



Let's Get In Touch



PRATHAMA BLOOD CENTRE

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*Blood &
Transfusion*

History

Blood has been considered as an essence of life for many centuries.

Blood transfusion, as successful practice became established during second world war, when it came as a life saver to millions of wounded soldiers. Since then blood donation and blood banking has immensely advanced and today blood is the single most important support to the modern health care.

What is blood ?

It is a red coloured, viscous liquid, which flows in blood vessels throughout the body. It has two parts. Liquid part (55% volume) is called plasma. It is light yellow in colour. The second part is cellular (45% by volume) and contains different types of cells viz. Red cells, White cells, Platelets.

What does Blood do ?

Blood is the transport system of our body. It transports food material (glucose, amino acid etc.) and carries back waste material like carbon dioxide to lungs and urea to liver and kidneys. Similarly it also transports hormones, vitamins and minerals across the body. Red cells transport gases like O_2 from lungs to each and every cell of our body and CO_2 processed by the cells is transported to lungs to be exhaled out. White blood cells in blood fight infections and foreign bodies. Platelets in blood help the blood to clot following injury, and prevent excessive loss of blood.

Where is Blood made ?

Our blood cells, viz. Red Cells, White cells and Platelets are made by cells called "Progenitor Cells" which live in bone marrow.

Bone marrow is a dull red colored liquid present in the central cavity of long bones. Liquid part of blood called plasma has dissolved proteins. These proteins are mainly made by liver. The life span of red cells is about 120 days, and that of platelets is about 7-9 days.

How much Blood do we have ?

About 8% of our body weight is blood. So a 50 kg person has about 4.0 litres of blood and a 75 kg person has about 6.0 litres of blood.

What are blood components ?

As we mentioned earlier blood is a mix of cells and plasma. Primarily red blood cells (RBC), white blood cells (WBC), platelets and plasma. These cells and plasma have different functions to perform. A patient never requires whole blood but only particular components. Besides that these components have different life span and storage conditions. For better survival of each components they should be separated and stored at optimum conditions.

The blood is separated into its components through the process of centrifugation. From a single unit of blood, we get one unit each of red cells, platelets and plasma. Plasma is further separated into cytoprecipitates and cyropoor plasma.

What are blood groups ?

Blood groups are the result of antigens (large protein molecules) which are present on red blood cells. Primarily there are three types of such antigens which decide our blood group. ABO blood groups were first discovered by Dr. Landsteiner in 1906. Rh antigen was discovered later by Dr. Landsteiner and Weiner. Rh antigen is primarily found in Rhesus monkey. On the basis of the presence of these antigens along or in combination the blood groups are decided as given below.

Antigen A or B	Antigen Rh Yes/No	Blood Group	Can donate blood to	Can take blood from
A	Yes	A+	A+, AB+	A+, A-, O+, O-
B	Yes	B+	B+, AB+	B+, B-, O+, O-
A&B	Yes	AB+	AB+	A+, B+, AB+, O+, O- A-, B-, AB- (Universal recipients)
Neither A nor B	Yes	O+	A+, AB+, B+, O+	O+, and O-
A-	No	A-	A+, AB+, A-, AB-	A-, O-
B-	No	B-	B+, AB+, B-, AB-	B-, O-
AB-	No	AB-	AB-	A-, B-, AB-, O-
O-	No	O-	Everyone A+, B+, AB+ & O+ A-, B-, AB-, O- (Universal Donor)	Only O-

What are rare blood groups ?

Besides A, B and Rh antigens on our red cells there are many more rare antigens. They are clinically not significant in normal conditions. However antibodies against some of these rare antigens may develop in case of multiple transfusions or exposure of different blood groups as during child birth. In such situations, blood group required has to be matched for rare antigens.

How is blood group tested ?

Blood groups are tested using antigen-antibody reaction. For example, if a blood group A is reacted with antibody A, then the red cells will lyse / agglutinate. This is then seen under microscope. A series of such reactions against antibody to A, B and Rh confirm the blood group.

Who can safely receive which blood group?

1. Group A individuals can receive group A and group O red blood cells
2. Group B individuals can receive group B and group O red blood cells
3. Group AB can receive group AB, A, B and O red blood cells. Since group AB individuals can usually receive any of the four blood groups, they are called "universal recipients."
4. Group O individuals can receive only group O blood. Since group O red blood cells can usually be given to group A, B, AB and O individuals, a donor with group O blood is referred to as a "universal donor."

What is the Rh Factor?

The "Rh Factor" is the principal antigen of the Rh blood group system. It is also called the D antigen. People whose red blood cells express the D antigen are called Rh positive; Rh-negative red blood cells lack the D antigen. Rh-negative persons may develop anti-D antibodies in their plasma if they are exposed to red blood cells from an Rh-positive person.

What is cross matching ?

We have seen in the chart earlier, who can donate or accept blood for whom. Still, to ensure fully, the patient's and donor's blood is mixed in different media and then viewed under the microscope for compatibility. Only compatible blood is used for transfusion to the patient.

What is antibody ?

These are protein molecules. Various types of antibodies are found in the body. Antibodies are normally present in plasma. These antibodies react against the antigen, depending upon the strength of the antibody. Antibodies are antigen specific. In blood group systems antibodies do not exist in the same person who carries their complementary antigen. For example, a person with blood group A will not have antibody against antigen A (Anti-A) in his blood.

What is Hemoglobin (Hb) ?

Hemoglobin is a protein molecule, which contains iron. Hemoglobin is present in red blood cells of our blood. It is because of Hb, that our blood looks red. In India females should have 12-14 gm% and males 14-16 gm% of hemoglobin.

What is Anaemia ?

Anaemia is a condition when hemoglobin falls below the normal level. It can happen because of Iron deficiency, Vitamin B 12 deficiency, blood loss, genetic reasons and a few other conditions. Your doctor is the best judge to diagnose and recommend treatment for anaemia.

What is Thalassemia ?

Thalassemia is a genetic disorder. It is of 2 types- Thalassemia major and Thalassemia minor.

Thalassemia major patients do not possess capability to produce healthy and effective Red blood cells. They survive only on blood transfusion 1-4 times a month. The only cure for Thalassemia major patients is bone marrow transplantation. Though even BMT is successful in only a small percentage of cases. India has about 100,000 thalassemia patients.

In Thalassemia minor, the patient does not suffer from any of these symptoms other than mild anemia as he is merely a carrier.

Thalassemia minor can lead a normal life. Hence it is imperative that two Thalassemia minors do not marry as their offsprings may be Thalassemia major.

What is Hemophilia ?

Hemophilia is a blood disorder where blood clotting is defective. Patients suffering from Hemophilia lack blood clotting factors. As soon as they bleed, they need clotting factors which are prepared from plasma. Any delay may cause excessive bleeding and death. India has about 50,000 to 75,000 of hemophilia patients. Almost 90% of them are still undiagnosed and are leading a miserable life.

What is Hemolytic disease of the new born?

Hemolytic disease of the new born (HDN) is a condition in which antibodies from the mother cross the placenta and destroy the red blood cells in the foetus she is carrying. The destructive process may be mild or intense, causing problems that can range from mild anemia and jaundice to severe fetal or neonatal distress or even to intrauterine death. HDN occurs when the mother develops an antibody to a blood group antigen that is absent from her red blood cells but present on the fetal red blood cells. The most common cause is anti-D in an Rh-negative mother carrying an Rh-positive child. HDN is sometimes called "Rh disease of the new born," but other antibodies sometimes cause the same problem.

Severe HDN is treated by transfusion. Intrauterine transfusion can be performed if necessary; after delivery, an infant can be treated by "exchange transfusion," which substitutes Rh negative blood of same ABO group as that of baby's for the infants damaged antibody coated red blood cells.

Who can donate Blood ?

Any healthy person with weight above 50 kgs and age between 18 to 60 years can donate blood. The person should NOT have had :

- Jaundice in last 1 year
- TB and Leprosy
- Anemia
- Fever in last one week
- Major surgery in last year
- High BP
- Heart attack/
Other heart problems
- Malaria in last 3 months
- AIDS
- Current infection
- Taken medicines in last 2 days
- Transfusion in last 1 year
- Ongoing pregnancy & lactation
- Ongoing menstrual period
- Risk Behavior

What is risk behavior ?

Risk behavior of a person exposes him to a high risk of AIDS. Such people are requested not to donate blood. Risk behavior includes people with following traits.

- Homosexuals
- Those with multiple sexual partners
- Intravenous drug addicts
- Males / females who had sex for money
- Had sex with any stranger or with any person during a short term relationship
- Had sex with an AIDS victim
- Had sex outside marriage
- Sexual partner of any in the above mentioned category

What is involved in Blood donation?

The actual donation process:

- You will complete a donor registration form
- You will receive a mini-physical check up
- You will proceed to the donor area where your arm will be cleaned with an antiseptic
- The donation process, will take around 10 to 12 minutes.
- Following your donation, you will receive refreshments
- The whole procedure takes about 40 minutes.
- Your gift of life may help as many as three to four people. You can donate blood every 90 days / 120 days. Except that it leaves you feeling good.

What is plateletpheresis?

Although most blood is donated as whole blood, it is also possible to donate only a portion of blood using a technique called "apheresis". Blood is drawn from the vein of a donor into an apheresis instrument, which separates the blood into different portions by centrifugation. By appropriately adjusting the instrument, a selected portion of the blood, such as the platelets, can be recovered, while the rest of the blood is returned to the donor either into the same vein or into the other arm. This process takes more time than whole blood donation, but the yield of platelets is much superior. Platelets collected by apheresis are particularly useful for patients who require numerous platelet transfusions, for example cancer patients who received chemotherapy.

How are blood components made?

The unit of whole blood drawn from the donor is centrifuged to separate the red blood cells and the plasma. When this process is complete, the red blood cells, which are heavier than plasma, will settle down in the lower portion of the blood bag. The plasma is removed into a sterile bag attached to the original blood bag. This plasma can then be used to prepare platelets and cryoprecipitate. To make platelets, the plasma is centrifuged again and the platelets settle on the bottom of the plasma solution. The plasma and platelets are separated. The plasma may also be used to prepare cryoprecipitate or to be pooled with plasma from other donors and further processed to provide a variety of purified plasma proteins such as albumin, immunoglobulins and clotting factors.

How are blood components preserved and how long can they be stored?

When blood is drawn from a donor, the blood bag contains an anticoagulant and also nourishment for blood cells. This keeps

blood in a liquid or fluid form and keeps the cells alive. Depending upon the type of anticoagulant used, red blood cells can be stored in the liquid state for 35-42 days. Platelets are stored at 22 to 24 degree centigrade for upto 5 days. Plasma is stored at -35 degree centigrade for 1 year.

All blood components are stored in special containers, inside refrigerators, freezers or environmental chambers. All these storage devices have temperature gauges and the temperature is checked daily. This ensures that the blood components are stored at the appropriate temperature.

What is component therapy?

Component therapy, or the use of the different parts of blood, helps conserve a scarce resource (blood) and allows patients to receive only the components they need. Because shelf life and storage temperatures of the different components vary, component therapy allows for more efficient utilization of donor blood. Each unit of blood donated can be used to save upto 4 lives.

Why is Blood transfusion required ?

Blood transfusion is primarily required for the conditions in which either blood or blood component is lost or destroyed to a dangerous level. Normally our body can tolerate blood loss to an extent of 20% or about 1.0 litre. But above that, blood has to be supplemented. So conditions like surgery (operation), accidents, child birth, some infections, cancer, thalassemia, hemophilia, anaemia etc. may require blood.

What is the difference between transfusion and infusion ?

Transfusion means injecting blood or blood products directly into the blood stream (vein) of a patient.

Infusion means injecting Intravenous (I.V.) fluid like Glucose or saline or any other medicated injection directly to the blood stream (vein).

Are there any risks in receiving a transfusion?

As with any medical procedure, blood transfusions carry some risk. There is a remote chance of receiving blood of the wrong type. In addition, several infectious diseases can be transmitted by blood transfusions. Among the viruses that may be transmitted by blood are: human immunodeficiency virus (HIV), the virus that causes AIDS; human T-cell lymphotropic virus (HTLV-I); several hepatitis viruses; and cytomegalovirus (CMV).

What steps are taken to reduce the risks involved in receiving a transfusion?

Steps to ensure maximum transfusion safety, involve both donor and recipient. Donors are screened very carefully, using a detailed questionnaire, for health problems or circumstances that increase risk of transmitting infection. After blood is drawn, it is tested for numerous viruses and other potentially harmful disease agents, and positive or doubtful units are discarded. Donor blood is tested for ABO, Rh and the presence of possibly dangerous blood group antibodies, as well. After the recipient's blood is tested for ABO, Rh and the presence of blood group antibodies, donor units are selected of the same blood group and cross matching is then performed to transfuse compatible blood.

How is blood tested ?

Each unit of donated blood is tested for blood groups and infectious diseases which can spread through blood donation. Infectious diseases for which blood is tested are HIV(AIDS), Hepatitis B&C, Malaria, Syphilis (sexually transmitted disease) Sophisticated and highly sensitive robotic machines are used to test blood. This is to ensure highest degree of safety to the recipient of blood.

What other donor screening for infectious diseases is done?

Donors who are at risk of transfusion transmissible diseases are screened by medical history and deferred from blood donation. As a result, very few recipients of blood transfusions develop these diseases.

How have tests performed on donated blood affected the supply?

Blood and components are tested to eliminate units that may carry HIV, hepatitis B, hepatitis C as well as those that are positive for syphilis and malaria. Approximately 2-10 percent of whole blood units donated are discarded due to positive tests. "False positives" may occur due to the sensitivity of the testing procedure. This means that some units of blood are discarded, even though the donor does not have a viral infection. It is very important that units that are "true positives" are totally eliminated. Until more research is done to perfect testing procedures that will detect only "true positives", Prathama blood centre will continue to take precautions to ensure the safest blood supply possible.

Summary

Blood is a heterogenous mixture of cells and plasma. Plasma itself contains about 130 different kinds of proteins. At the birth of transfusion therapy it was considered ok to transfuse whole blood. Soon it was realized that different blood components have different shelf lives, requirement of storage conditions and various therapeutic use. These reasons coupled with chronic shortage of blood and blood products, saw the birth of blood component therapy. Blood component therapy ensures that the patient gets only what he wants without transfusion of unwanted components. This also reduces the side effects of transfusion. By giving blood components more patients benefit from a single unit of blood.

Prior to transfusion it is imperative to test blood through state of the art technologies and machines to ensure maximum safety of the transfusion.