SAFE BLOOD TRANSFUSION

contribution of Hayatabad medical complex

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History of Blood Transfusions

- “Before The Nobel laureate , Karl Landsteiner discovered the ABO human blood groups in 1901, it was thought that all blood was the same. This misunderstanding led to fatal blood transfusions and many death”.

www.nobelprize.org

History of blood transfusion……

- **1492**: first attempt at using blood for therapeutic use.
- **1665**: First animal to animal Transfusion-

by Dr.Richard Lower

- **1667:** Jean Baptiste Denys, first successful IV transfusion of blood from animal to human
- **1818**: James Blundell first to transfuse human blood to human.
- **1901**: Karl Landsteiner: Discovered ABO blood grouping and was awarded' Nobel Prize in 1930.

- *Source www.nobelprize.org*

History of Discovery of Blood Groups

- 1927: Landsteiner and Levine discovered further M,N and P system
- 1939,40: Levine, Stetson, Landsteiner and Weiner discovers Rh system and it's role in erythroblastosis fetalis (HDN)
- 1946-Kell system discovered by Coombs, Mourant and Race
- 1950-51: Duffy, Kidd, Lutheran system was discovered.
- Landsteiner and Alexander lead to the discovery of >800 Blood group systems.

Introduction – Safe Blood Transfusion

- Safe blood transfusion is defined as

"maintaining safe and effective procedures around collection, components preparation, blood screening, storage and use of donated blood."

HAZARDS OF BLOOD TRANSFUSION

- Hemolytic transfusion reactions.
- Febrile reactions.
- Transfusion-related acute lung injury.
- Urticarial and anaphylactic reactions.
- Bacterial contamination
- Transmission of infections
- Post transfusion Purpura.
- Host verses graft reaction.

Introduction – Safe Blood Transfusion

- Donor selection/safety
- blood Screening
- Component making and Storage
- Documentations/SOPs

- Compatibility testing as;
- a) Pre analytical
- b)Serological testing
- c) Post analytical procedures

- Patient and donor adverse reaction record
- Proper waste Disposal
- Leucoreduction

1. Donor selection/safety

- first step towards blood safety
- Donor selection criteria is essential
- Aim is to;
  - protect the donor
  - Protect the recipient

- Medical interview/detailed history and clinical examination is mandatory

Donor should be;

- In good health
- hemoglobin > 12.5 g/dl
- Age >18 years
- Weight > 45 kg
- Venipuncture site free of any lesion

2. blood Screening

- Of primary importance

because we call the BLOOD safe when it is free of all micro organisms.i.e; viruses, bacteria parasites, alcohol, chemical substances, or other exogenous factors

- Screening basically starts from donor selection
- Then process of blood collection
- Pre transfusion testing
- Laboratory screening tests include;
  - Hepatitis B virus (HBV)
  - Hepatitis C virus (HCV)
  - HIV
  - Syphilis
  - malaria

Methods OF VIRAL SCREENING

- Rapid test

(NOT RECOMMENDED. very low sensitivity and specificity)

- ELIZA method-

(decades old method, demand skill sets, narrower detection window)

- Chemilumenescence's method

(more sensitive, high precision, wider detection limits

Chemilumenescence's (CMIA) equipment

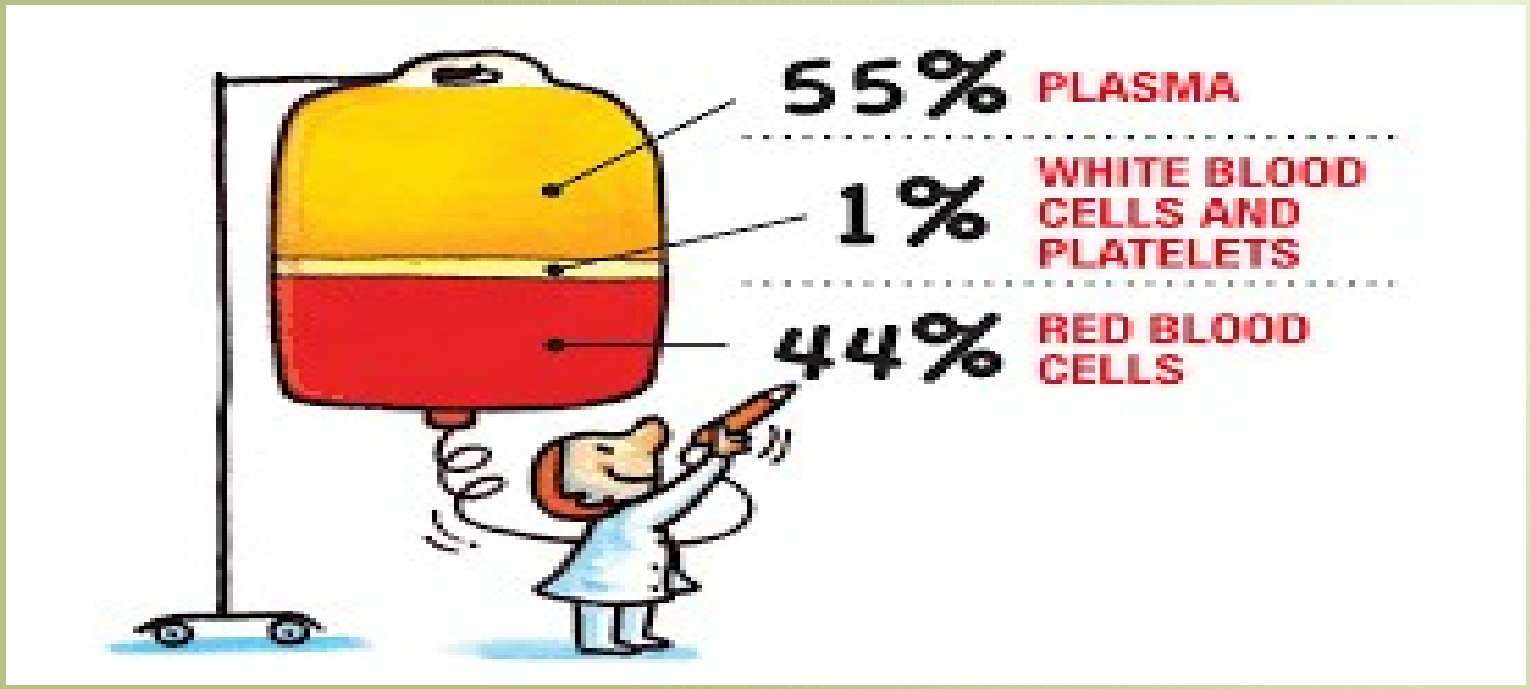
Blood components preparation and storage

BLOOD COMPONENTS

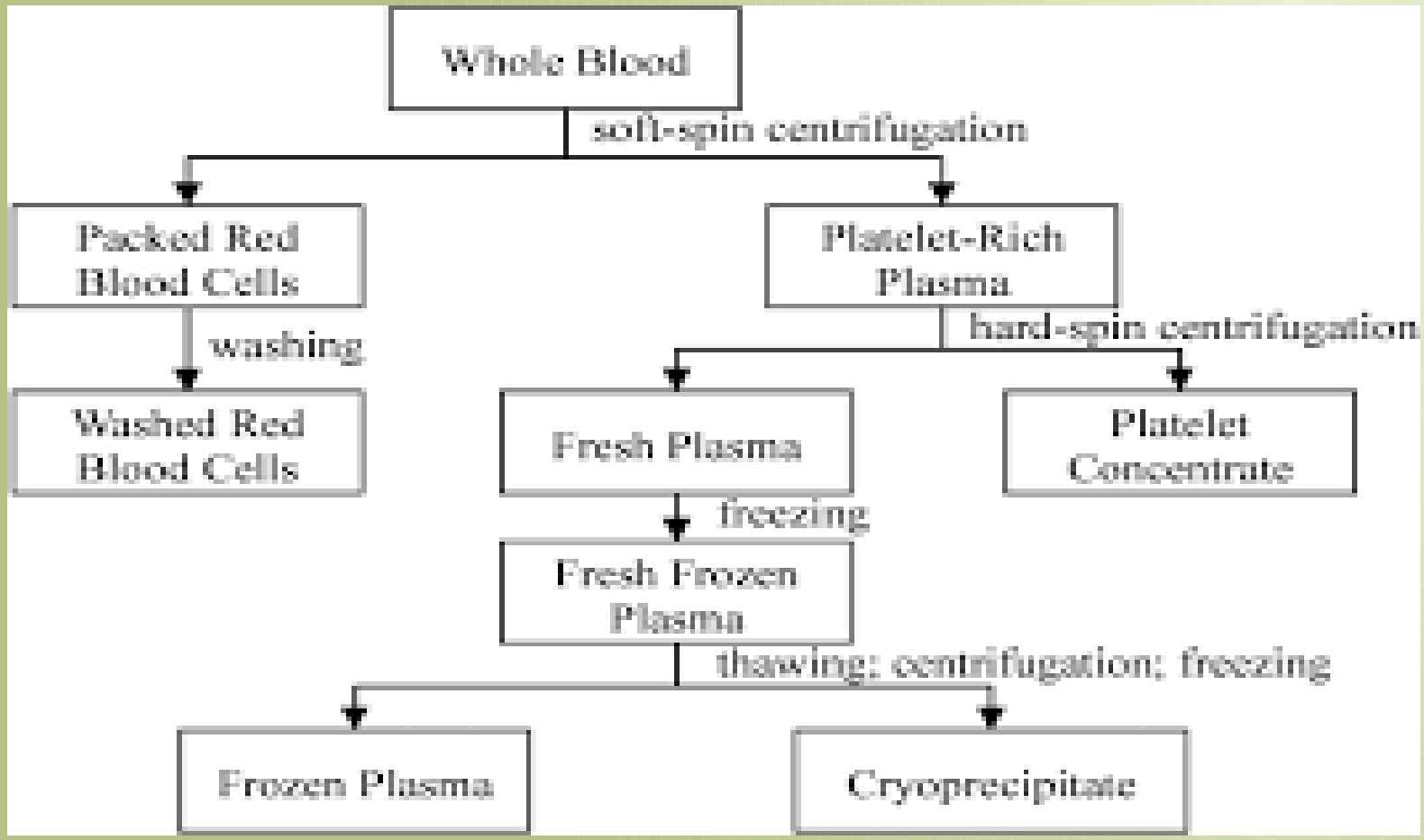
01 unit of whole blood theoretically yields;

- 01 Packed red blood cells (PRBCs)
- 01 random unit Platelets
- 01 unit Fresh Frozen Plasma (FFP)

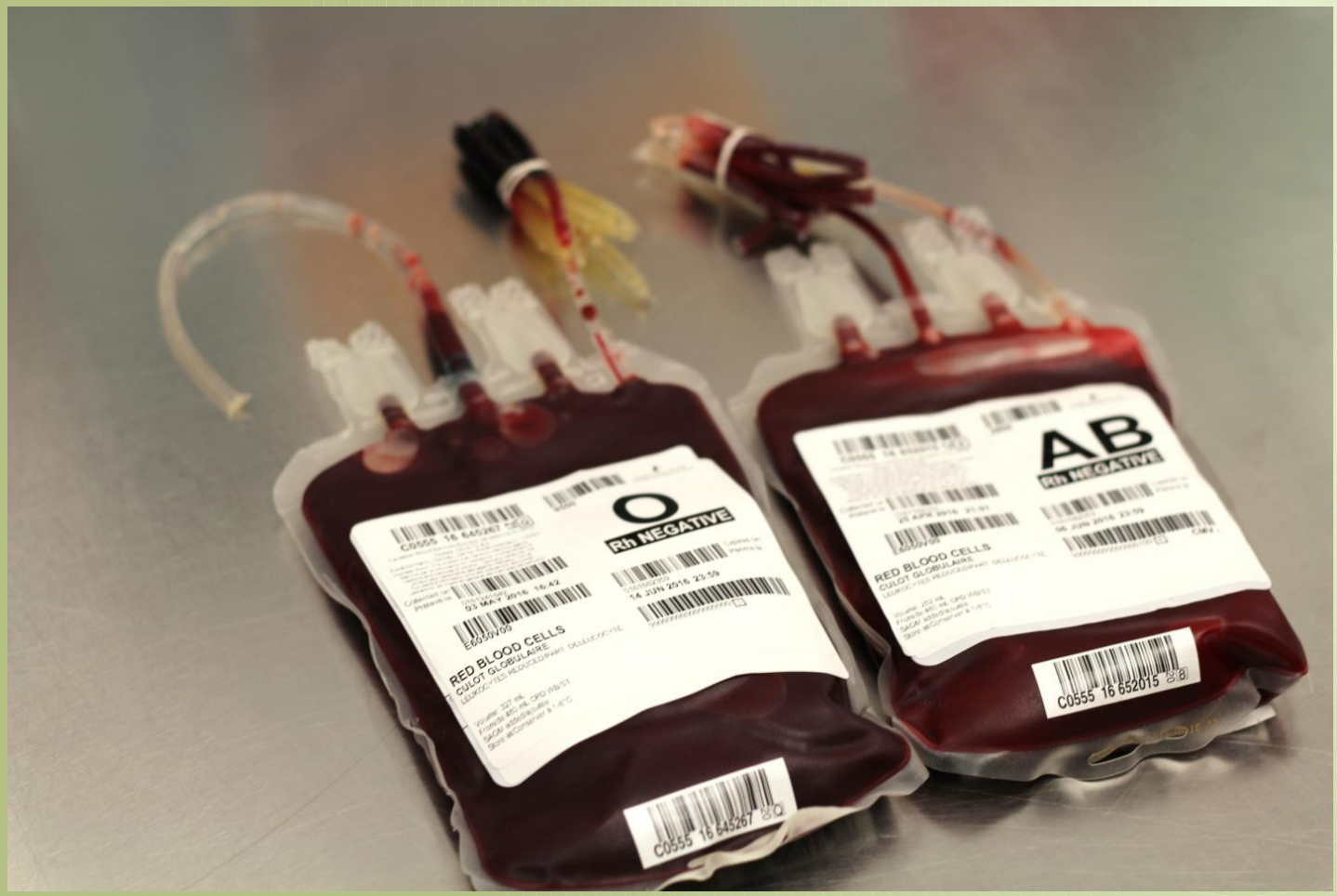
/Cryoprecipitate


55%
PLASMA
1%
WHITE BLOOD CELLS AND PLATELETS
44%
RED BLOOD CELLS

Process of blood components preparation



Packed red Cell Concentrates(RCC)



Packed red Cell Concentrates(RCC)

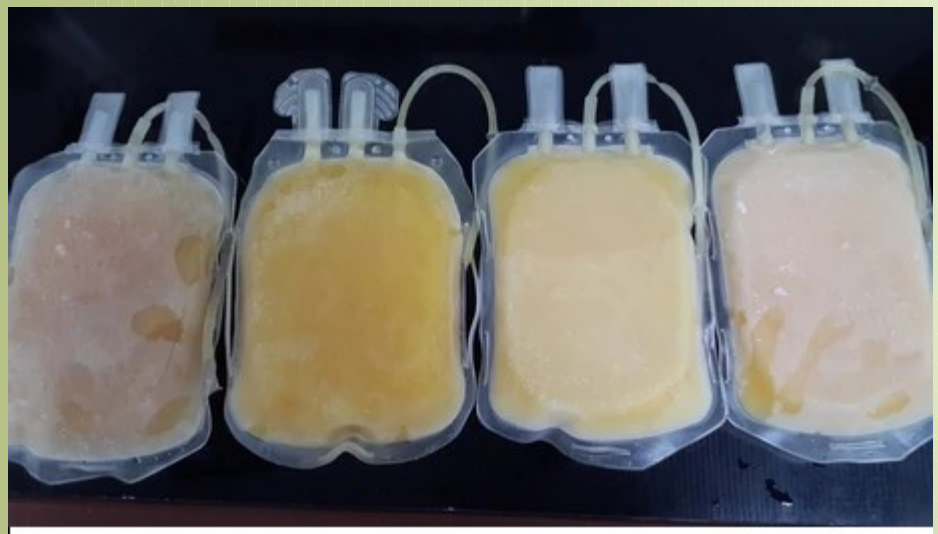
- 150-200 ml of red cells with plasma removed
- Haemoglobin 20g/dl / 100 ml, PCV 55-75 %
- Expected rise in Hb with 1 unit of red cells is approximately 1g/dl in Av. Adult individual
- Stored at 4-6 0 C

Random donor platelets

- Stored at room temperature; 20-25 ◦C (av.22)
- Constantly agitated
- Only last for 05 days

Platelets Agitator

Fresh Frozen Plasma (FFPs)



FFP
[Fresh Frozen Plasma]

- 1 unit is 250 ml
- Contains all plasma proteins
- Plasma collected from single donor units or by apheresis
- Frozen within 8 hours of collection
- -18^{o} to -30^{o} C, shelf life up to 12 months

Compatibility testing

Can be divided into 3 categories;

1) Pre analytical procedures

2) Serological testing

3) Post analytical procedures

1) Pre analytical phases

- Patient identification;
- Sample identification
- Specimen collection;

- Review of patients history

Patient identification

Should include recipient's;

- ID
- full name
- hospital number
- name of physician/unit of admission

Sample identification

It always should have patient's;

- Full name
- Hospital ID
- Physician name
- Date/time of collection
- Phlebotomist's initials

[All these details should be on the request form and the sample]

Specimen collection

- Collection should be in EDTA tube with no additives
- If venipuncture causes hemolysis, reject the sample
- Samples must be labeled at bed side(pre labeling is not recommended)
- Record of the person collecting specimen of blood for backtracking purpose

Compatibility testing

- **ABO/Rh**

- In ABO typing forward and reverse MUST match
- In the Rh typing, the control must be negative
- Both these will indicate what type of blood should be given

2. Antibody detection/ identification

- The antibody screening will detect the presence of any unexpected antibodies in patient’s serum
- If antibodies detected, antibody identification should be performed using panel cells(with an auto control)
- If an antibody is present, units negative for antigen must be given after cross match

3. Cross match

purpose;

- Prevent transfusion reaction
- Increase in vitro survival of red cells
- Double checks for ABO errors
- Another method for detecting antibodies
- Steps for cross matching’

1. Saline
2. 37 ◦ LISS
3. AHG

3) Post analytical procedures

- Involves labeling , inspecting and issuing the blood unit
- Labeling form includes patient's ;
  - full name
  - ID number
  - ABO/Rh of patient and blood unit
  - donor number
  - compatibility result
  - technician ID

- Form is attached to the donor unit and only released for the recipient tested

- The blood unit is visually inspected for abnormalities such as discoloration, hemolysis, leaking , clots

- **Issuing blood component units**;

few checks must be done before issuing the blood unit;

- Requisition form
- Comparing requisition form / donor unit tag/blood product label
- Name and ID of the recipient
- Date/time of release
- Visual inspection of the blood units

7. Patient and donor adverse reaction record

SERIOUS HAZARDS OF TRANSFUSIONS (SHOT)

- SHOT is a confidential scheme of voluntary reporting, introduced in 1996 in UK.
- It gathers information from the collection of blood and its components to the follow-up of its recipients with the purpose of collecting information about the undesirable effects resulting from the use of blood and blood products, and of preventing their occurrence”

WRONG BLOOD INCIDENTS

- SHOT has shown that in ABO incompatible transfusions;
  - 20% errors occur in prescription & sampling
  - 29% in transfusion laboratory and
  - 48% in collection and administration.
- Failure to identify correct recipient at sampling.
- Correct pt at sampling but incorrectly labelled sample.
- Selection of incompatible products in emergency.

Leukoreduction

Methods of Leukoreduction

- Cell Washing
- Centrifugation
- Freezing and Deglycerolization
- Apheresis
- Filtration

Third/Fourth Generation Filters

- Retain both microaggregates and free leukocytes
- Reduce Leukocytes to <5x 106 per unit

- SAFETY OF BLOOD ;
- Starts from donor selection and

- Follows the whole way of labeling, screening, component preparation, storage , issuing

- To the safe and hazardless intravenous recipient transfusion

Thank you