

## Blood Cross matching Activity Guide

### Equipment:

- 6 x Salad spinners (set up with Velcro inside – 3 with sticky side, 3 with non-sticky side)
- Red felt pom poms
- Plastic cups (for holding felt pom poms) in the following colours: Green, Red, Yellow, White
- Clear cups (for holding felt pom poms)
- Laminated cards showing how blood types can be matched
- Gel cards
- Pipettes and tips (optional)

### Set up

Distribute the pom poms between all of the cups so there is a handful in each cup. Set out each coloured cup with the salad spinners, positioning the clear cups slightly separately from the coloured ones. Display the cards and pipettes.



**Example of a setup of crossmatching activity (extra large set).**

### Background:

In 1901 Austrian-American immunologist and pathologist Karl Landsteiner discovered human blood groups. His work helped determine blood groups and how to perform blood transfusions safely. Landsteiner received the Nobel Prize in Physiology or Medicine in 1930 for this discovery.

There have been many more advances in medical technology, allowing for testing of blood groups and also cross matching. This is where doctors, nurses and researchers can find out who can donate blood to whom and which blood a recipient can receive.

Our blood type depends on the presence of certain antigens on our red blood cells. These are substances that cause our immune system to produce antibodies.

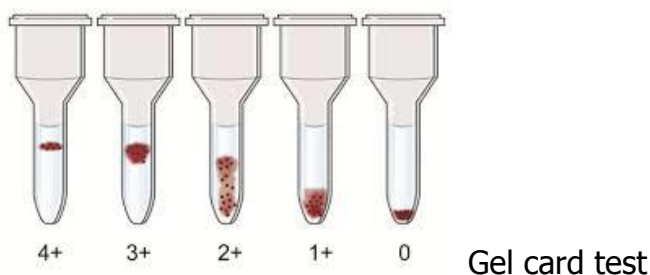
An antibody is a protein produced by the body's immune system in response to a foreign substance such as a bacterium or virus. Each antibody is unique and defends the body against a single foreign substance (antigen).

Usually you can tell if you know someone's blood group, which blood to give them, but sometimes there may be other antigens. Cross-matching is used by a doctor to make sure that the specific donor blood that will be used during a transfusion does not react with a patient's blood.

In cross-matching tests we are looking to see if there are any antibodies in the patient's blood that may react with the red cells to be transfused. This is done by mixing a small amount of dilute red cells from the blood for transfusion, with a drop of plasma from the patient. The simplest cross-matching test was traditionally done on a glazed tile where the two drops were mixed in a circular motion so that the drop was about the size of a ten-pence coin and the tile was rocked back and forth to see if the cells clumped together (positive reaction) or remained free (negative reaction). This test could also be carried out in a small test tube where the drops of red cells and plasma are mixed and then gently spun in a centrifuge for 1 minute. The test tube would then be agitated gently to dislodge the cells from the bottom of the tube. If the cells were clumped tightly together you had a positive reaction and if the cells fully re-suspended you had a negative reaction.

### **Summary:**

How do we make sure patients get the right blood in transfusion medicine today? Knowing the blood group is one thing, but sometimes donor blood samples can have other antigens that are recognised as foreign by the patient.



This activity uses salad spinners and pom poms to simulate a cross-match test known as Column Agglutination Technology (more commonly referred to as the Gel Card test) in which the red cells and plasma are added to a gel or bead column and then spun in a specially adapted centrifuge. If the red cells remain at the top of the gel, they have clumped and cannot pass between the beads (positive reaction) and if they have not clumped together then they can pass to the bottom of the column (negative reaction).

**Note:** For the purposes of this activity, to quicken and simplify, Rhesus has been overlooked, and although plasma pom poms would look better in a different colour, separating them back out for each activity would take too long.

**Instructions:**

- Attendees can be given a sticker or piece of card with a colour that represents their 'blood group': green, red, yellow or white to match the cups.
- There are cups full of red felt pom poms (i.e. red blood cells) available, each in cups matching attendees' sticker colour.
- Show them the blood group laminated card. Ask them if they know what their blood group is, and to look at which blood types are compatible with theirs.
- The following table will be available on a laminated sheets:

<b>Blood Group</b>	<b>Antigens on the red blood cell surface</b>	<b>Antibodies in the blood plasma</b>	<b>Can donate blood to</b>	<b>Can receive blood from</b>
AB – green	A and B	None	AB	AB, A, B, O
A – red	A	B	A and AB	A and O
B – yellow	B	A	B and AB	B and O
O – white	None	A and B	AB, A, B, O	O

- Volunteers can explain the following:
  - Blood Group AB has both A and B antigens on the red blood cell surfaces, but no A or B antibodies in the blood plasma. (Universal Recipient).
  - Blood Group A has A antigens on the red blood cell surfaces, but B antibodies in the blood plasma.

- Blood Group B has B antigens on red blood cell surfaces, but A antibodies in the blood plasma.
- Blood Group O has no A or B antigens on red blood cell surfaces, but has A and B antibodies in the blood plasma. (Universal Donor).
- Now attendees are going to *see* if their blood is compatible with another type of blood in order to transfuse. Compatibility between the blood groups of donor and recipient determines a successful transfusion.
- Volunteers to ask attendees, to take a sample of their blood (i.e. a cup of pom poms in the right coloured cup i.e. matches their sticker colour) and blood plasma sample (another cup of red pom poms, not labelled and in a clear cup) which are put into a gel card (one column magnified here as a salad spinner) containing the gel/bead column (Velcro), and spun. Attendees can pick a salad spinner at random.
- If the blood samples (pom poms) clump together and can't pass to the bottom (i.e. are stuck on the top and sides of the salad spinner with sticky Velcro) it's a **positive** reaction and so it's **not a match**.
- If the blood samples (pom poms) remain unclumped and go to the bottom of the column (i.e. in the salad spinner with non-sticky Velcro), it's a **negative** reaction and so it's **a match**. The attendee's blood sample can be donated to the patient who supplied the plasma, safely.
- Pathologists to explain the process and show attendees the real gel cards and describe other methods used. Pipettes can be used to show how such small amounts are moved.

## Second method

The method above is random as to whether the cross match will be positive or negative, depending on which spinner they have picked up. However you can run the activity so they get the correct result. In this version the clear cups are not used:

- Ask them to find the cup which matches their blood group
- Then ask them to look at the card and select the coloured cup with blood which they think theirs is compatible.
- Then based on the 2 coloured cups they are holding give them either the sticky or non-sticky spinner depending on whether they have got it correct or not.
- Then get them to spin as before and explain why they have got it right or wrong.