Medicine for Managers

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Blood Groups and Transfusions

Everyone has heard of Blood Groups, A, B and O and also about Rhesus factor, made famous in the 1950s when comedian Tony Hancock, on hearing a reference to Rhesus, said to the doctor "That's a monkey isn't it?" Understanding blood groups is vital for safe transfusion of blood to individuals who require it.

The discovery of blood groups was made by Austrian physician Karl Landsteiner in 1900. He realised that not all blood was compatible.

Indeed for hundreds of years enterprising physicians had been trying to give blood to patients, the vast majority of whom had died because the mixing of the administered blood with the patient's own blood had resulted in clumping of the two different sources of blood cells.

Clumping occurred because the recipient of the blood had antibodies to the donor blood which reacted with antigens. Antibodies circulate in the blood plasma and recognise the presence of anything 'foreign' (antigens) in the body and alert the immune system to destroy it. Antigens are protein molecules which are located on the surface of the red blood cells. Landsteiner recognised that there were different types of blood because he observed that not every blood sample clumped when mixed with another.

Clumping or agglutination of red blood cells in a transfusion reaction is a very serious complication. This reaction can lead to haemolysis, which is a breakdown of red blood cells. The destruction of red blood cells can result in severe anaemia, kidney failure and clotting abnormalities which may have fatal consequences for the patient.

For example if a patient with blood group A were to receive blood group B blood, then the B antibodies in the A blood would bind to the B antigens on the donor B red blood cells and cause agglutination.

So the concept of blood groups was born. The principal (ABO) blood grouping system

recognises four blood groups, O (46% of population), A (42%), B (9%) and AB (3%). The different groups are associated with different antigens and antibodies, thus:

Blood Group	Red Cell antigen	Plasma antibody
Group A	A	B
Group B	B	A
Group AB	AB	No A or B
Group O	No A or B	A and B

In addition there is an additional factor called the Rhesus factor. About six out of every seven people have the Rhesus antigen on the red blood cell surface (Rh +ve) and therefore have no rhesus antibody in the plasma.

People who are Rhesus negative (Rh –ve) have no Rhesus antigen on the red blood cell but do ***not*** naturally have Rhesus antibodies.

However, if exposed to Rhesus positive blood, the presence of the Rh +ve antigen on the donated red cells will stimulate the production of Rhesus antibodies in the recipient plasma and a second or subsequent transfusion of Rhesus positive blood will generate an antigen/antibody reaction.

A person with Rhesus negative blood can receive a Rhesus negative transfusion in complete safety.

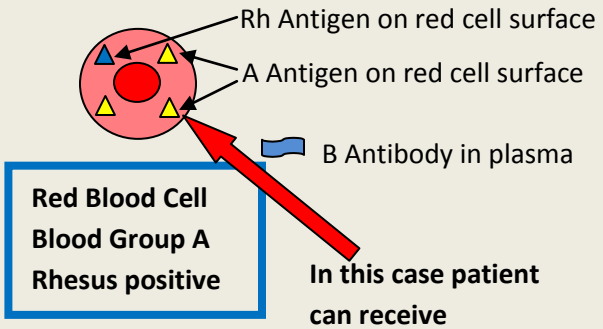
There are over fifteen other identified more minor blood groups, which are genetically determined, but the ABO system is the most important from the transfusion perspective. However it is possible for there to be a transfusion reaction between minor groups and for this reason blood is always taken for cross-match except in emergency to ensure compatibility of donated blood with the recipient blood before administration to minimise the risk of any transfusion complications.

So, who can have which blood? The key to success is to ensure that the blood which is **administered** does not contain the antibodies which will cause agglutination of the red blood cells of the recipient.

Therefore patients with O Rh –ve blood are described as universal donors because the blood can be administered to patients with blood which is O Rh +ve or –ve, A or B Rh +ve or –ve, or AB Rh +ve or –ve. Conversely patients with blood group AB Rh +ve are described as universal recipients because they have no A, B or Rh antibodies and can therefore receive the blood of any A, B or AB Rh +ve or –ve donor.

A patient who is A Rh –ve could only receive blood from someone who was A Rh –ve or O Rh –ve.

This all sounds jolly complicated. Perhaps it would be easier by example as follows:



In this case patient can receive

A Rh +ve
A Rh –ve
O Rh +ve
O Rh -ve

Pregnancy may present a special problem if a transfusion is required.

All pregnant women are always grouped because of the risk that, if a mother is Rhesus negative and the developing foetus has inherited Rhesus positive blood from the father, complications might develop if the situation was left untreated.

So, the whole thing may appear complicated but hopefully, a little clearer now! As you all know, blood is thicker than water and you can't get it from a stone, so, the next time you see a blood transfusion poster, roll up your sleeves and support this vital service.

For more information about Blood Transfusion Services, follow the web-links of the blood services in the four UK services:
www.blood.co.uk
www.scotblood.co.uk
www.welshblood.org
www.nibts.org

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