University of Diyala/ College of Medicine
Department of Physiology
Physiology Lab

Blood Banking and Donation

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Outlines

- Introduction.
- Blood Donation Eligibility Requirements.
- Screening of Blood Donation.
- Blood Donation Steps and Post Donation.
- Autologous Donation.
- Blood Products and Storage.

Objectives

At the end of this lab, students should be able :

- To define blood banking and donation.
- To have a clear idea about the criteria of donation and contraindications of blood donation.
- To understand the steps of donation & post-donation.
- To get a knowledge about autologous blood donation and what can happen to blood after donation.
- To know the conditions under which the blood must be stored.

Introduction

A **blood bank** is a cache or bank of blood or blood components, gathered as a result of blood donation or collection, stored and preserved for later use in blood transfusion.

The term "**blood bank**" typically refers to ***a division of a hospital where the storage of blood products occurs and where proper testing is performed*** to reduce the risk of transfusion related adverse events. This includes compatibility testing for transfusion and may include blood donation processing, depending on the capabilities of the facility.

Who Can Donate Blood?

Donors must meet certain criteria to ensure their safety and the safety of the recipients. Rules of eligibility have been established by the U.S. Food and Drug Administration (FDA), although some donor centers may have some additional requirements. **Donor must:**

- **Be in a good health and feeling well. The donor must pass the physical and health history assessment.**
- **Be at least 17 years of age (although some states in USA permit younger people to donate if they have parental consent).**
- **Weigh at least 50 kg.**
- **Temperature not more than 37°C.**
- **Pulse rate: 50-100 beats /min.**
- **Blood pressure: systolic 100-150 mmHg, diastolic 60-90 mmHg.**
- **PCV :male 40% / female 35%.**

Screening of Blood Donation

- To protect donor/recipient health, a health history questionnaire is required.

- Potential risks for transfusion-transmissible infections are identified by donor history questionnaires (DHQs), and donors with higher risks are deferred from donation.

- Many viruses, bacteria and protozoa can be transmitted by transfusion and new agents that potentially can be transmitted through transfusion continue to emerge. Thus, WHO recommends that, at a minimum, screening of all blood donations should be done for the following infections:
- HIV, Hepatitis B and C, and HTLV I and II (Human T-cell lymphotropic viruses ***(Viral Infection).***
- Malaria, Babesiosis, and Chagas disease (trypanosomiasis) ***(Parasitic Infection).***

Disqualification (Contraindication) of Blood Donation

- **Blood donation contraindications** focus on ***donor ineligibility***. Some people are disqualified from donating blood because they have diseases that are transmissible via blood. Other potential donors are disqualified because their conditions could endanger themselves.

- Individuals disqualified from donating blood are known as ***"deferred donors".*** A prospective donor may be deferred at any point during the collection and testing process. Whether or not a person is deferred, temporarily or permanently, will depend on the specific reason for disqualification.

- If the deferral is of a **permanent** nature, donor will be **informed**. Otherwise, the deferral time depends upon the reason for deferral. Prior to each donation, donor will be given a mini-physical and medical interview. At that time, it will be determined if he/she is eligible to donate blood on that particular day.

Causes of Disqualification for Blood Donation

There are certain conditions that prevent a person from donating blood ***temporarily or permanently***:

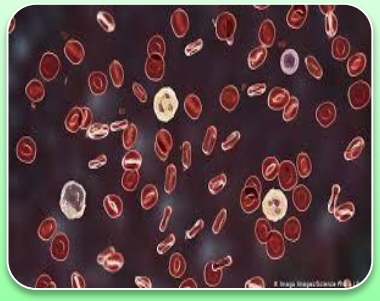
- ✓ Cancer
- ✓ Cardiac diseases
- ✓ Sever lung disease
- ✓ Hepatitis B and C
- ✓ HIV infection, AIDS or Sexually Transmitted Diseases (STD)
- ✓ Illegal intravenous (IV) drugs
- ✓ Chronic alcoholism
- ✓ Hemophilia and bleeding disorders
- ✓ Anyone with convulsion, tuberculosis, and syphilis
- ✓ Pregnancy
- ✓ Acute fever
- ✓ Recent alcoholic intake
- ✓ Surgery
- ✓ Anemia

} **Temporary Causes**

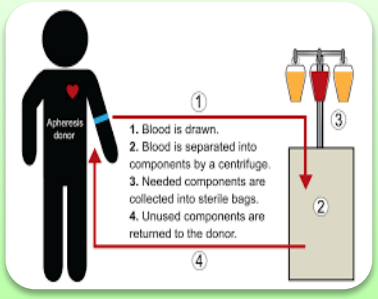
Donor must wait 56 days before giving another donation of whole blood. Can you think about the reason?

How Much Blood Can Be Taken?

Usually one unit (about a pint(1\2 Litter)) of blood is collected into a blood bag from a vein in the inner part of the elbow joint using a new sterile needle.



Your body replenishes the fluid lost during donation in 24 hours, but it may take up to 2 months to replace the lost red blood cells. ***Therefore, whole blood can be donated only once every 8 weeks.***



Two units of red blood cells can be donated at a time, using a process called red cell apheresis, Platelets can also be donated by apheresis, usually every 4 weeks.

Apheresis is a medical technology in which the blood of a person is passed through an apparatus that separates out one particular constituent and returns the remainder to the circulation.

Steps Of Donation

- ***REGISTRATION:*** When you volunteer to give blood or platelets we need to record your details (full name, address and date of birth).
- ***HEALTH SCREENING :*** ask about your medical, lifestyle and travel history. You will then have a health screening interview. This is to be sure you are well enough to donate and it is safe to give your blood to a patient.
- ***CONSENT :*** next you will need to carefully read and sign the 'Donor Consent'. ***This is a legal document that confirms you understand what is involved in blood donation before you donate.***
- ***HAEMOGLOBIN TESTING :*** We take a small sample of your blood, to check your hemoglobin level.
- ***BLOOD DONATION*** and ***RESTING***.

Blood Donation Procedure

- Once the pre-donation screening is finished, you will proceed to a donor bed where your arm will be cleaned with an antiseptic, and a professional will use a blood donation kit to draw blood from a vein in your arm.
- During the donation process, you will **donate one unit of blood**; this takes about **six to ten minutes**.
- **Blood donation:** One of the staff will then insert a needle attached to a blood bag into the vein. Donors are advised to do applied muscle tension exercises during donation. This is to promote your wellbeing during and after donation. Following needle insertion you should be comfortable during your donation. If you experience any discomfort or pain please alert a member of staff.

The staff should keep a close eye on you and the bag to make sure everything is fine. It usually takes ***five to fifteen minutes to complete your donation of 500 ml.***

Post Blood Donation

- Following your donation, you should receive refreshments in the canteen area, where you can stay until you feel strong enough to leave.
- After donating, it is recommended that you increase your fluid intake (water and juice) for the next 24 to 48 hours; avoid strenuous physical activities, heavy lifting or pulling with the donation arm for about five hours; and eat well balanced meals for the next 24 hours. After donating, smoking and alcohol consumption is not recommended.
- Although donors seldom experience discomfort after donating, if you feel light-headed, lie down until the feeling passes. If some bleeding occurs after removal of the bandage, apply pressure to the site and raise your arm for three to five minutes. If bruising or bleeding appears under the skin, apply a cold pack periodically to the bruised area during the first 24 hours, then warm, moist heat intermittently.

Post Blood Donation

- Keep the pressure dressing on your arm for about 30 minutes after you have given blood, and the plaster on for 6 hours.
- Take a rest for a short time after giving blood.
- Eat and drink – you will be encouraged to have at least 2 drinks and a snack before you leave.
- Avoid using the donation arm to carry anything very heavy for the rest of the day.
- Avoid having a hot bath after you have given blood.

Autologous Donation

Another type of blood donation is **autologous donation**. This refers to transfusions in which the blood donor and the transfusion recipient are the same. People may elect to do this before a surgical procedure in which the likelihood of needing a transfusion is high. Although there are still risks with this process, autologous donation minimizes many of them because ***it is the person's own blood that is being returned to his/her body.***

People can donate their blood up until 72 hours prior to the surgery. Iron supplements or erythropoietin also may be prescribed to help increase the person's red blood cell count. Any blood that remains unused during the surgery is usually discarded. However, the blood can be transfused into another patient if it has been fully tested and is compatible with the recipient.

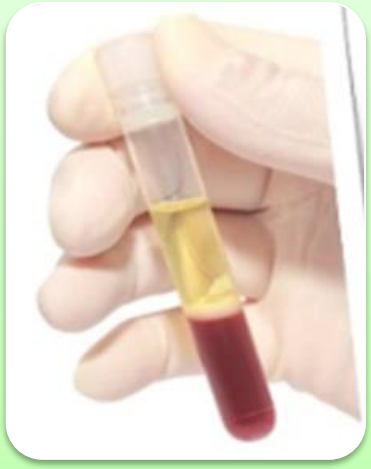
Blood After Donation

What Happens to Blood After it gets Donated?

- When a unit of whole blood is donated, the components can be separated in the laboratory so that they can be transfused into multiple patients, each with different needs. A person rarely needs all of the components that comprise whole blood.

What Are the Components of Blood?

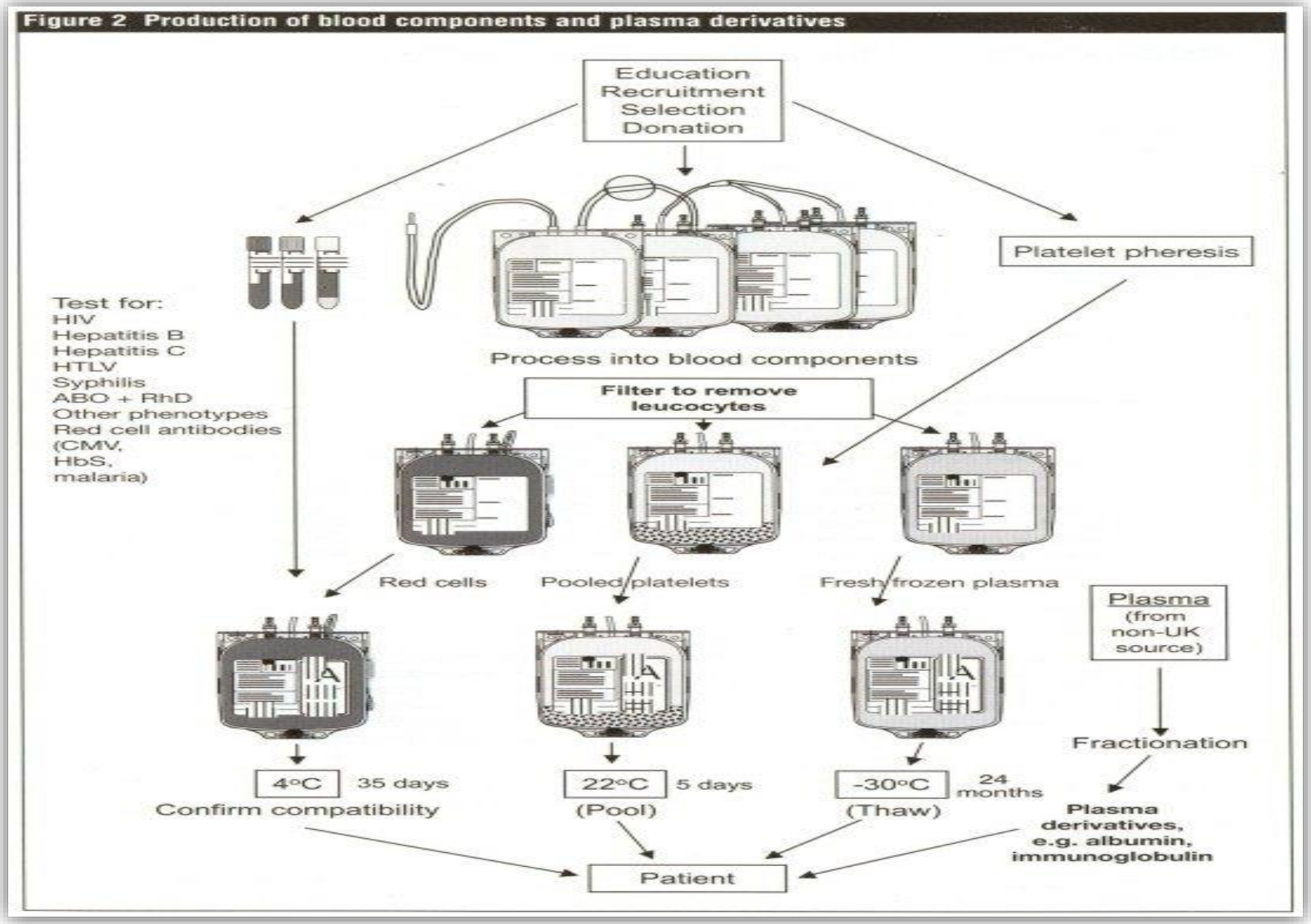
Blood is made up of a few different types of cells suspended in fluid called plasma, which contains proteins like clotting factors and other substances. ***Blood that flows through the body in veins and arteries is called whole blood***. Each of the components of whole blood has an important role.



Separation of these components is performed by first treating the blood to prevent clotting and then letting the blood stands. Red blood cells settle to the bottom ,while plasma migrates to the top. Using a centrifuge to spin out these components can speed up the process. The plasma is then removed and placed in a sterile bag. It can be used to prepare platelets, plasma, and cryoprecipitate anti-hemophilic factors, again with the help of a centrifuge to separate out the platelets. Plasma may be pooled with that from other donors and processed further (fractionated) to provide purified plasma proteins, such as albumin, immunoglobulin, and clotting factor concentrates.

Production of Blood Components

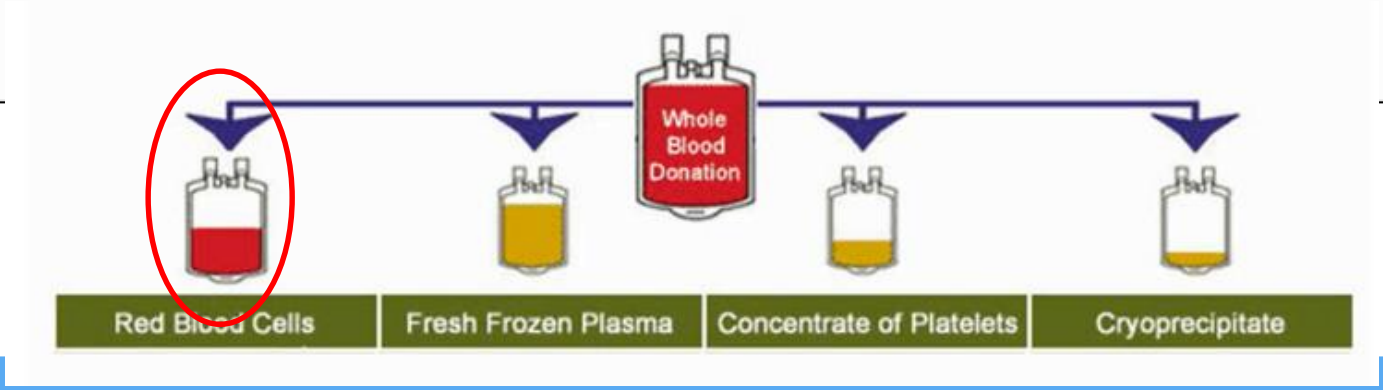
Components of the blood which are collected from a donor for use in blood transfusion.



Blood Products

1. Packed Red Blood Cells (PRBC)

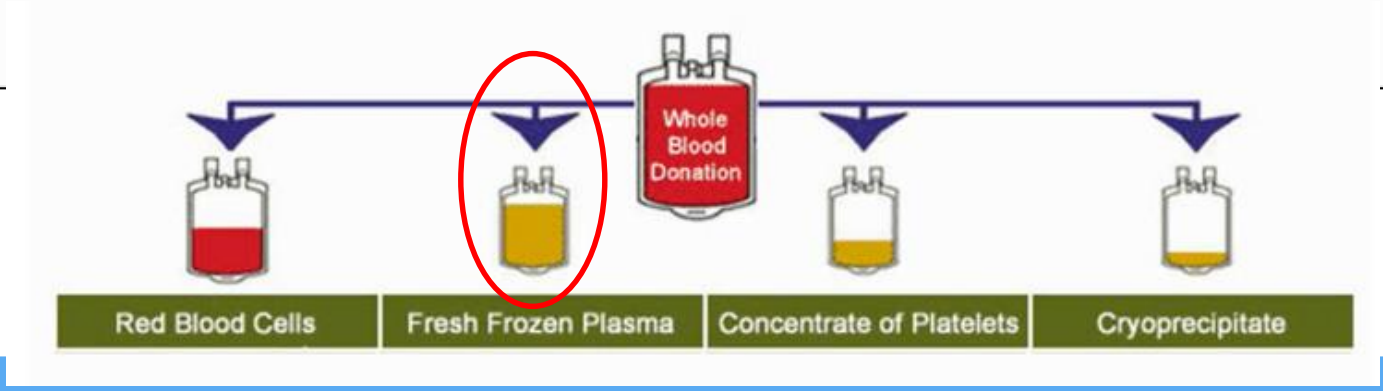
- Most common type of blood products for transfusion.
- ***Purpose:*** To restore oxygen carrying capacity in patients with anemia or blood loss, treatment of anemia in kidney failure ,gastrointestinal bleeding ,blood loss during trauma or surgery. It also helps the body to get rid of carbon dioxide and other waste products
- ***Average volume:*** 220 - 340 mL .
- ***Storage temp:*** 2 to 6 °C.
- ***Expiry:*** 35 days (14 days if irradiated)
- unit of PRBCs = raises hematocrit by 2-3%.



Blood Products

2. Fresh Frozen Plasma (FFP)

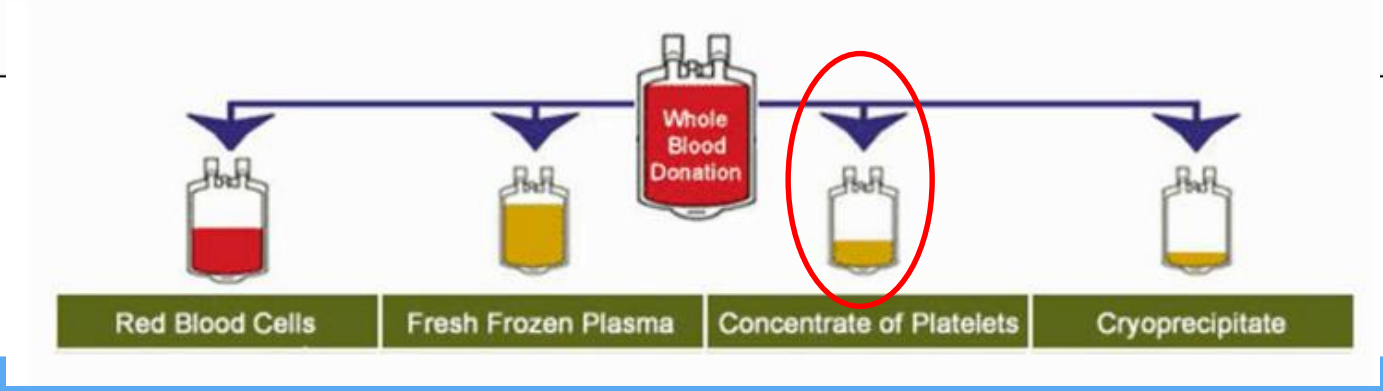
- Plasma is the liquid component of blood; it has proteins called clotting factors.
- ***Purpose:*** Expands blood volume and provides clotting factors. Used in treatment of patients with bleeding due to multiple clotting deficiencies such as DIC.
- ***Average volume:*** 150 - 300 mL .
- ***Storage temp:*** Below -25 °C.
- ***Expiry:*** Frozen - 1 year .
- ***Thawed:*** 24 hours (at 4 °C) /4 hours (Room Temp./unknown)
- unit of FFP = increases level of any clotting factor by 2-3%.



Blood Products

3. Concentrate of Platelets

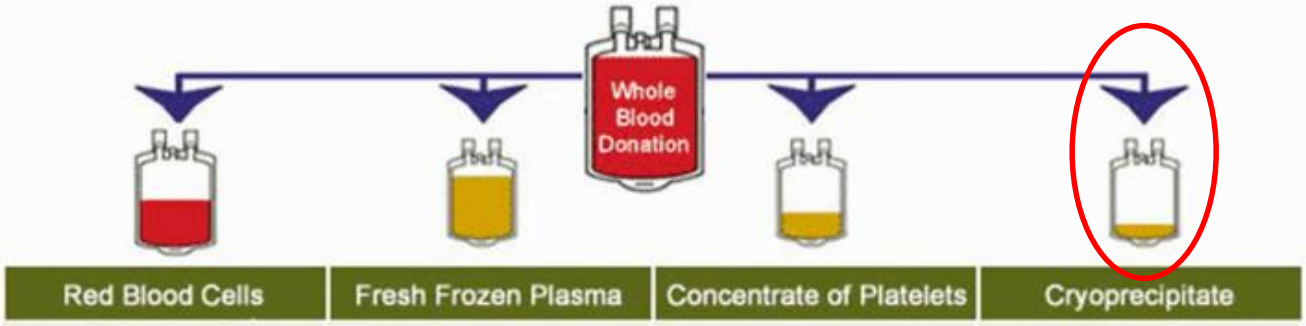
- Also known as thrombocytes . They are tiny fragments necessary in blood clotting process.
- ***Purpose:*** Platelet transfusion is indicated for the treatment or prevention of bleeding in patients with a low platelet count or dysfunction, used in the treatment of leukemia and other types of cancer and conditions in which patients have a shortage of platelets (e.g. thrombocytopenia or abnormal platelets function to control bleeding)
- ***Average volume:*** Up to 300 mL .
- ***Storage temp:*** 20 to 24 °C.
- ***Expiry:*** 7 days.
- unit = increases the average adult client's platelet count by about 5,000 platelets/microliter.



Blood Products

4. Cryoprecipitate

- To create **cryoprecipitate**, fresh frozen plasma thawed at 1–6 °C, is then centrifuged and the precipitate is collected.
- ***Purpose:*** Rich in fibrinogen, Factor VIII and Von Will brand factor. Used as a more concentration source of fibrinogen ,Part of plasma that contains clotting factors to help control bleeding in people with hemophilia and von Will brands disease.
- ***Average volume (pool):*** 100 - 250 mL , ***(Single):***Approx. 50 mL.
- ***Storage temp:*** **Cryoprecipitate** is **stored** in the Blood Bank freezer at a temp of ≤18°C until thawing. After thawing, it should be maintained at room **temperature** (20 - 24°C). It should never be refrigerated or placed in a blood cooler.
- ***Expiry:*** 1 year.



Blood Storage

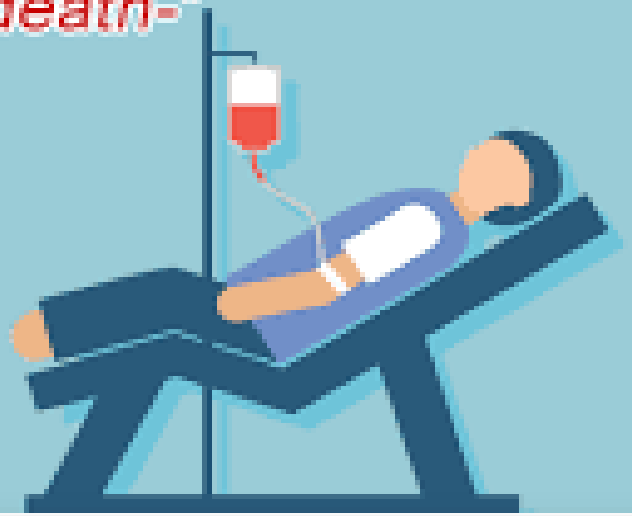
- Whole blood is typically stored under the same conditions as red blood cells and can be kept up to *35 days* if collected with CPDA-1(Citrate Phosphate Dextrose Adenine Solution) storage solution or *21 days* with other common storage solutions such as CPD (Citrate Phosphate Dextrose Solution).

- If the blood will be used to make platelets, it is kept at room temperature until the process is complete. This must be done quickly to minimize the warm storage of RBCs in the unit.

BENEFITS OF BLOOD DONATION

- YOU GET A FREE CHECK UP.
- IT LOWERS THE RISK OF STROKE.
- IT REDUCES THE CHANCES OF HEART ATTACK.
- IT ENHANCES THE PRODUCTION OF RED BLOOD CELLS.
- REDUCES THE RISK OF CANCER.
- IT REDUCES CHOLESTEROL.
- IT IMPROVES CIRCULATION.
- IT PREVENTS IRON ACCUMULATION.

"20 minutes of your time and 250 cc of your blood, may make the difference between life and death-"



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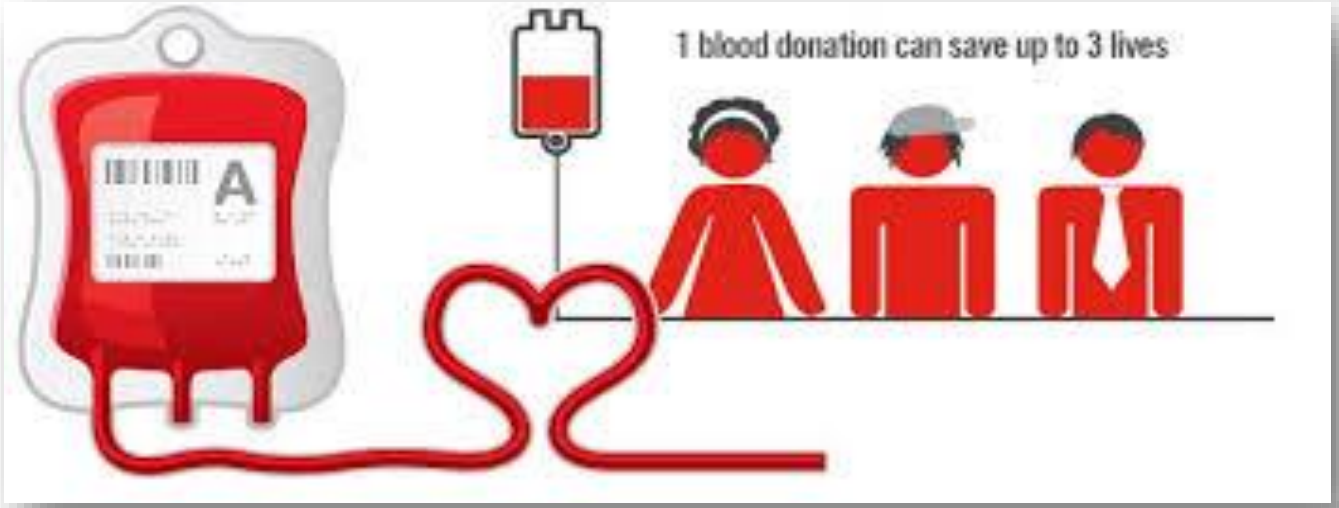

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