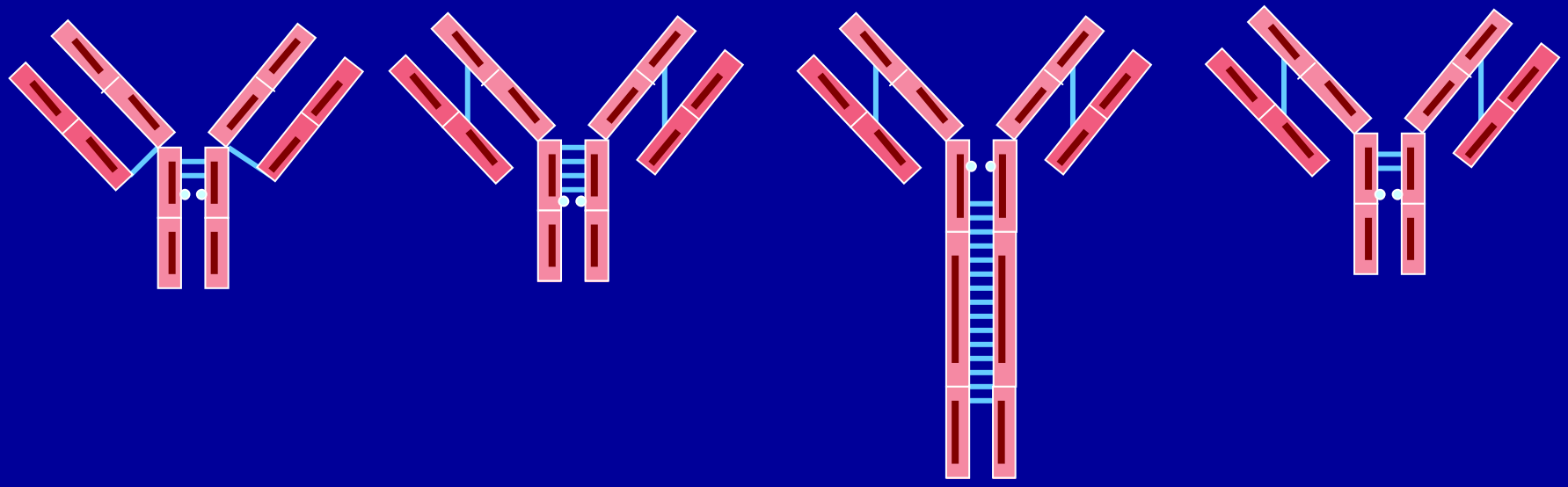
- Previous transfusion of blood/components
- Fetal maternal haemorrhage during pregnancy or at delivery

Antibodies produced by lymphocytes



Antibodies - IgG

Immunoglobulin IgG subclasses



IgG1 **IgG2** **IgG3** **IgG4**

ABO system

Red Cells (Antigens)	Plasma (Antibodies)
• A	• Anti-B
• B	• Anti-A
• O	• Anti-A, Anti-B
• AB	• None

Choice of group – platelet transfusion

Platelet selection by recipient ABO group

Recipient Group	O	A	B	AB
1st Choice	O	A	B	AB
2nd Choice	A or B	AB or B* or O*†	AB or A* or O*†	A* or B* or O*†

* components tested negative for high-titre anti-A and/or anti-B and those suspended in PAS should be used

† the use of group O apheresis platelets for non group O neonates and children is not recommended because of the risk of haemolysis

http://www.b-s-h.org.uk/guidelines/guidelines/transfusion-for-fetuses-neonates-and-older-children

http://www.b-s-h.org.uk/guidelines/guidelines/use-of-platelet-transfusions/

HSCT

ABO incompatible transplants introduce either:

- New red cell antigens (A donor, O recipient) - major mismatch
- New red cell antibodies (O donor, A recipient) – minor mismatch
- Both (A donor, B recipient)

Transfusion support for recipients of ABO incompatible HSC components

	Recipient	Donor	Packed RBC	Platelet / FFP
ABO Major	O O O A B	A B AB AB AB	O O O A, O B, O	A, AB B,AB AB AB AB
ABO Minor	A B AB AB AB	O O O A B	O O O A, O B, O	A, AB B,AB AB AB AB
ABO Major and Minor	A B	B A	O O	AB AB

Pre-transfusion compatibility testing

- Relevant clinical details
- Transfusion/transplant history
- Blood group – ABO and RhD
- Antibody screen

Communication is key

IRRADIATED AND SPECIALIST BLOOD COMPONENTS COMMUNICATIONS DOCUMENT

This section ONLY is to be completed by a member of the Clinical Team and then sent to the Transfusion Laboratory for the remainder of the form to be completed.			
Affix Addressograph here or complete the following details:	Referring hospital:	ABO and RhD Group Details	Specialist Requirements
Patient First and family Name:	Specialist Treatment Hospital:	Donor Group	Irradiated: Yes / No
Date Of Birth;	Diagnosis:	Patient Group	CMV Neg: Yes / No
			HEV Neg: Yes / No
NHS / Hospital Number:	Specialist Treatment required or received:		Patient Informed of Specialist Requirements? Yes / No
Address	Signed:..... Print Name..... Date / / Contact number / Bleep.....		

The following sections are ONLY to be completed by the Transfusion Laboratories

Please document below the ABO and D (where applicable) group of the blood components that the patient currently requires		
Red cells:	Platelets:	FFP:

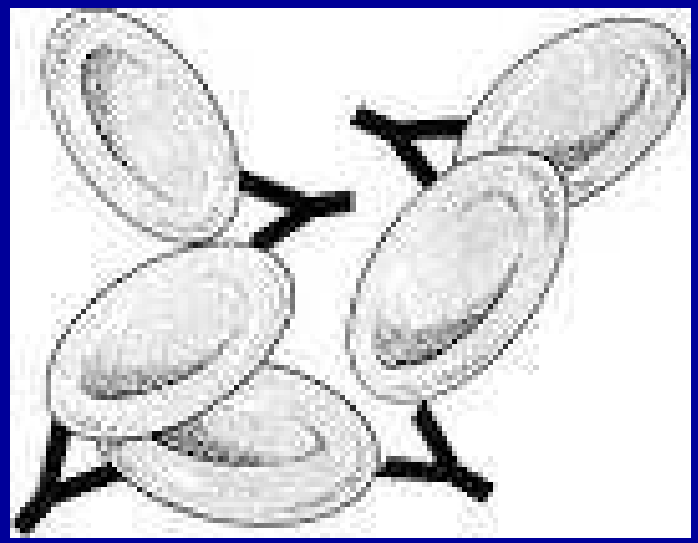
RBC Antibodies	**Specialist Requirements**	**Additional Requirements**
Historical Antibodies:	HLA / HPA abs: Yes / No	RBC Phenotype:
Current Antibodies:	Specificity:	Washed RBCs: Yes / No
D.A.T		Washed Platelets: Yes / No
Signed:.....Print Name..... Date.....		

Copy of completed form to be sent by Secure Fax or scanned copy emailed by Laboratory of identifying hospital to Shared Care Hospital Laboratory	**Confirmation of receipt by Shared Care Hospital Laboratory.** To confirm receipt of this form please sign, print name, and date below and fax back
Date Fax sent / /	Signed:.....Print Name.....
Signed:..... Print Name.....	Specialist requirements input into Shared Care Hospital LIMS computer Yes / No Date / /

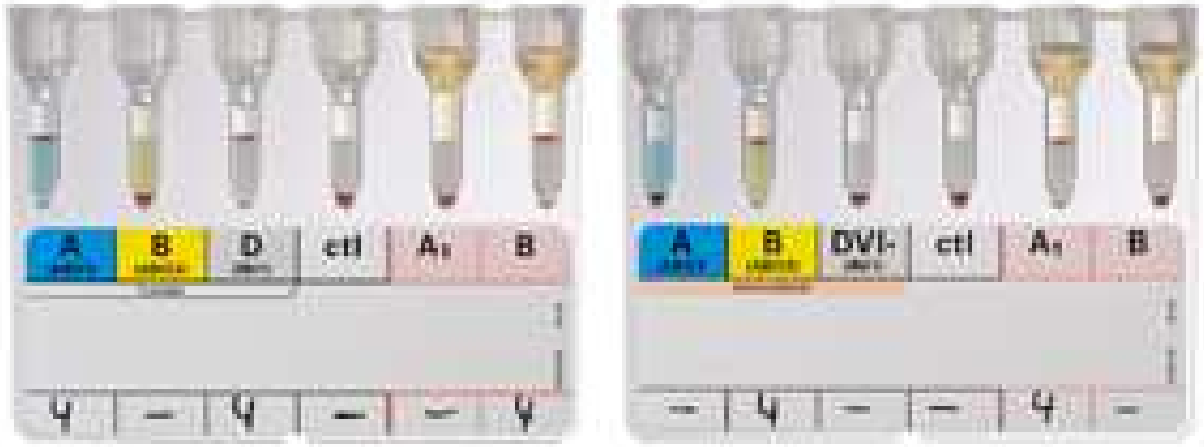
Ratified by the East of England RTC 18/10/12 **V2 25/02/16**

NHS
East of England Regional Transfusion Committee

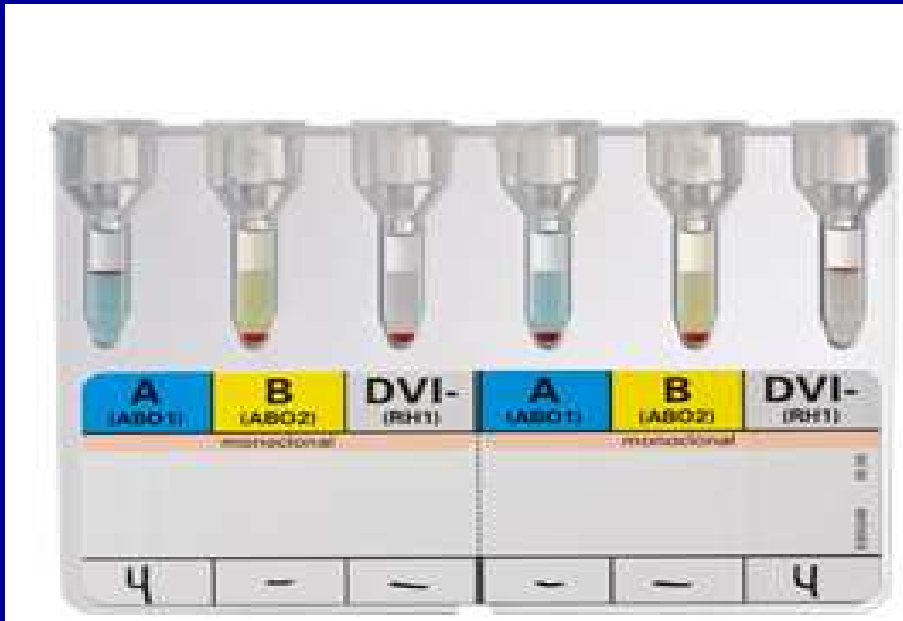
Agglutination



Blood grouping



Check group



Transplant patient

Pre-transfusion compatibility testing

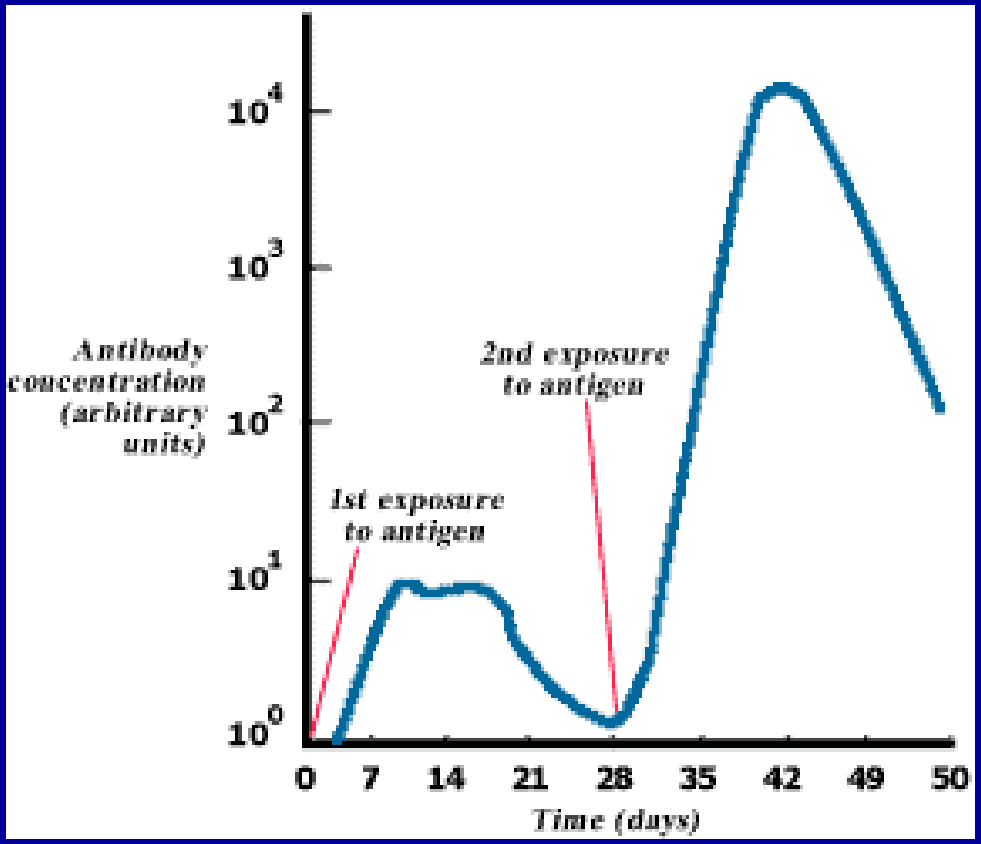
- History and clinical details checked
- Blood group – ABO and RhD
- Antibody screen - no antibodies detected
- Issue blood

Pre-transfusion compatibility testing

- To ensure that the specimen used for compatibility testing is representative of the patient's current immune status testing should be performed using blood taken no more than 3 days in advance of the actual transfusion, when the patient has been transfused or pregnant in the preceding 3 months.

BCSH guidelines, Transfusion Medicine, 2013, 23, 3-35

Antibody production



Pre-transfusion compatibility testing

- History and clinical details checked
- Blood group – ABO and RhD
- Antibody screen – antibody detected
- Antibody identification
- Select blood
- Crossmatch

Autoimmune Haemolytic Anaemia

- Antibody against own red cells - autoantibody
- Reacts to all red cells tested in the laboratory
- Major difficulty in determining whether there is also an alloantibody (ies)
- Samples sent to a NHSBT Reference Centre

DAT / DCT

- Direct antiglobulin test
- Direct Coombs test

- Looks for antibody bound to red cells *'in vivo'* ie
  - an antibody against self – AIHA, post transplant (HDFN)
  - an antibody against transfused cells – incompatible transfusion

Reasons haematology patients are challenging

- HSCT – need to be aware of recipient and donor blood groups
- Multi-transfused – more likely to have antibodies
- Transfused in the out patient setting – need careful planning
- AIHA – need the help of the reference centre and even more careful planning!

Communication is key

- Laboratory inform clinical area of difficulty
- Clinical area clearly document difficulty in patient’s notes
- Come up with a clear plan for these patients