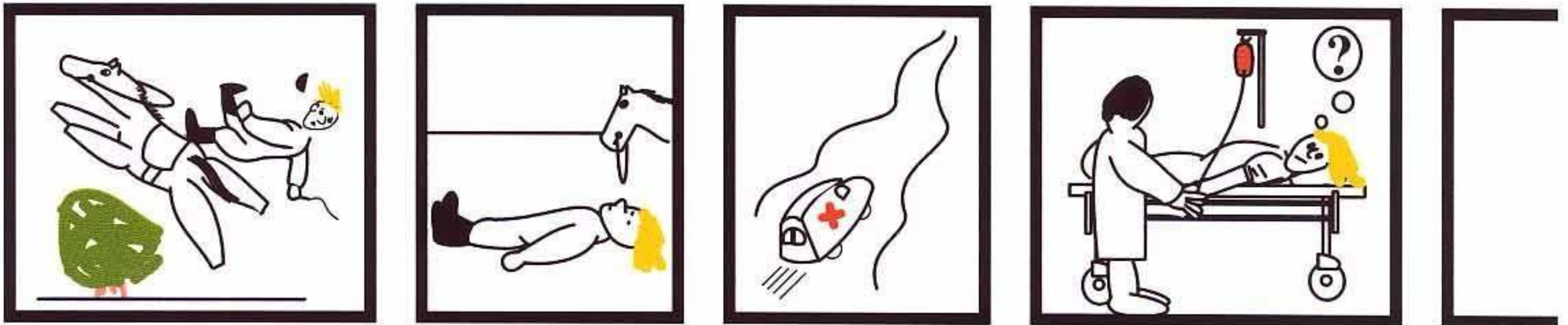


CHAPTER EIGHT

THE RED BLOOD CELL

BLOOD GROUPS



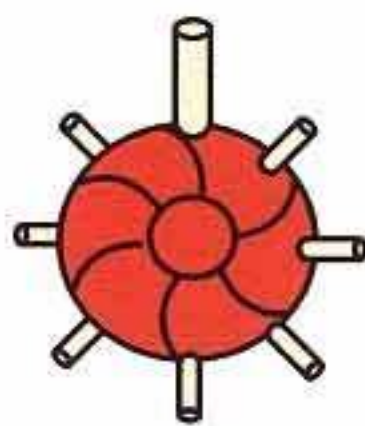
Following a riding accident, Holly is rushed to hospital for a blood transfusion.

Easy reading

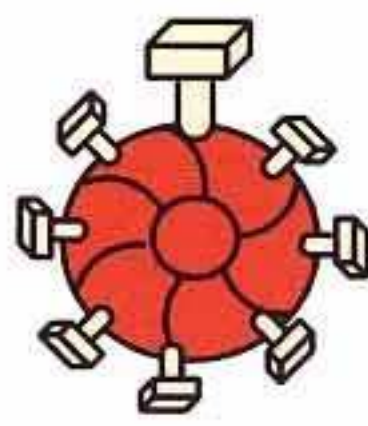


Technical information

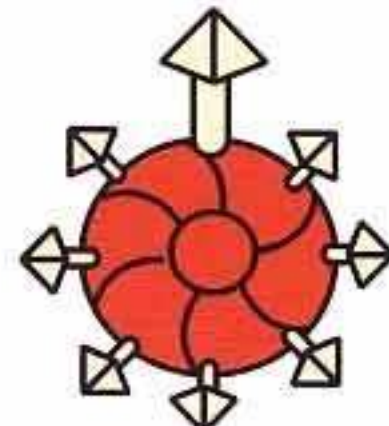
THE ABO BLOOD GROUPS



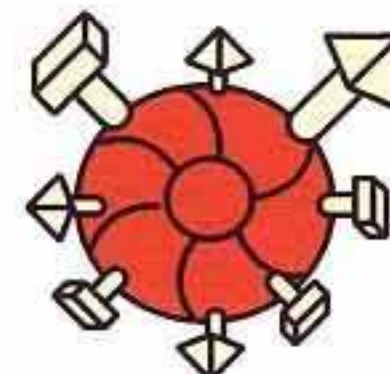
Group O



Group A



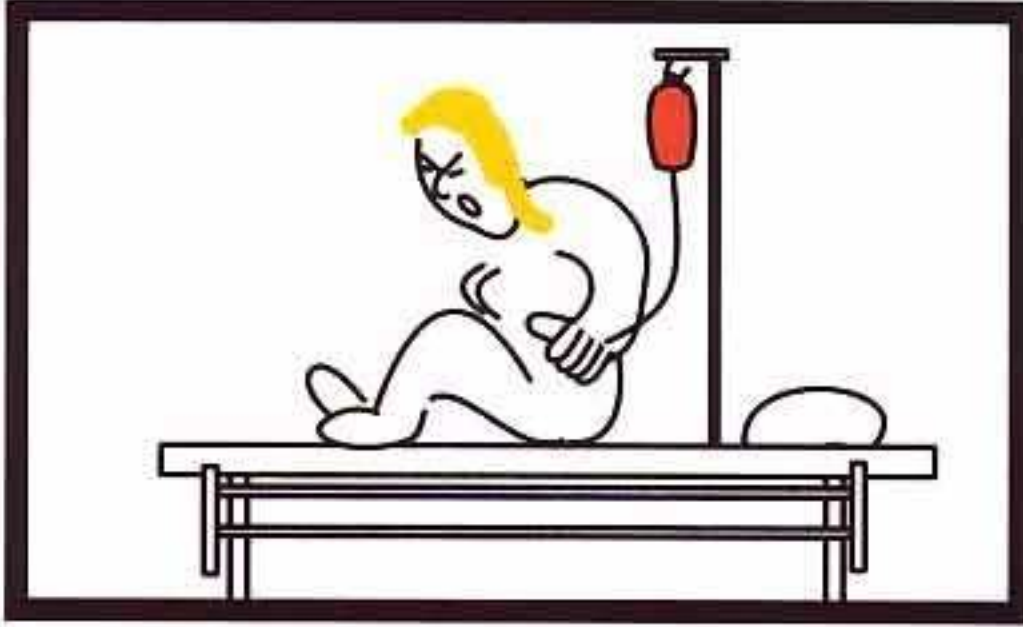
Group B



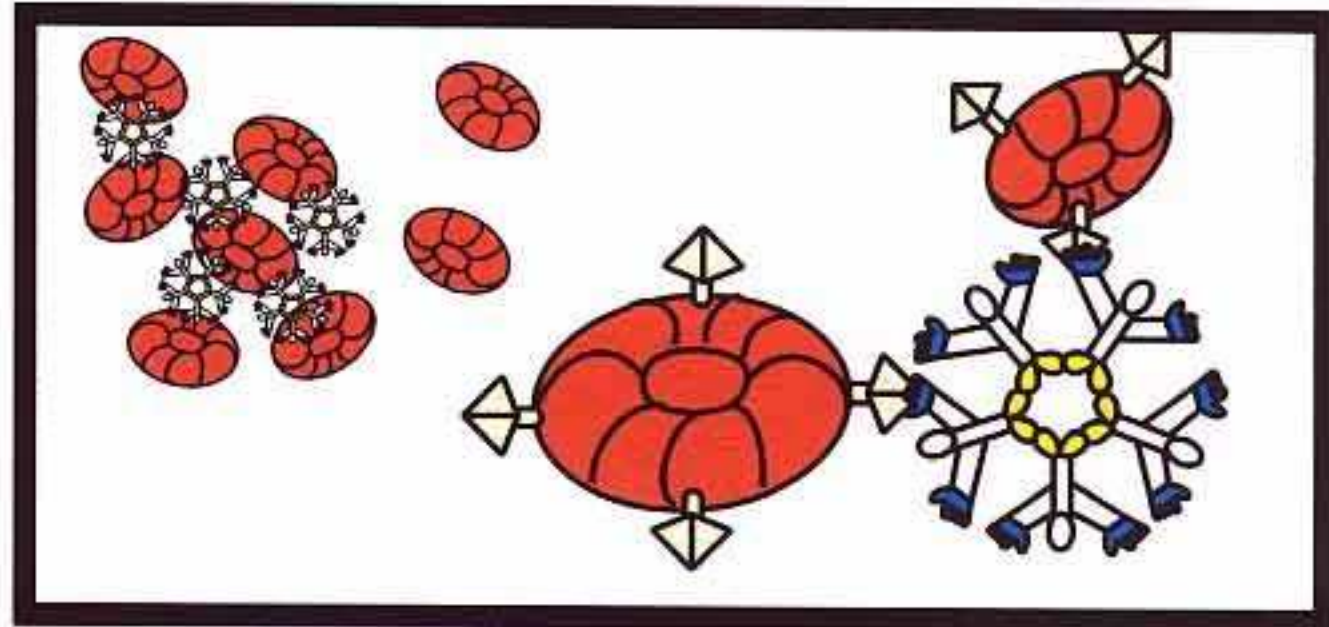
Group AB

The only difference between these blood groups are 2 surface markers, found at the end of the common O core.

HOLLY IS GIVEN THE WRONG BLOOD GROUP

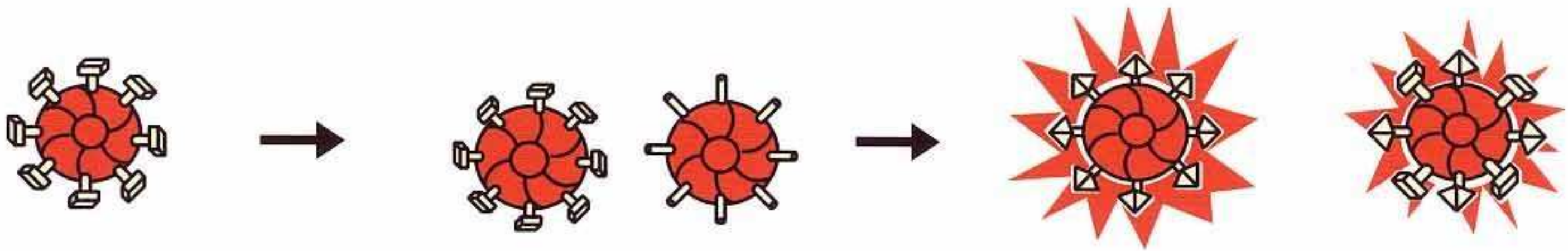


But only minutes after starting the blood transfusion, Holly begins to experience severe back pain.



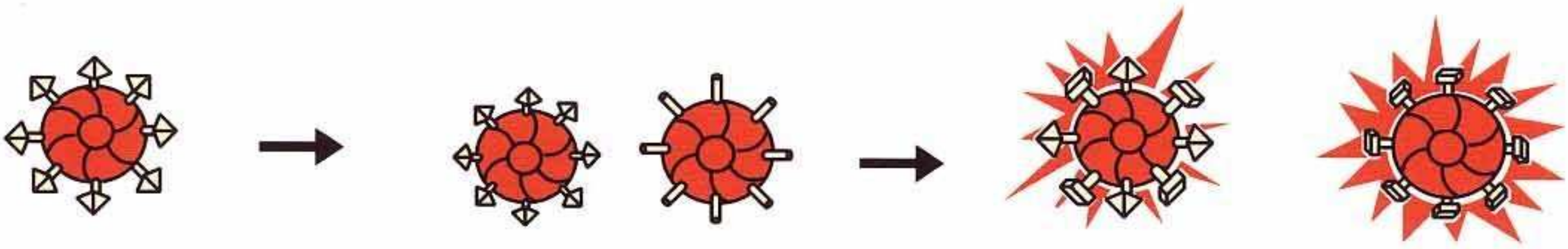
IgM antibodies in her blood have 'grabbed' the transfused red blood cells and the resulting complexes start to block her kidneys.

For an unknown reason, soon after we are born, our immune system will start to produce IgM antibodies with 'hands' which fit any ABO blood group marker, not found on our own red blood cells.



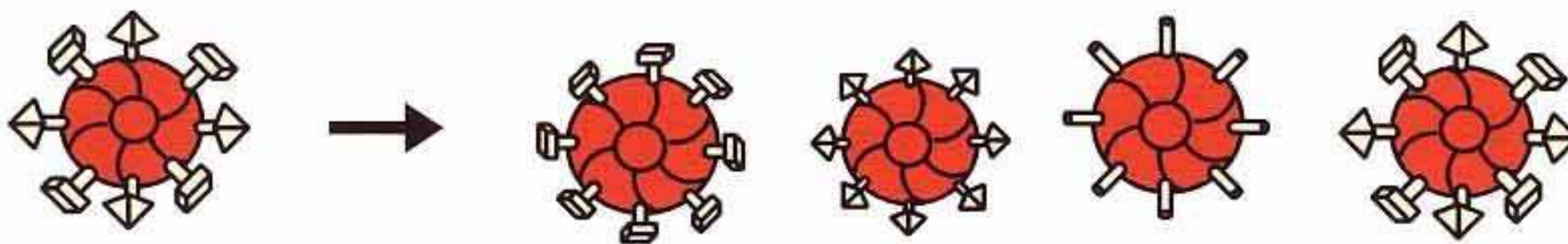
Group A patients can receive blood groups A and O.

But they will reject groups B and AB.

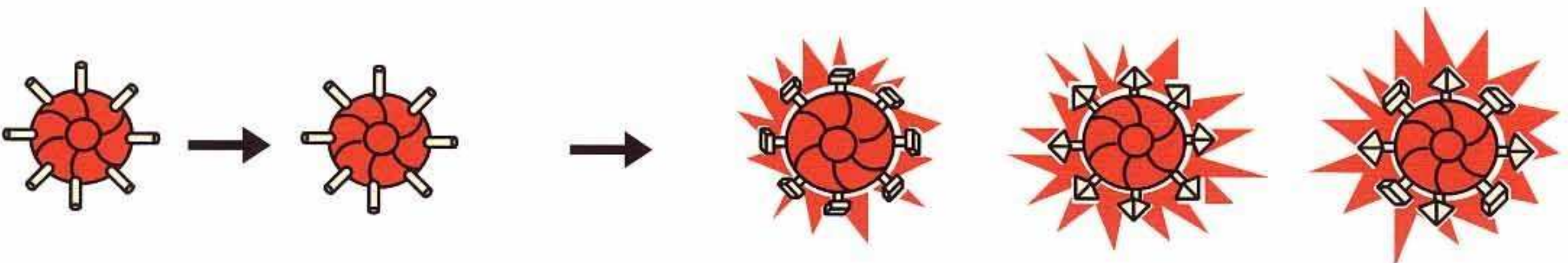


Group B patients can receive blood groups B and O.

But they will reject groups A and AB.



Group AB patients can receive any ABO blood group (ie A, B, AB and O).
Hence, these patients are sometimes referred to as the 'universal recipient'.



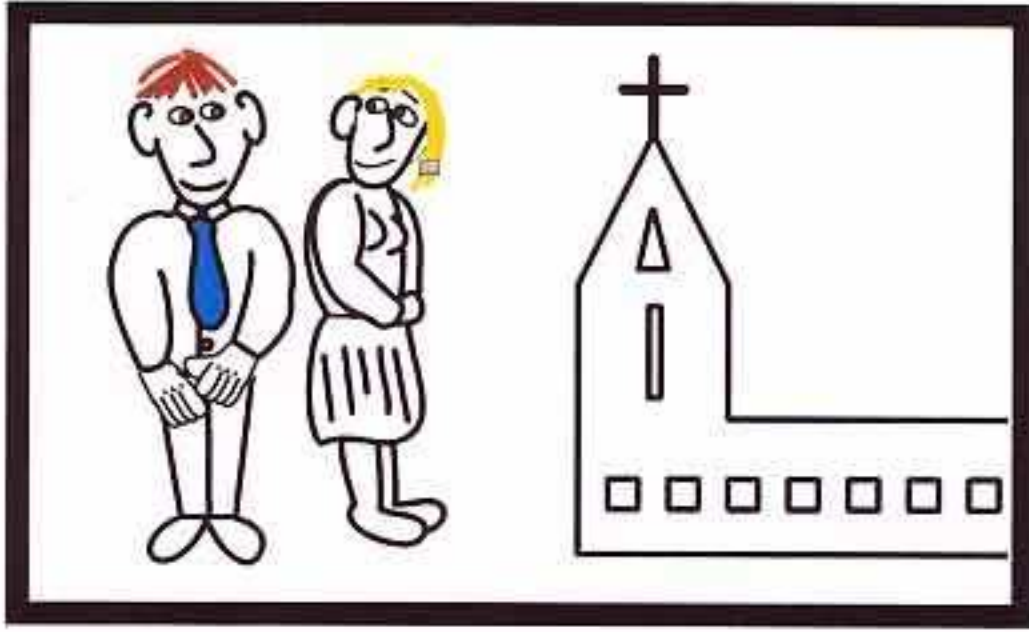
Group O patients can only receive group O blood.

They will reject the other ABO blood groups.

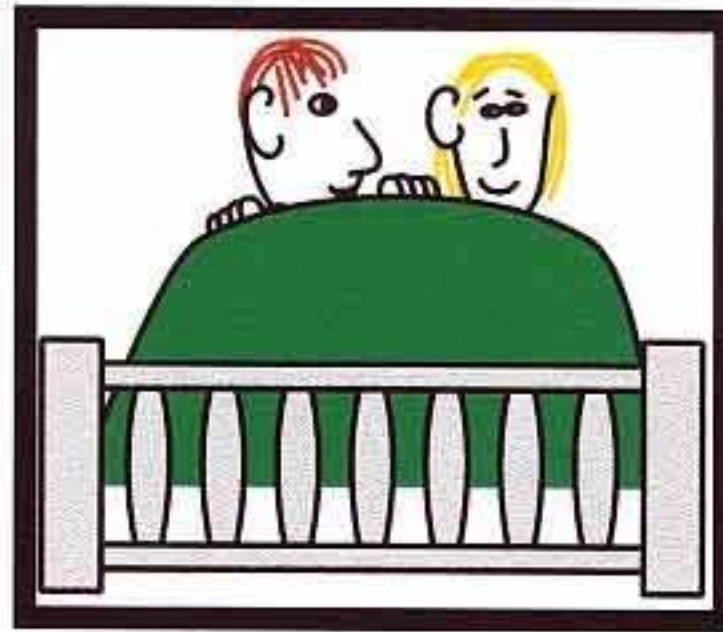
Because group O blood does not have either the A or the B surface markers, it can be given to patients with the other ABO blood groups. Hence group O patients are sometimes referred to as 'universal donors'.

THE RHESUS FACTOR

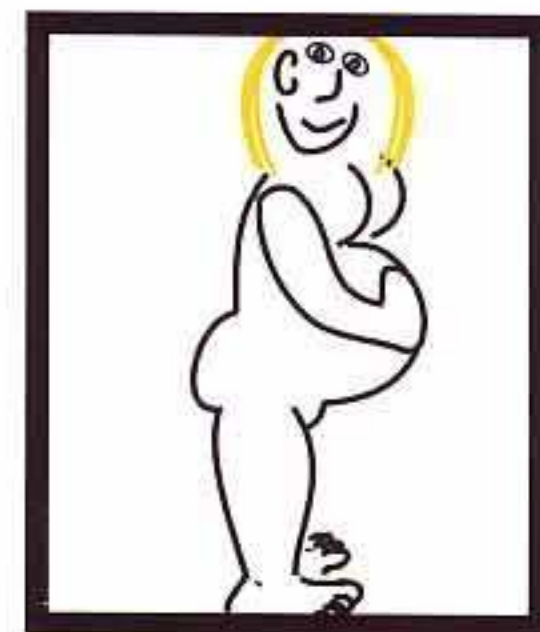
About 60% of the population have this molecule on their red blood cells.



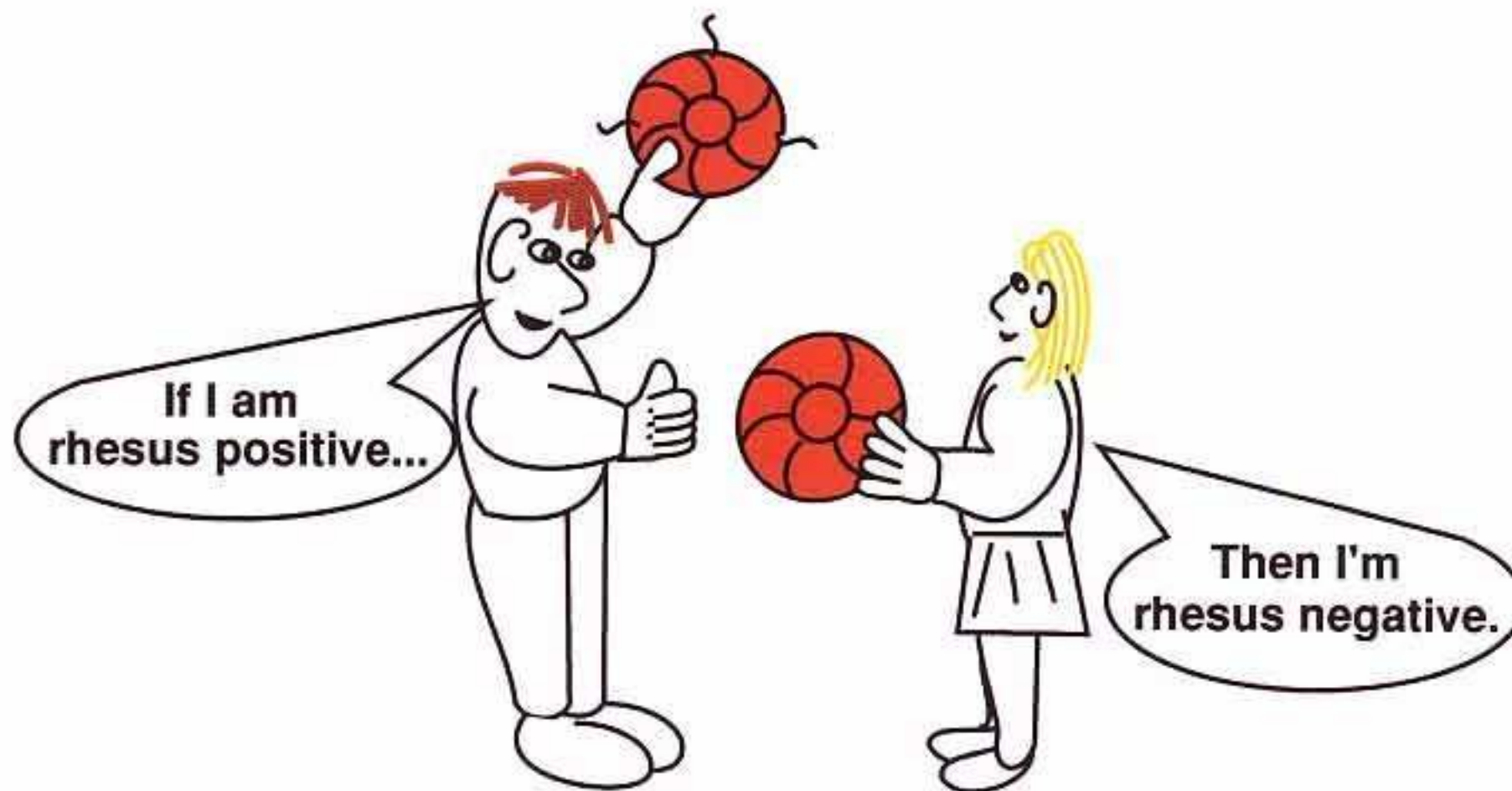
Dan and Rosie decide to tie the knot.



He pops the question.

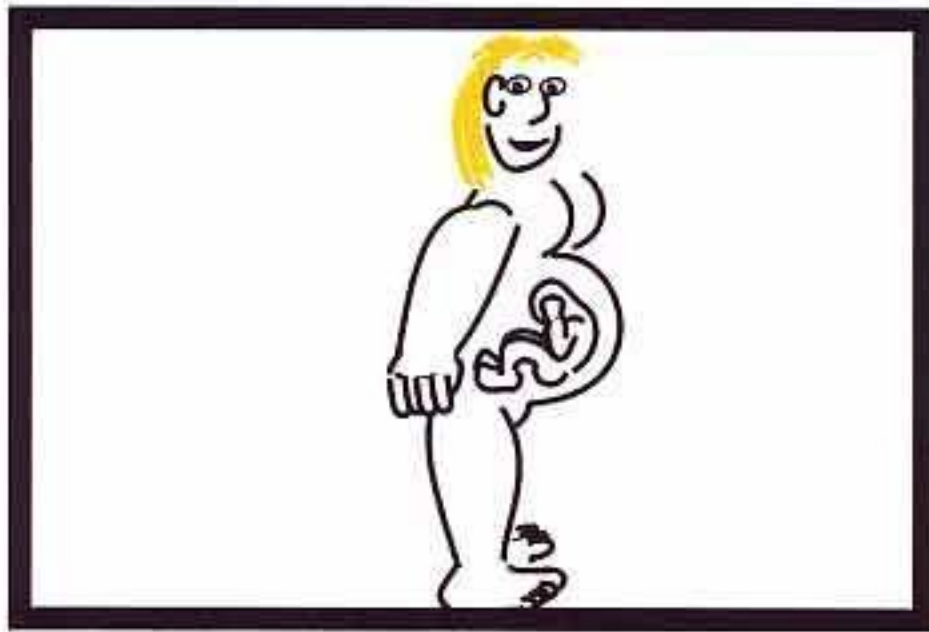


4 months later!

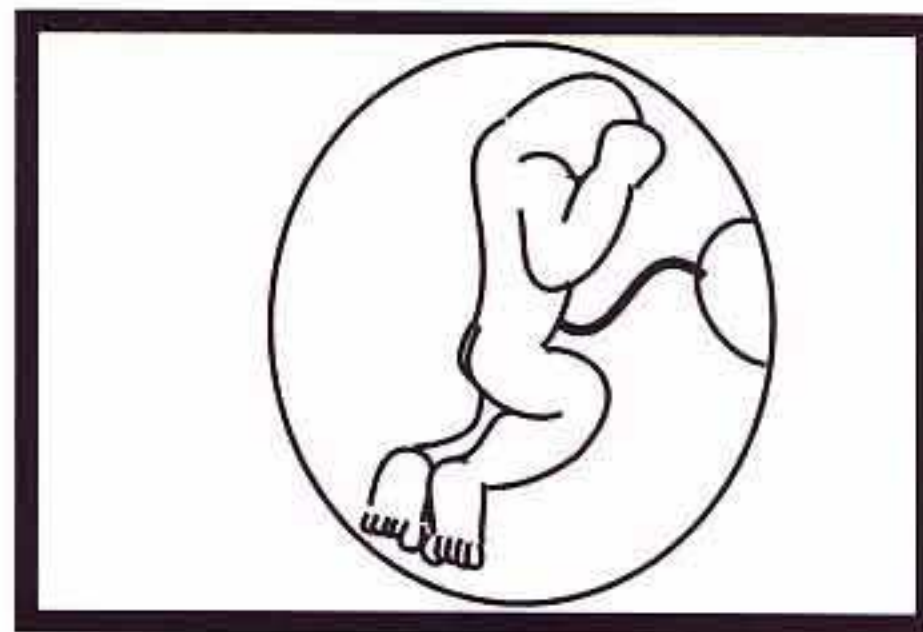


Dan has the rhesus factor on his red blood cells (RBC's). But unfortunately, Rosie does not have it on her's.

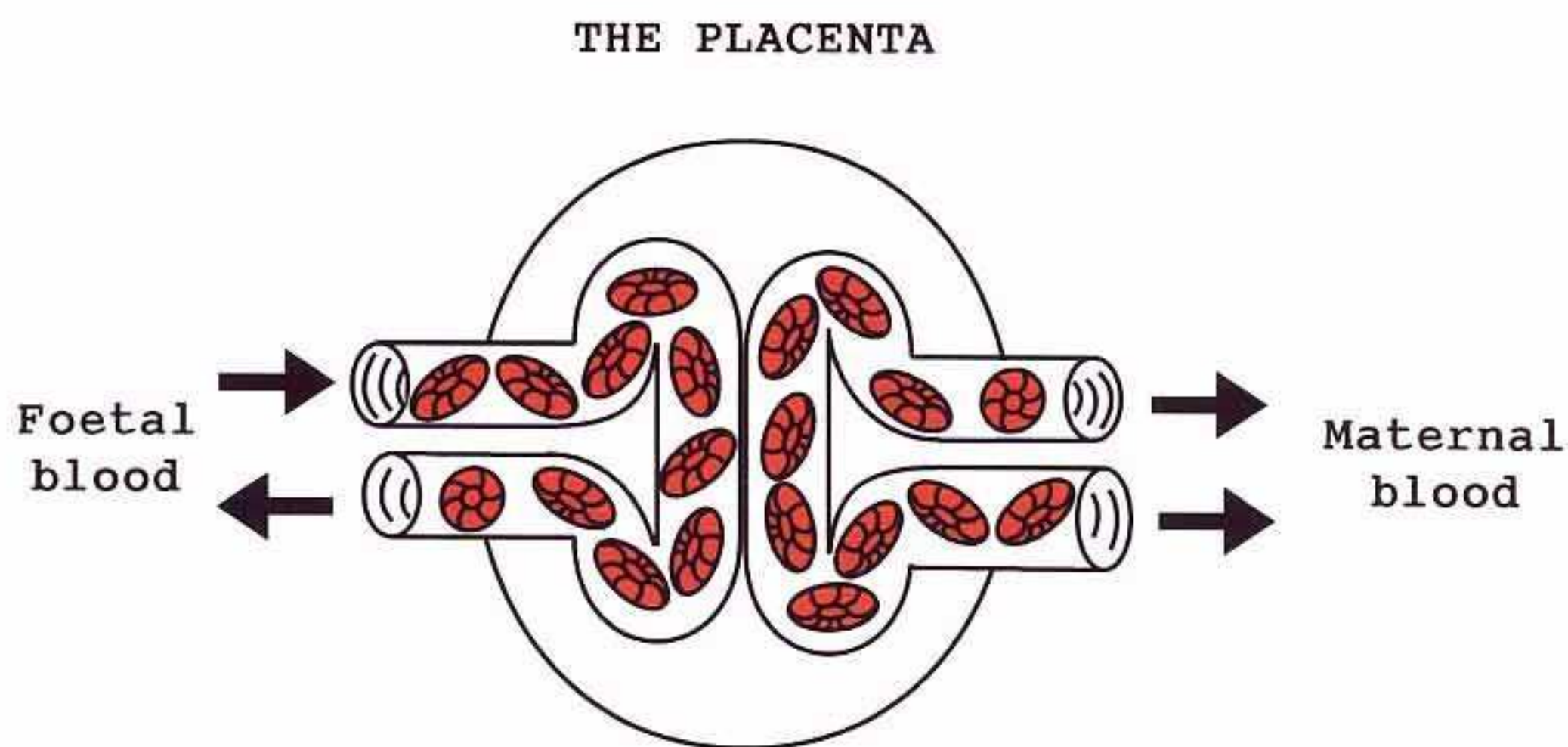
LIKE DAD, THE FOETUS IS RHESUS POSITIVE



As you can see, Rosie's baby is now growing rapidly inside her.

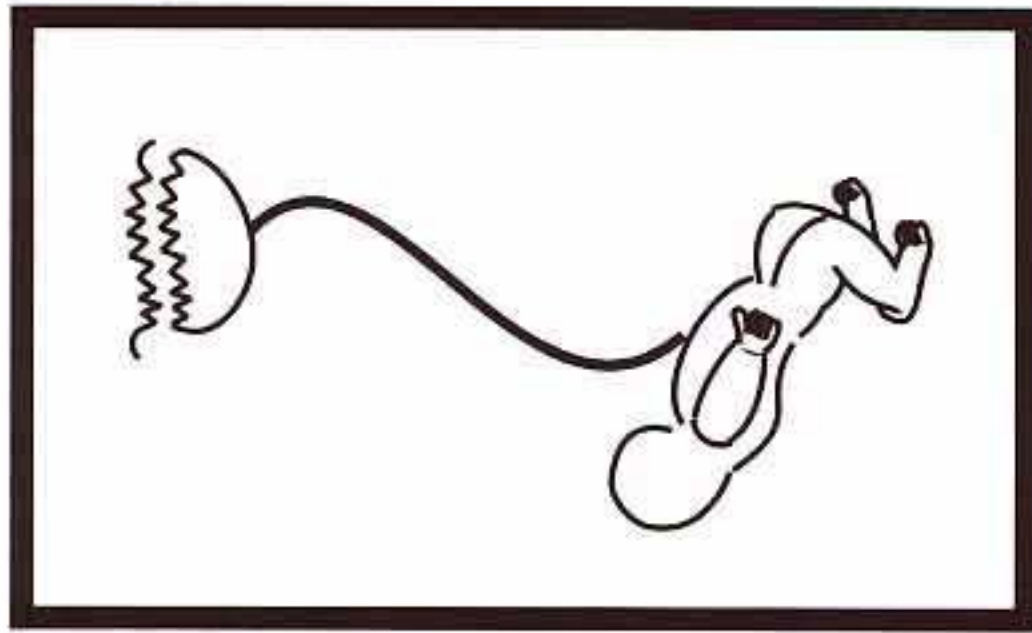


All the unborn baby's nutrients must come via the placenta.

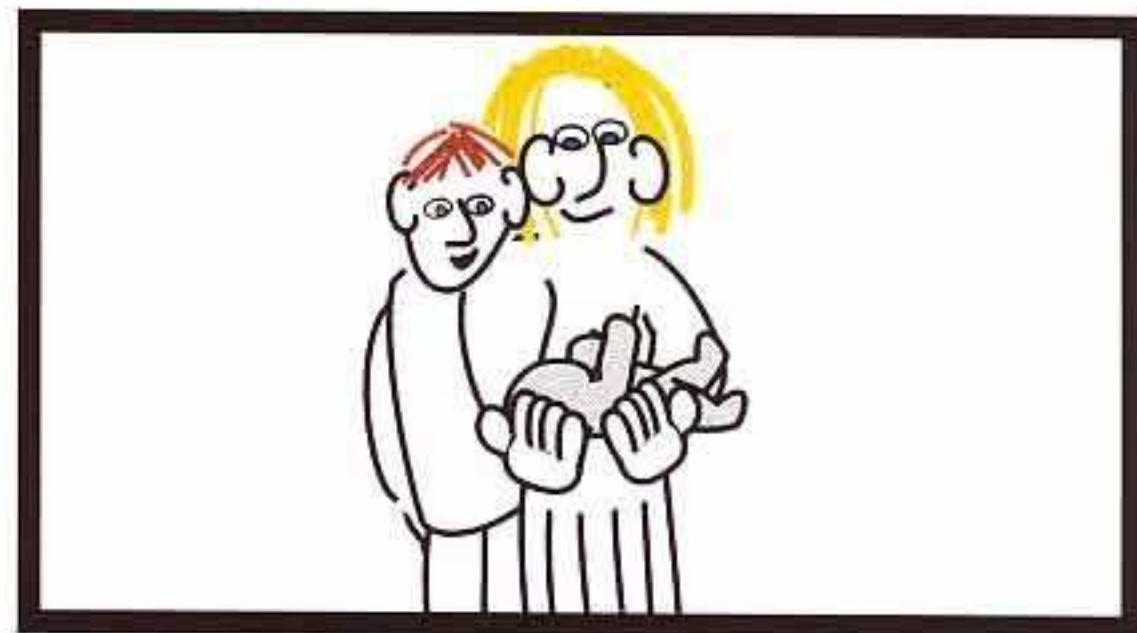


In the placenta, the baby's and maternal RBC's remain separated.

AT THE BIRTH

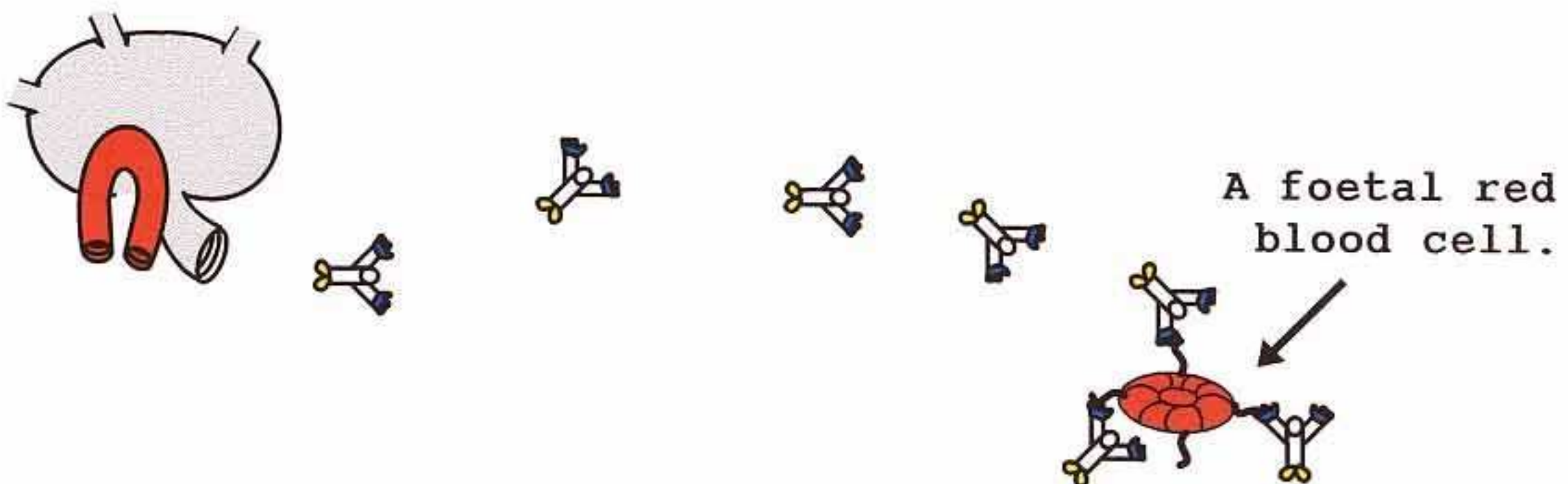


After the baby is born, the placenta detaches and foetal blood sometimes enters the mother's circulation.



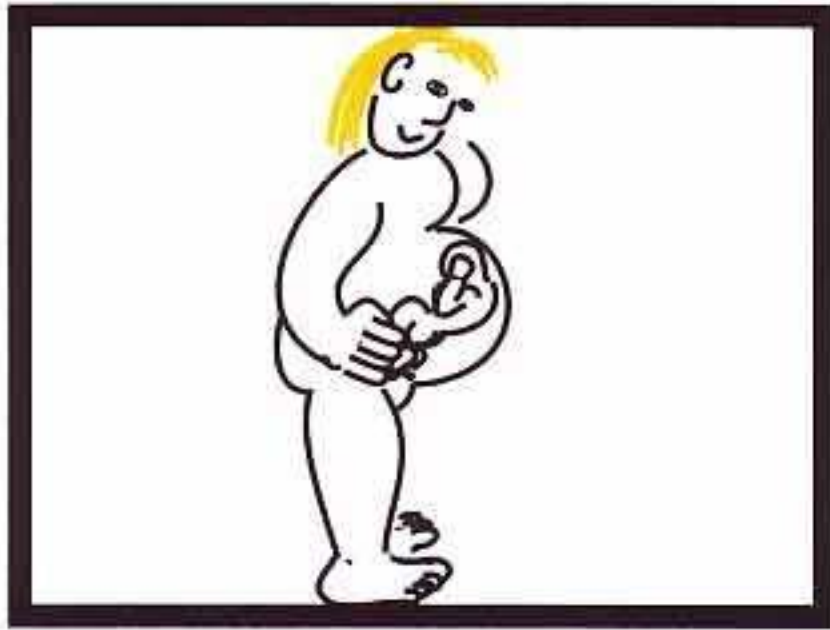
Dan is chuffed about their first baby, but is unaware that some of its blood has mixed with Rosie's blood.

2 WEEKS LATER, INSIDE ROSIE

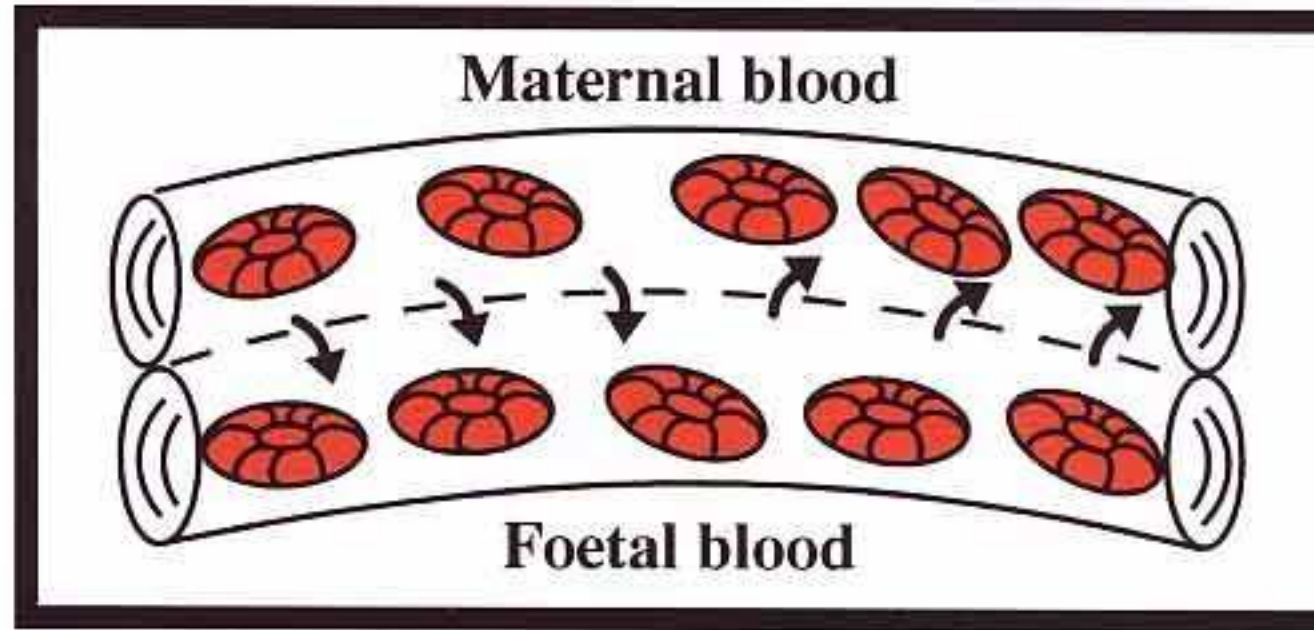


Because RBC's coated with the rhesus factor are foreign to Rosie's immune system, IgG are released to eliminate them.

SEVERAL YEARS LATER

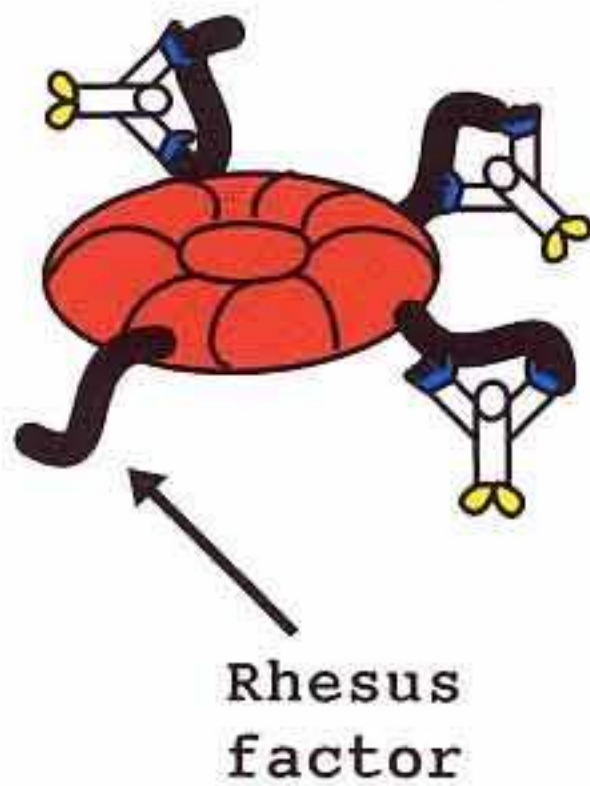


Rosie has baby number 2, which is also rhesus positive.



In the placenta, small things like the mother's anti-rhesus IgG (made after the birth of her first baby), pass from the mother to her foetus.

INSIDE THE FOETUS

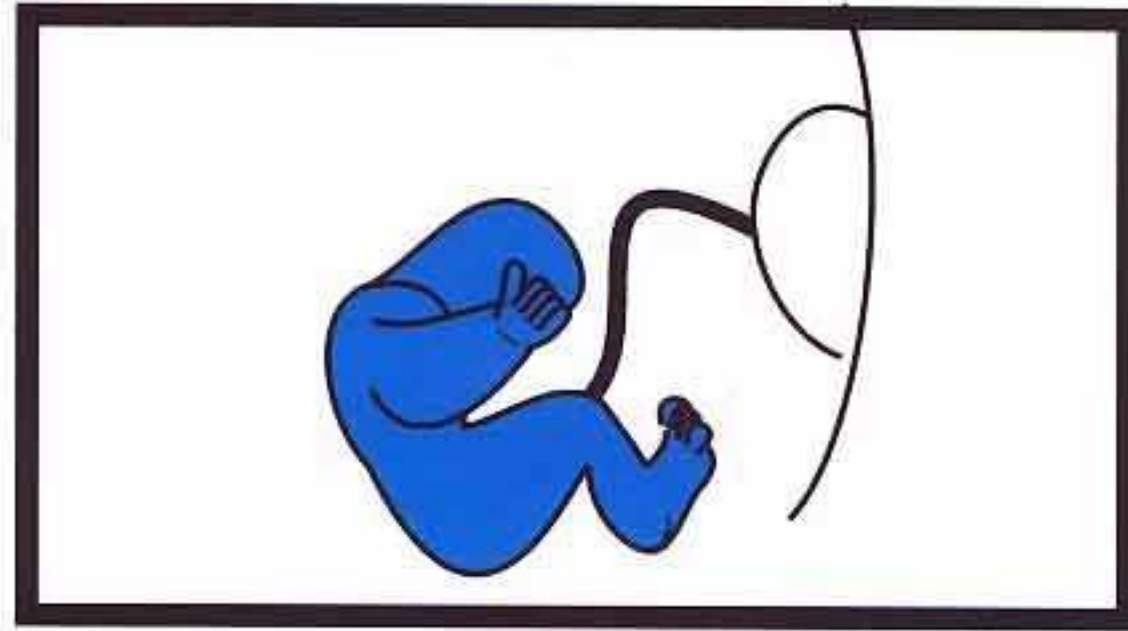


The mother's anti - rhesus IgG, 'grab' the rhesus factor on the foetal RBC's, but are not close enough to activate complement.



However, the baby's own macrophages now 'think' that the red blood cell's are foreign and start to 'eat' them.

A BLUE BABY



As the foetal macrophages remove the coated red blood cells, so the foetus becomes anaemic and could die.

PREVENTION

So how long do these antibodies you're giving Rosie last inside her?



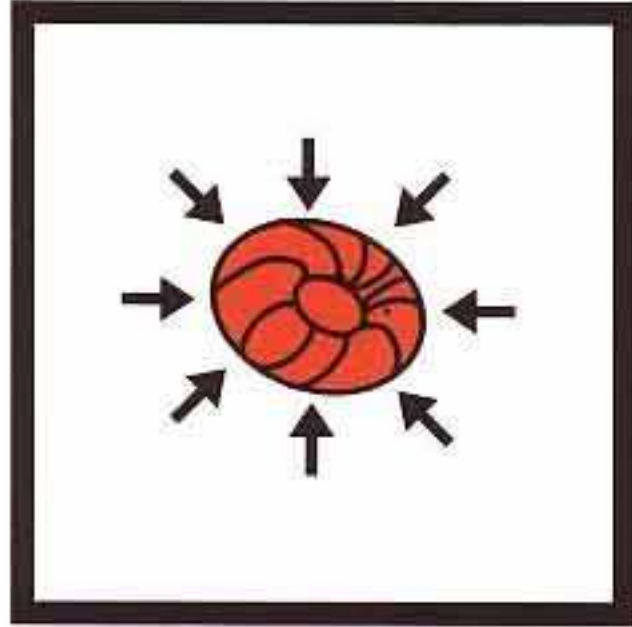
They only last a few weeks.

So whenever a rhesus negative mother gives birth to a rhesus positive baby, she will be given anti - rhesus antibodies. These will 'grab' any foetal RBC's now inside her, before her immune system is triggered into making any anti-rhesus IgG.

A FEW OTHER FACTS ABOUT RBC's



This microbe has been coated in complement C3b.



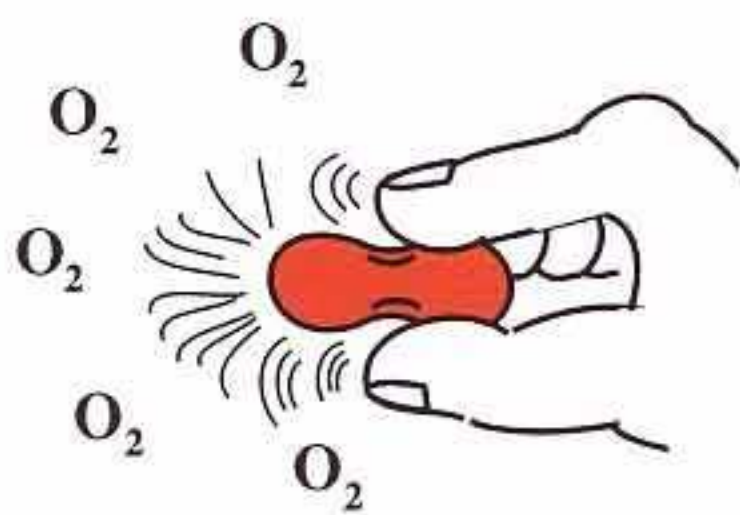
RBC's have surface receptors which will fit C3b (see page 267).



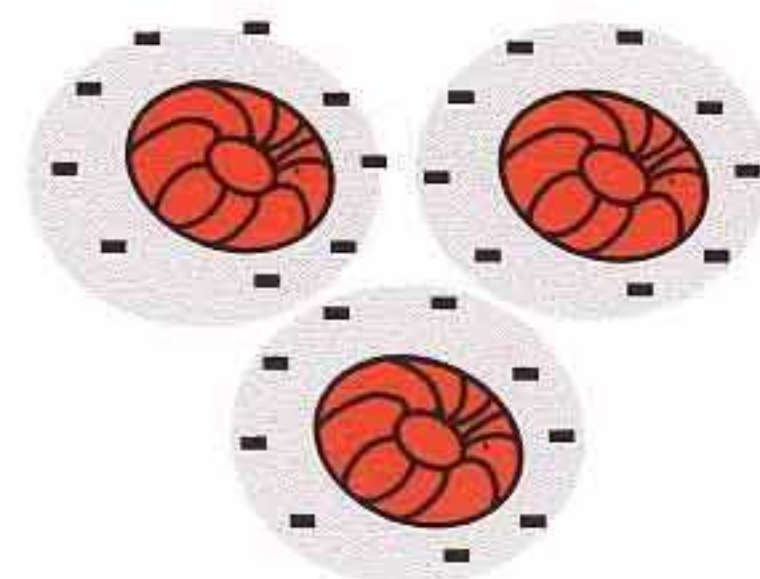
Once attached to a RBC, the microbe is soon being carried to the spleen.



In here, it is plucked off and 'eaten' by the resident macrophages.



The red blood cell or erythrocyte (as it is sometimes called), carries oxygen around the body.



Each RBC carries a small negative charge, called a "zeta potential", which repels neighbouring RBC's.