

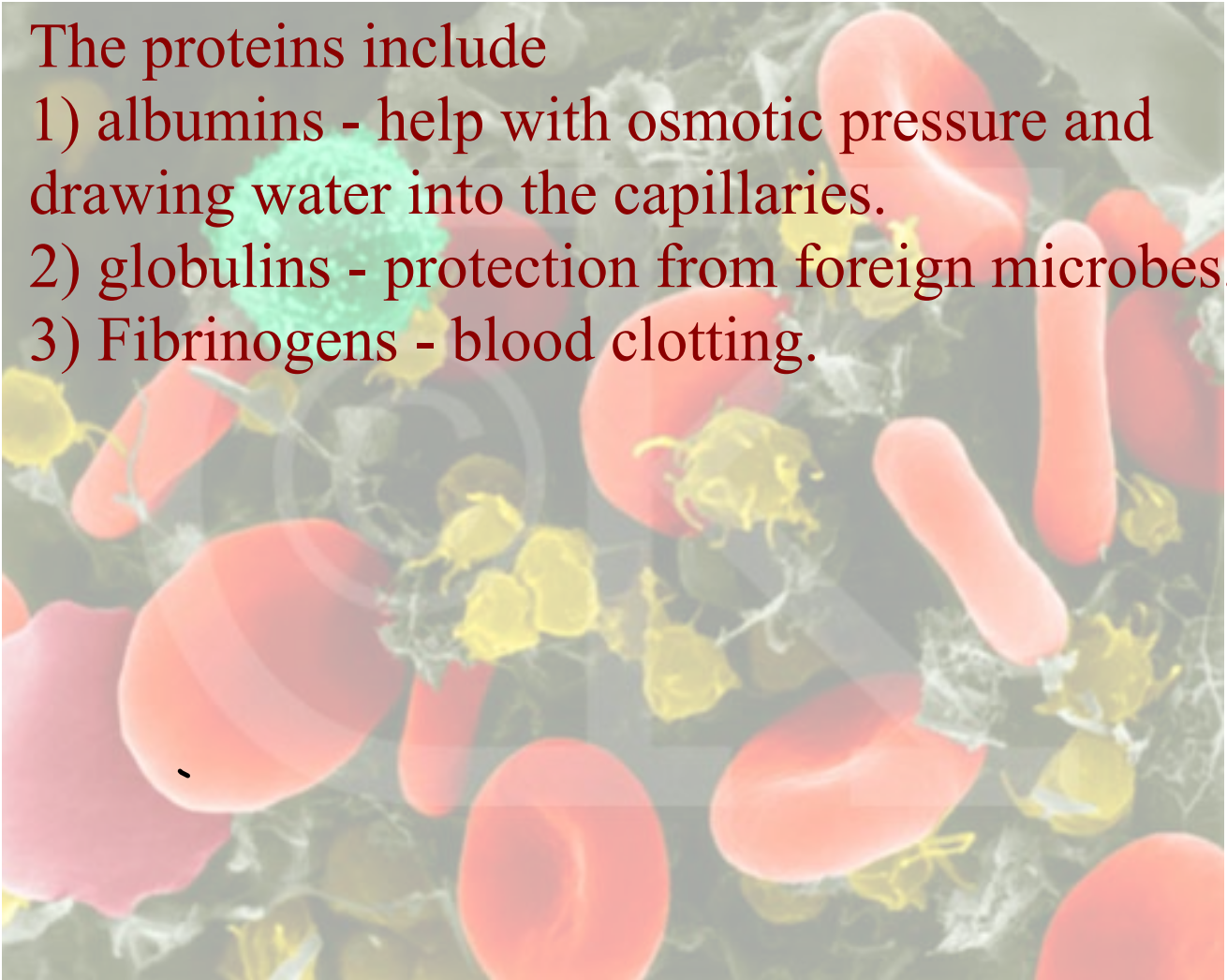


### Blood and Immunity

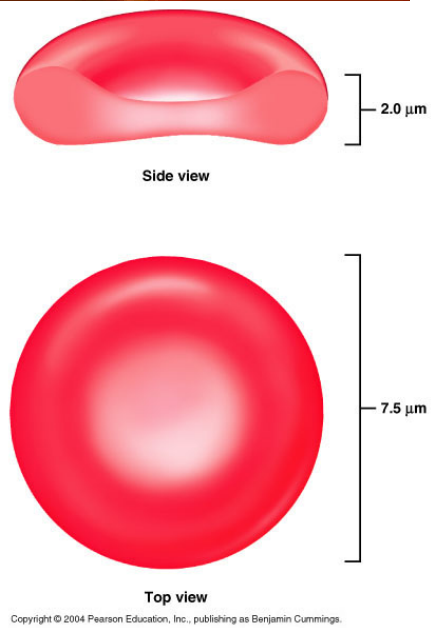
Blood plays an important role in our immune system, the system that fights disease. 55% of our blood is fluid and the rest are blood cells. The fluid is made up of plasma. It is 90% water but also contains blood proteins, glucose, vitamins, minerals and dissolved gases and waste.

The proteins include

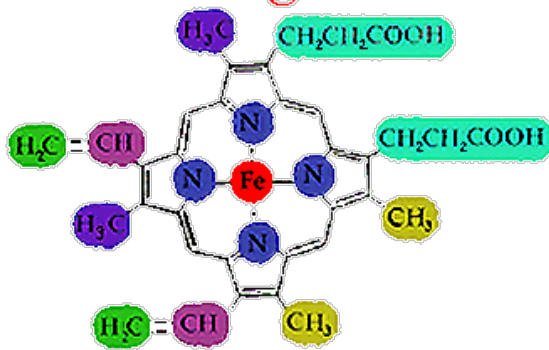
- 1) albumins - help with osmotic pressure and drawing water into the capillaries.
- 2) globulins - protection from foreign microbes.
- 3) Fibrinogens - blood clotting.



**Erythrocytes are red blood cells. They are important in the transport of oxygen.**



## Hemoglobin



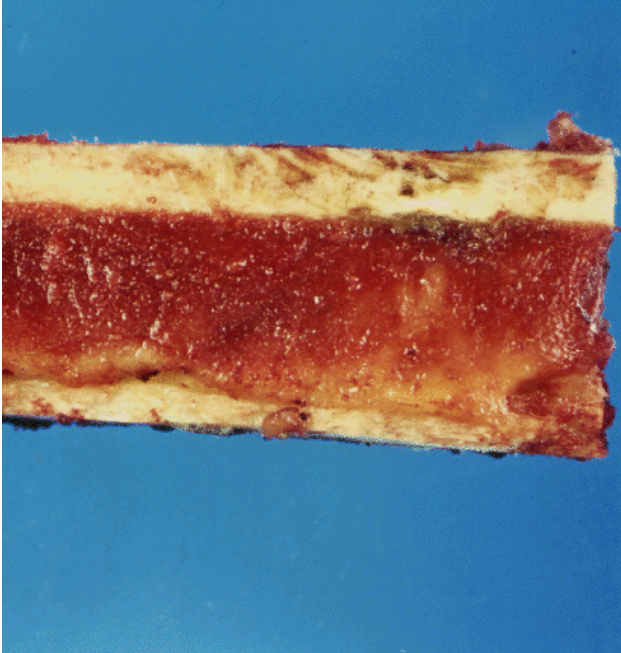
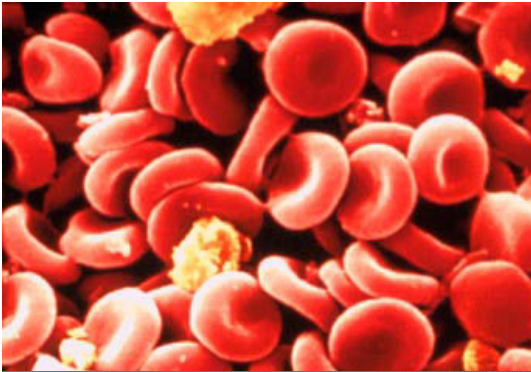
Accidents  
involving cold  
water.

Hemoglobin is a pigment found in red blood cells (RBC) and it increases the amount of oxygen that the RBC can carry. They contain iron.

- With hemoglobin 1L of blood carries 200ml of O<sub>2</sub>.
- Without, 1L of blood carries 3ml of O<sub>2</sub>.

When hemoglobin is without oxygen, it appears bluish.



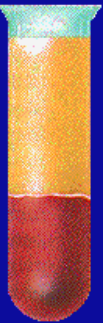


Mature RBC's are enucleated meaning that they do not contain a nucleus. This gives them more room to carry oxygen. They do not replicate. They live for about 120 days. Immature RBCs do have a nucleus and can divide by mitosis. When they mature, they are released into the blood. Erythropoiesis is the production of RBC in the bone marrow.

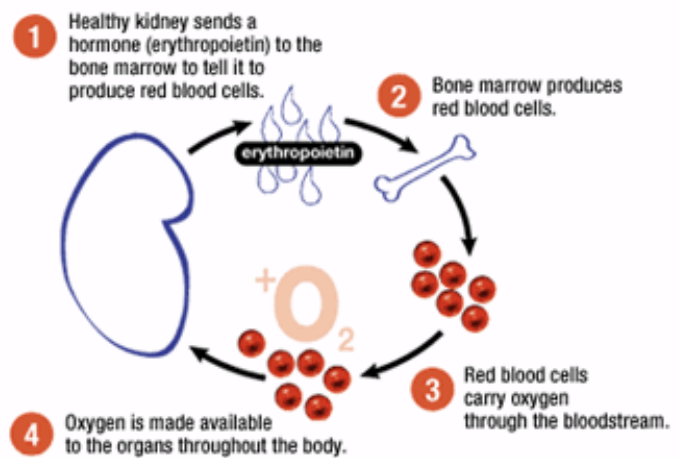


**Erythrocytes**

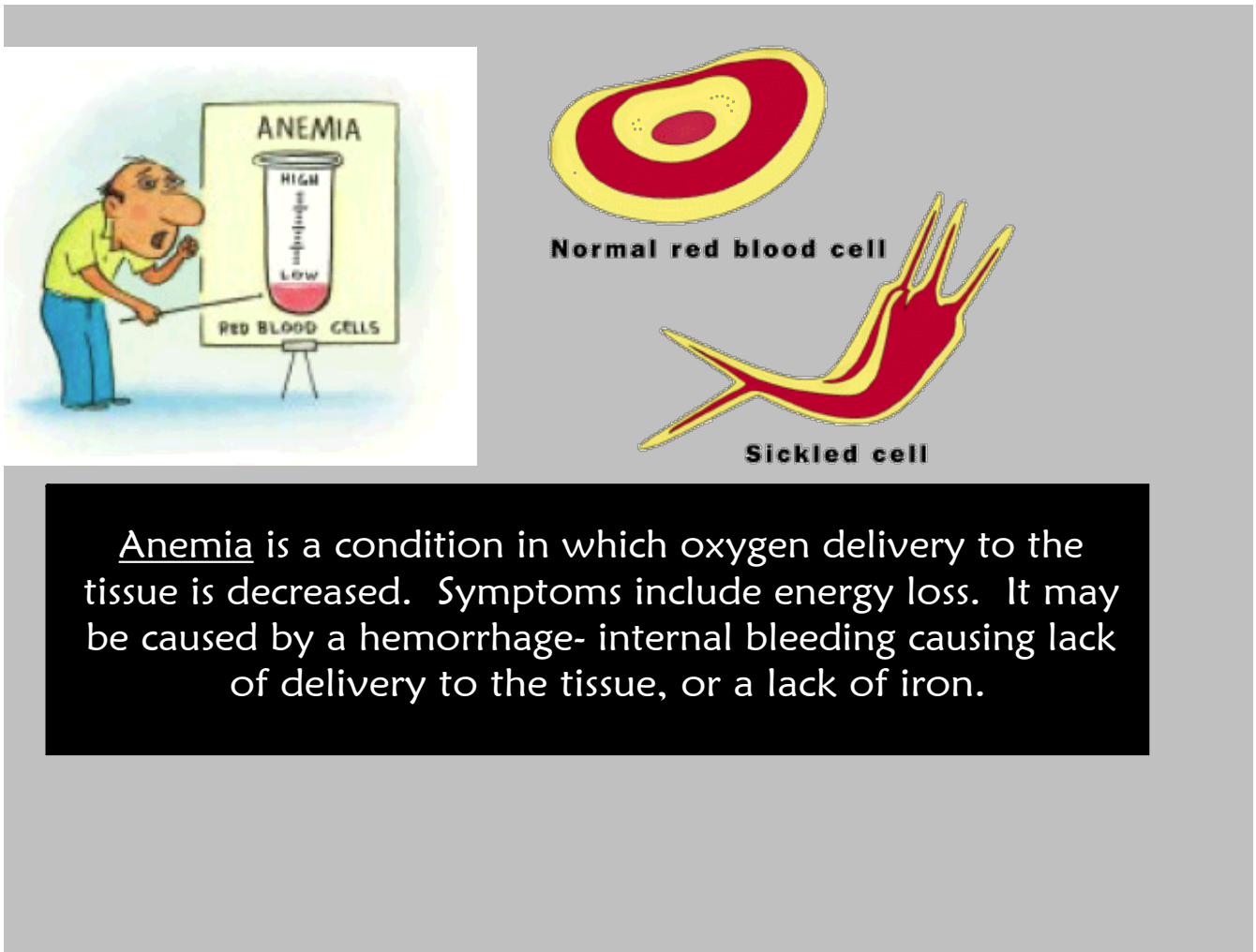
♂ 5 million/cc  
 ♀ 4.5 million/cc  
 82 billion/in<sup>3</sup>



### Normal Kidney Function



The average male contains about 5.5 million RBC per milliliter of blood. The average female about a million less. When the cells die, white blood cells remove the debris. The hemoglobin is returned to the bone marrow. The kidneys regulate the production of RBC.



### Fluosol-artificial blood

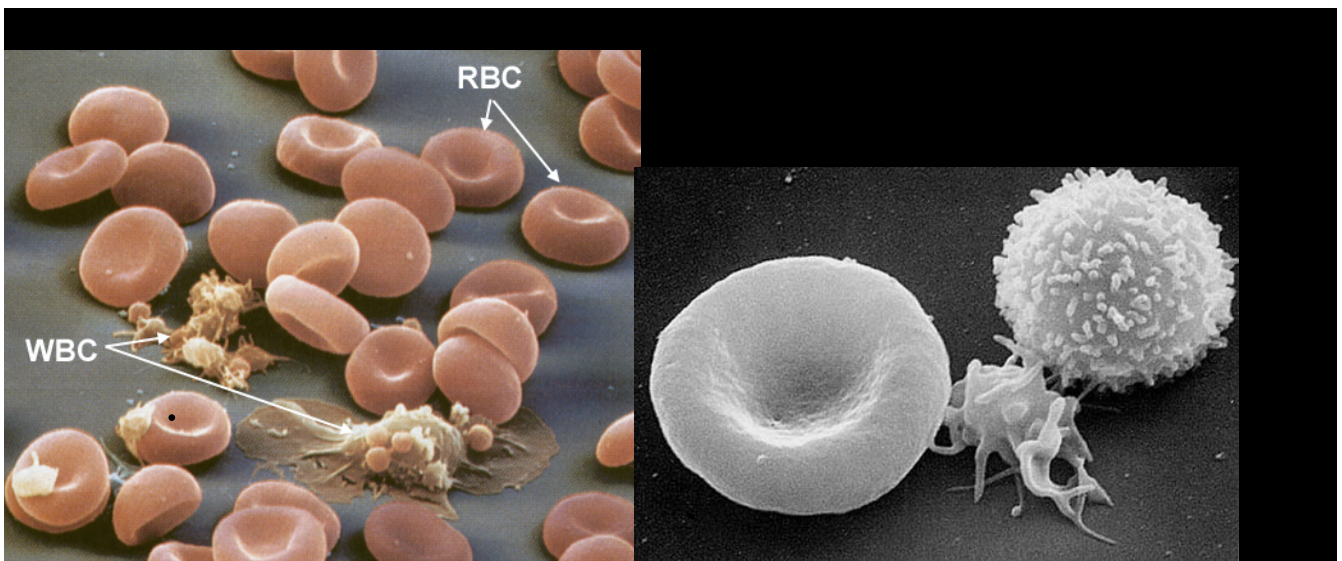
- no need for blood matching
- carries oxygen and carbon dioxide
- can be frozen
- no need to screen for infections

#### *However....*

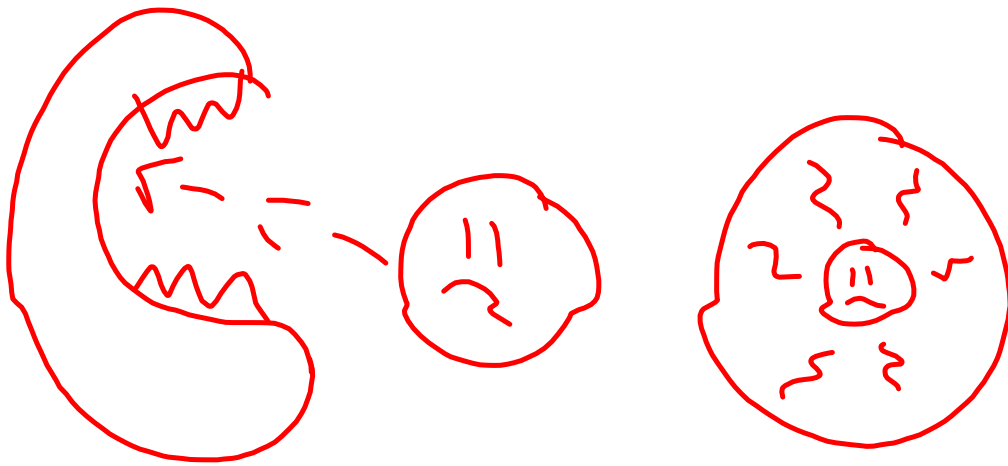
- not used for blood clotting or immunity
- not as effecient as real blood

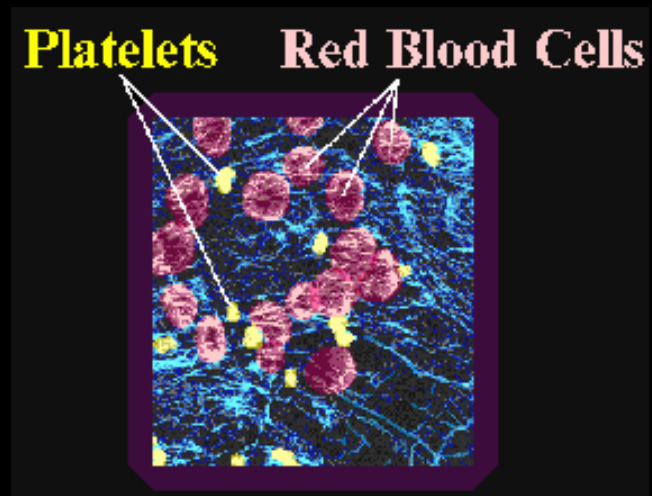
**Fluosol** is an artificial blood substitute which is milky in color. Its main ingredients are perfluorodecalin or perfluorotributylamine in **Fluosol-DA** and **Fluosol-43** respectively, perfluorochemicals suspended in an albumin emulsion. It was developed in Japan and first tested in the United States in 1982, its recipients being individuals who refused blood transfusions on religious grounds.



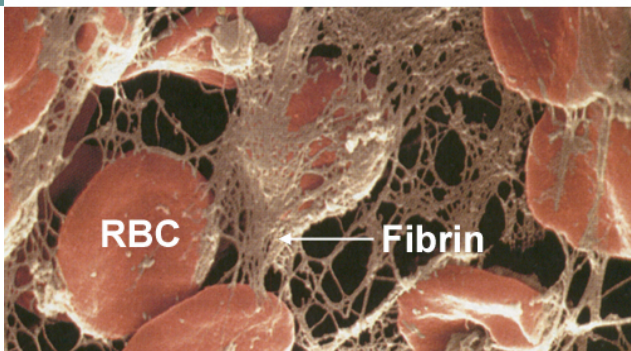
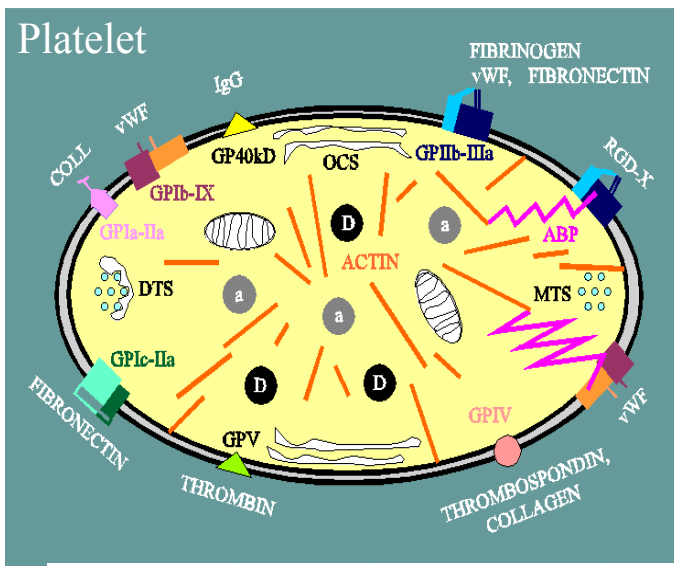


Leukocytes are white blood cells. They are nucleated and are involved in destroying foreign microbes by phagocytosis. Once it engulfs the invader, it destroys it with an enzyme. The remains are called pus. RBC outnumber White blood cells 700 to 1. Antibodies are produced by leukocytes.





Platelets initiate blood clots.



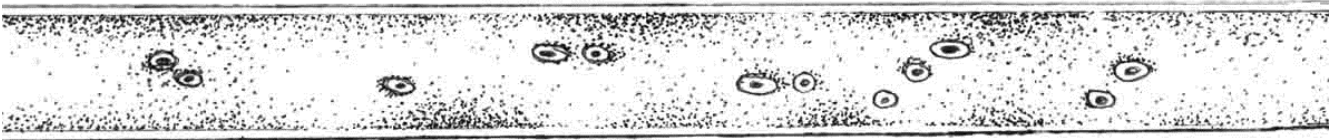
### Blood Clotting

**Blood clotting prevents the loss of blood from ruptured or torn blood vessels.**

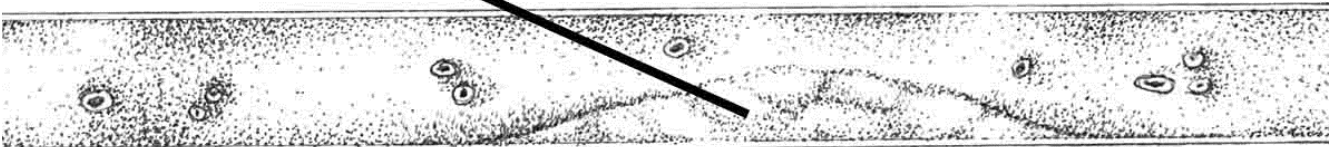
**Platelets move through blood vessels and if they strike a rough surface created by a tear, they break apart and release a protein called Thrombin. Thrombin helps convert Fibrinogen into Fibrin threads and helps seal the cut.**

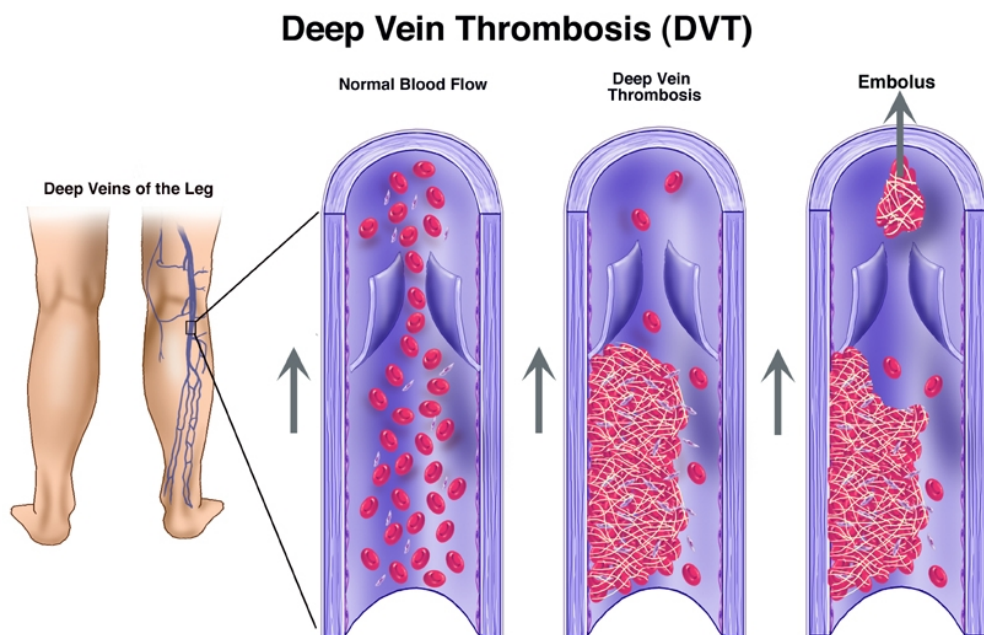
Blood clots can also be dangerous. Thrombus is a clot that seals a blood vessel and prevents the flow of blood. Cerebral Thrombosis is a clot in the brain and may cause a stroke. Coronary Thrombosis is a clot in the coronary artery.

## Normal Artery



## Thrombus

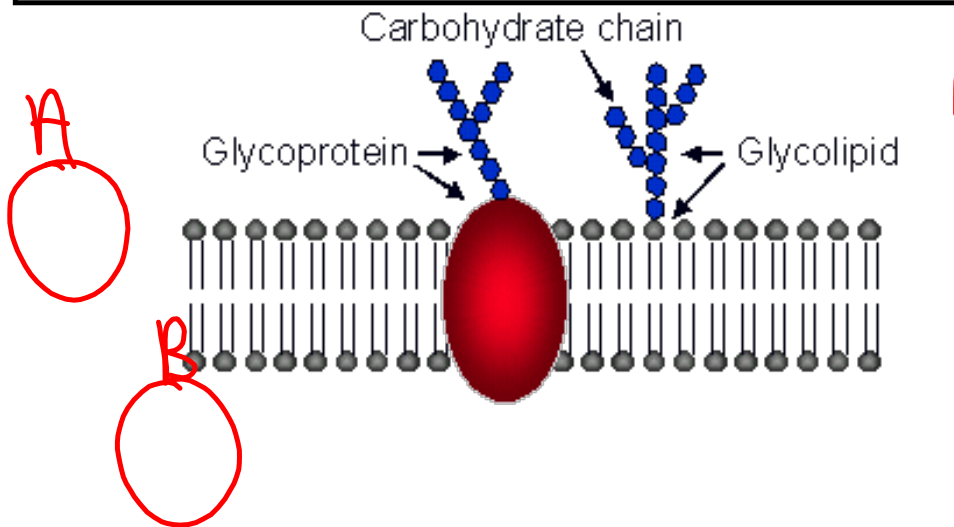




Sometimes, blood clots may dislodge and are called an Embolus. They travel to vital organs where they lodge. This may cause serious problems or death. Causes of Thrombus and Embolus are unknown but their frequency increases as people get older.










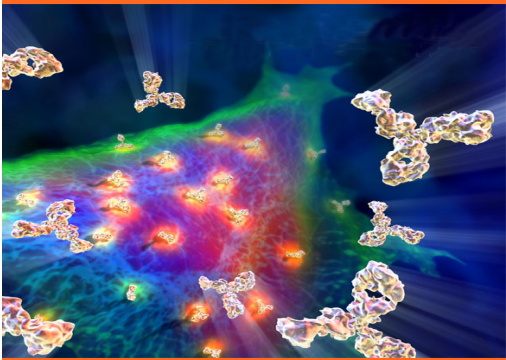
**Blood Groups**  
**People have different blood types in order to perform a successful transfusion, blood types must be matched correctly. Glycoproteins are special markers found on the membranes of some RBC.**



- Blood type A=A marker
- Blood type B=B marker
- Blood type AB=A and B markers
- Blood type O has no special marker.

**The ABO Blood System**

Blood Type (genotype)	Type A (AA, AO)	Type B (BB, BO)	Type AB (AB)	Type O (OO)
Red Blood Cell Surface Proteins (phenotype)	 <p>A agglutinogens only</p>	 <p>B agglutinogens only</p>	 <p>A and B agglutinogens</p>	 <p>No agglutinogens</p>
Plasma Antibodies (phenotype)	 <p>b agglutinin only</p>	 <p>a agglutinin only</p>	<p>NONE.</p> <p>No agglutinin</p>	 <p>a and b agglutinin</p>

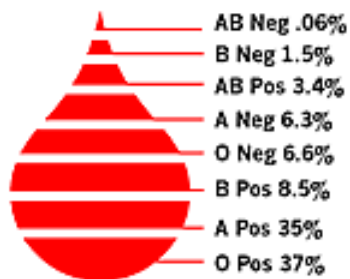


**If a person accepts blood that is not compatible, their body recognizes it as a foreign invader. A marker acts as an antigen. It stimulates the production of antibodies to combat the invaders.**

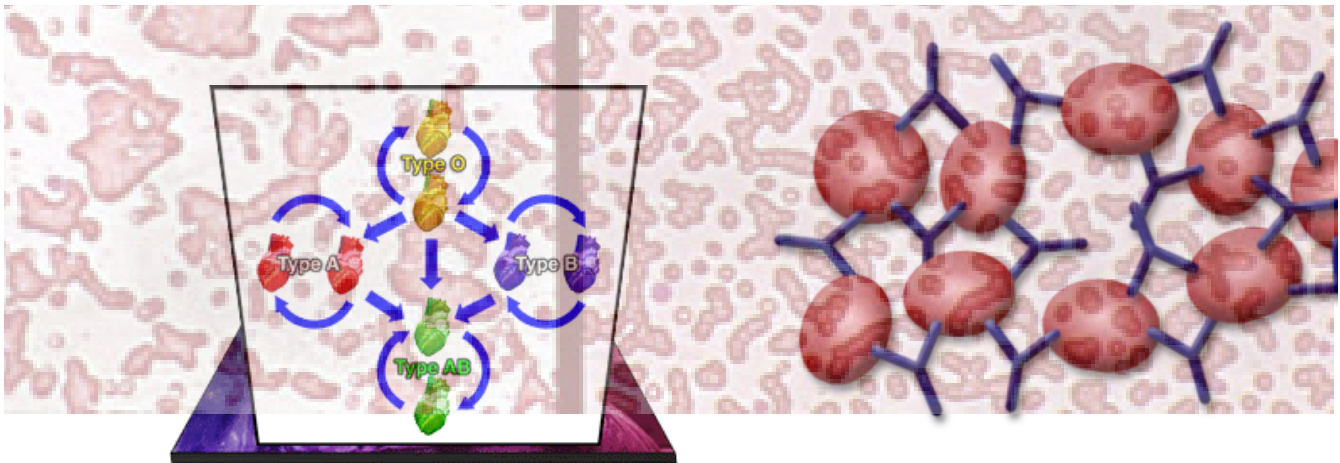
**Blood type A accepts only A or O type blood.**  
**Blood type B accepts only B or O type blood.**  
**Blood type AB accepts A, B and O.**  
**Blood type O accepts only O blood.**

**O is said to be the universal donor. All blood types can accept Blood type O blood.**

Frequency of Blood Types



**The Rhesus factor is another RBC antigen and like blood types, it is inherited. If you have the antigen, you are Rh+. 85% of Canadians have it. The remainders do not. They are Rh-. Rh+ people can receive blood from Rh- but not vice versa.**

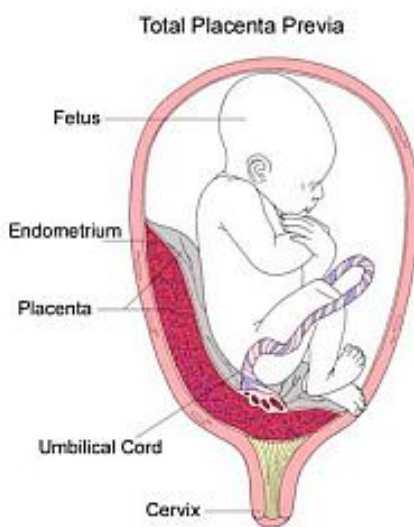


When you receive the wrong blood type, the blood agglutinates which means that the blood will clump and be unable to get through the capillaries. People with blood type AB are all set.



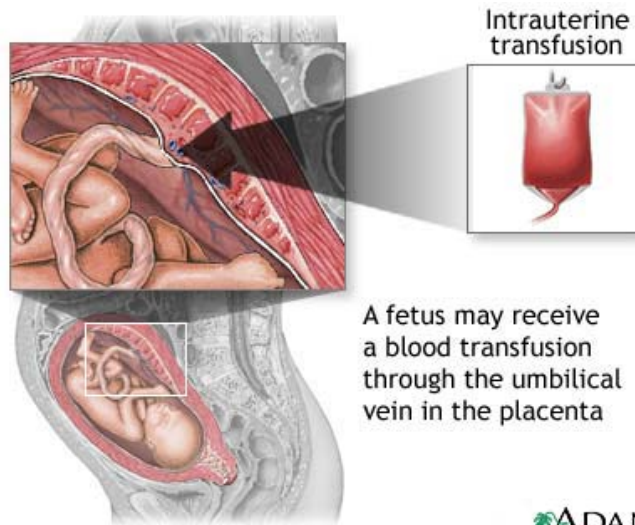
**Erythroblastosis fetalis (Blue Baby)** occurs when a Rh- mother is pregnant with a Rh+ baby. Blood of the mother and child are separated by the placenta. There is no mixture of blood until birth. The first child is not at risk because the mother does not have the antibody against Rh+ blood. At birth the blood mixes and the mother recognizes the foreign antigens and begins to produce antibodies. At this point, the baby will have been safely born.



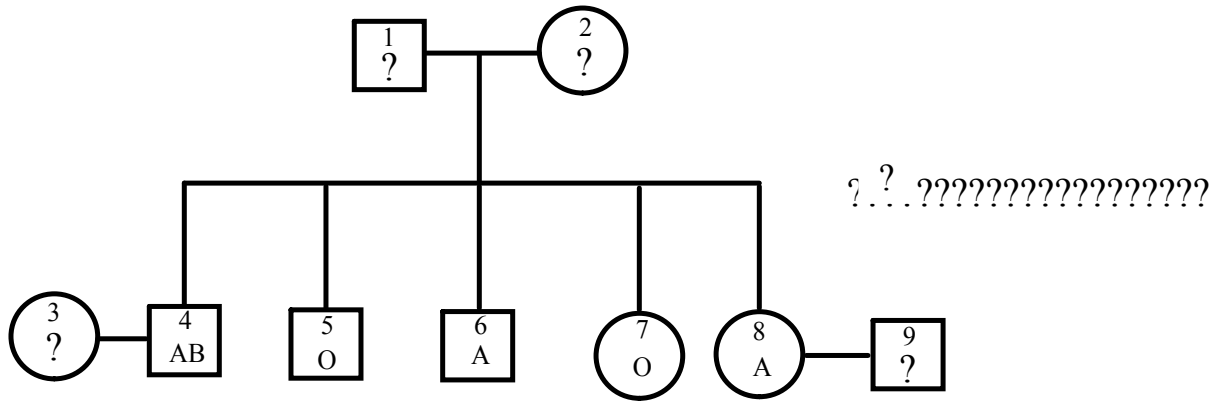


The next pregnancies are more dangerous as the mother retains many antibodies that were produced at the end of the first pregnancy. Antibodies *may* move across the placenta (a membrane that allows materials to pass from mother to embryo) and attach to the antigen on the RBC causing them to clump. Cells are unable to pass through the capillaries and oxygen delivery is reduced. The result is a blue baby.

**Treatment is a transfusion of Rh- blood. Mother's antibodies recognize it and does not attack. Eventually the mothers' antibodies die and the baby will begin to produce Rh+ blood. Another treatment is injection of a drug after the first birth to prevent mom from producing the Rh+ antibodies.**



ADAM.



5

Daughter/Son In-law  
Not from same family

1. How many children do 1 and 2 have?
2. Who are 3 and 9?
3. Can you determine the blood type of 3 or 9?
4. What are the blood types(genotypes) of 1 and 2?  
Can you be specific?

AO & BO

