

Division of Blood Transfusion Services

Ministry of Health and Family Welfare



BLOOD COMPONENT PREPARATION

Teaching Aims

This presentation will enable participants to

- Understand the basic principles and procedure of Component Separation
- Know the different components that can be prepared in a blood bank

Introduction

- Transfusion service – certain patient goals
- Cater to patient needs
- Provide blood and components which are
 - Safe
 - Pure
 - Potent
 - Effective
- Policies and procedures so that goals are met

Development of Component Therapy

- Earlier only whole blood
- Polyvinyl Chloride (PVC) bags introduced in India in late '80s
- Treatment in various diseases/conditions
 - Cancer : platelets
 - DIC : plasma, platelets, cryo
 - Haemophilia : cryo



Cardinal Principles

COMPONENT PREPARATION is “manufacturing”

- **SOPs** - outline all details of procedures
- Standardization
- Quality assurance
- **Equipment** for preparation and storage
 - Must be maintained and reassessed

Sedimentation Method of separating components

- The blood after collection is kept into a refrigerator in an upright position, till the red cells settle down and the supernatant plasma is transferred into a transfer bag or a satellite bag.

BLOOD COMPONENTS

Standard

- Whole blood
- Packed Red Cells
- Platelets PP, RDP, SDP
- Fresh Frozen Plasma (FFP)
- Cryoprecipitate

Specialized

- Saline-washed Red Cells
- Frozen Red Cells
- Leucodepleted components
- Irradiated components

Planning a Component Lab

Type of hospital and bed strength

Adequate
AC space
(+ 50 m²)

Equipment

Double, triple
or quadruple bags

Trained
manpower

QC
program

License from
Regulatory
authorities



Blood Donors

- Fulfill criteria
- $Hb \geq 12.5$ gm/dl
- Weight
 - 45 kg (350 ml)
 - 50 kg (450 ml)
- No Aspirin < 3 days
- Single bold venipuncture, free flow of blood
- Collection - time < 10 minutes with frequent mixing



Equipment for components

- Weighing balance
 - Two pan balance
 - Refrigerated centrifuge
 - Laminar air flow bench
 - Deep freezers
(-30°C-80°C)
 - Platelet shaker/ incubator
 - Refrigerated water bath
 - Plasma expressor
- Tube sealer

Additional

- Sterile tubing welder
- Gamma irradiator
- Cell separator (apheresis)

Multiple integrated blood bags



Quadruple Blood Bags



Preparation protocol



Weighing



Counter balancing



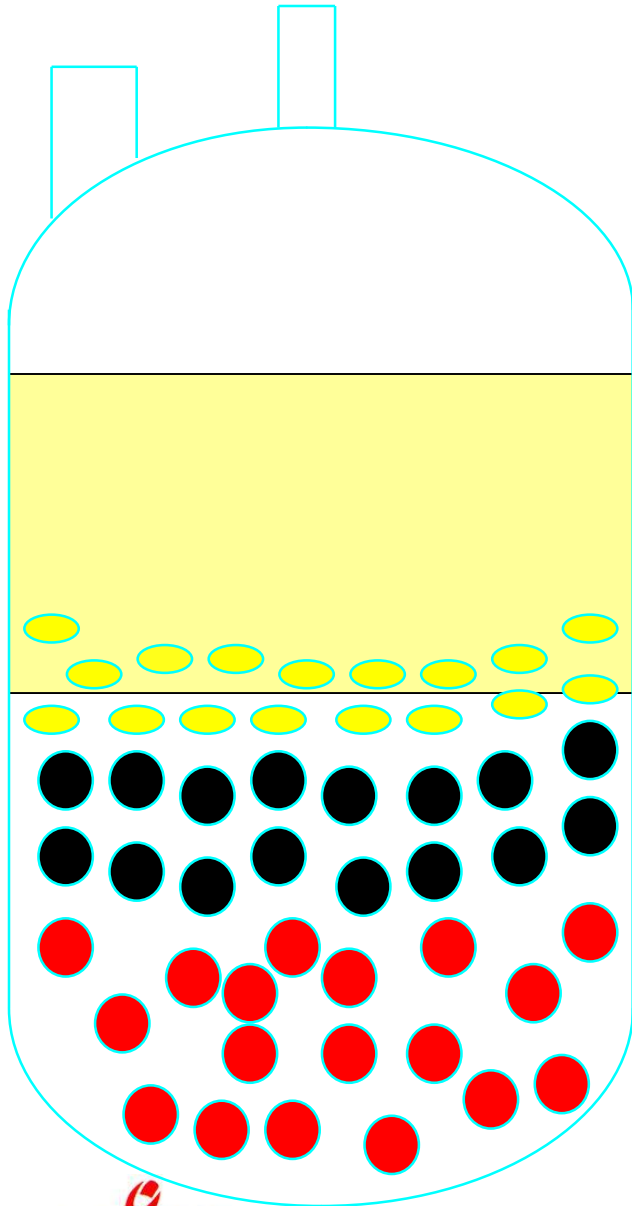
Centrifugation



Expression

Centrifugation - Principle

Blood cells have different
Sedimentation Coefficients

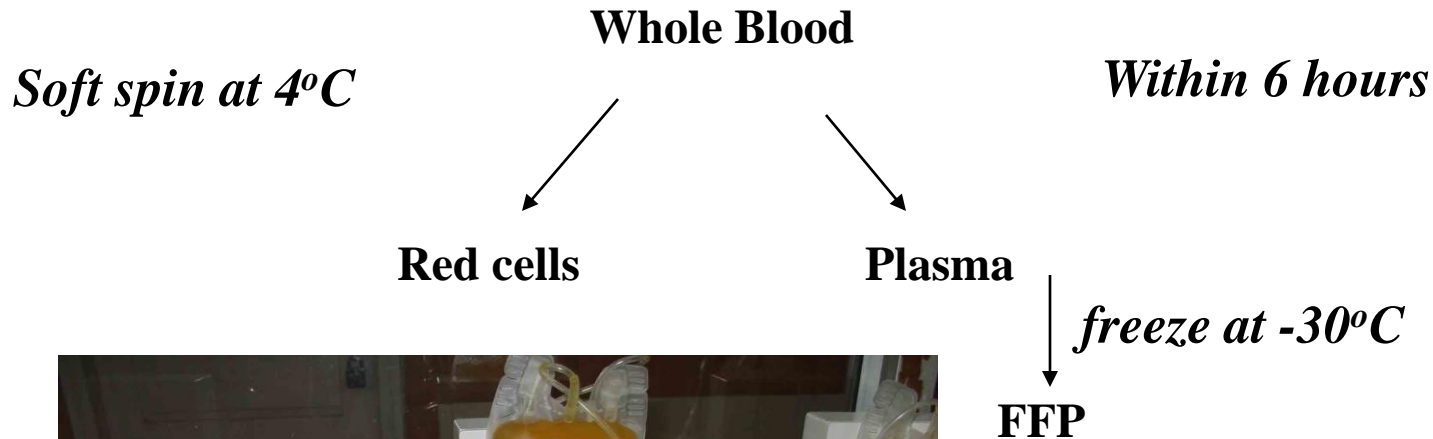


Plasma

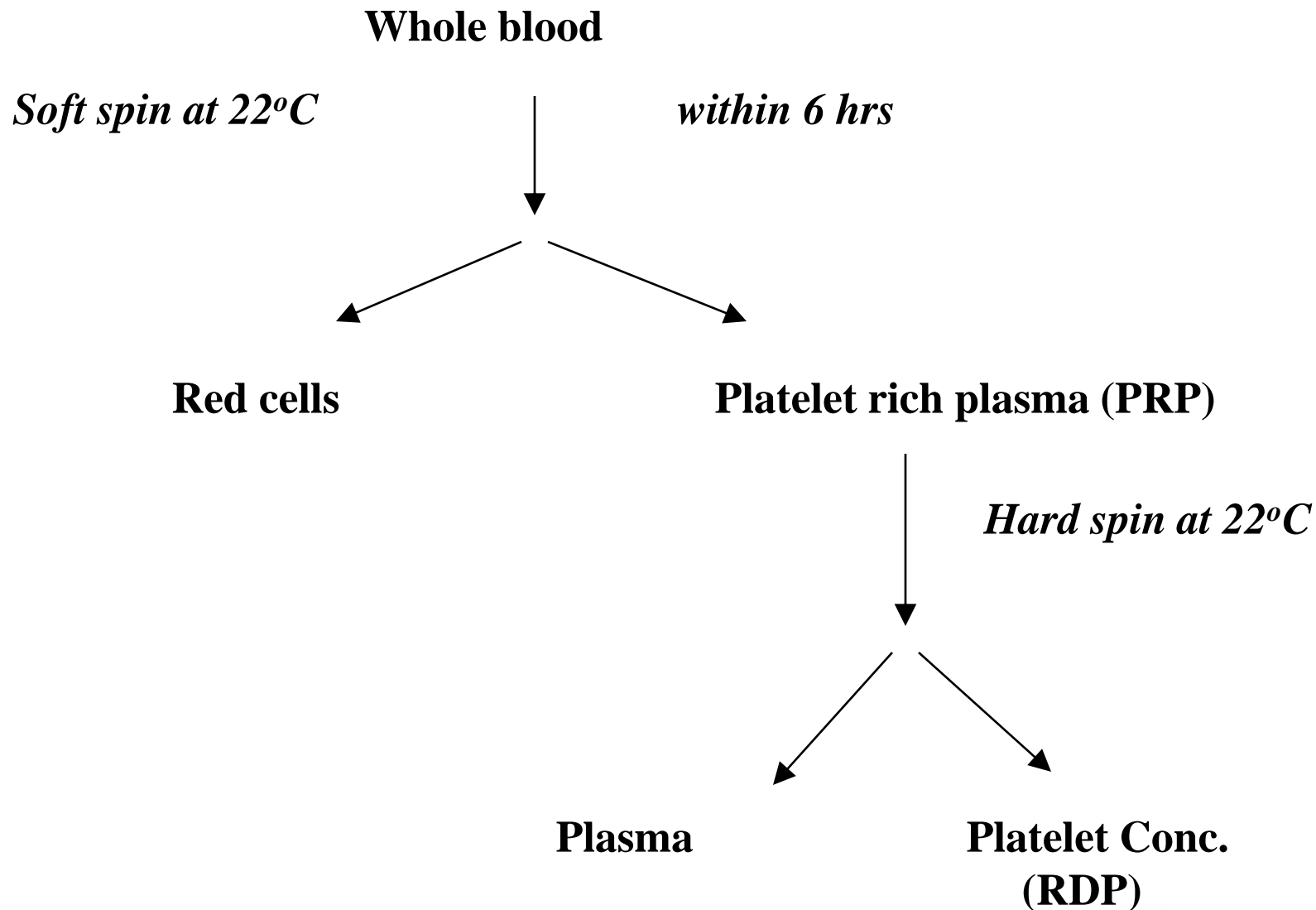
Buffy Coat

Packed Red Cells

Protocol for preparation of Red Cells and FFP



Protocol for preparation of Platelets



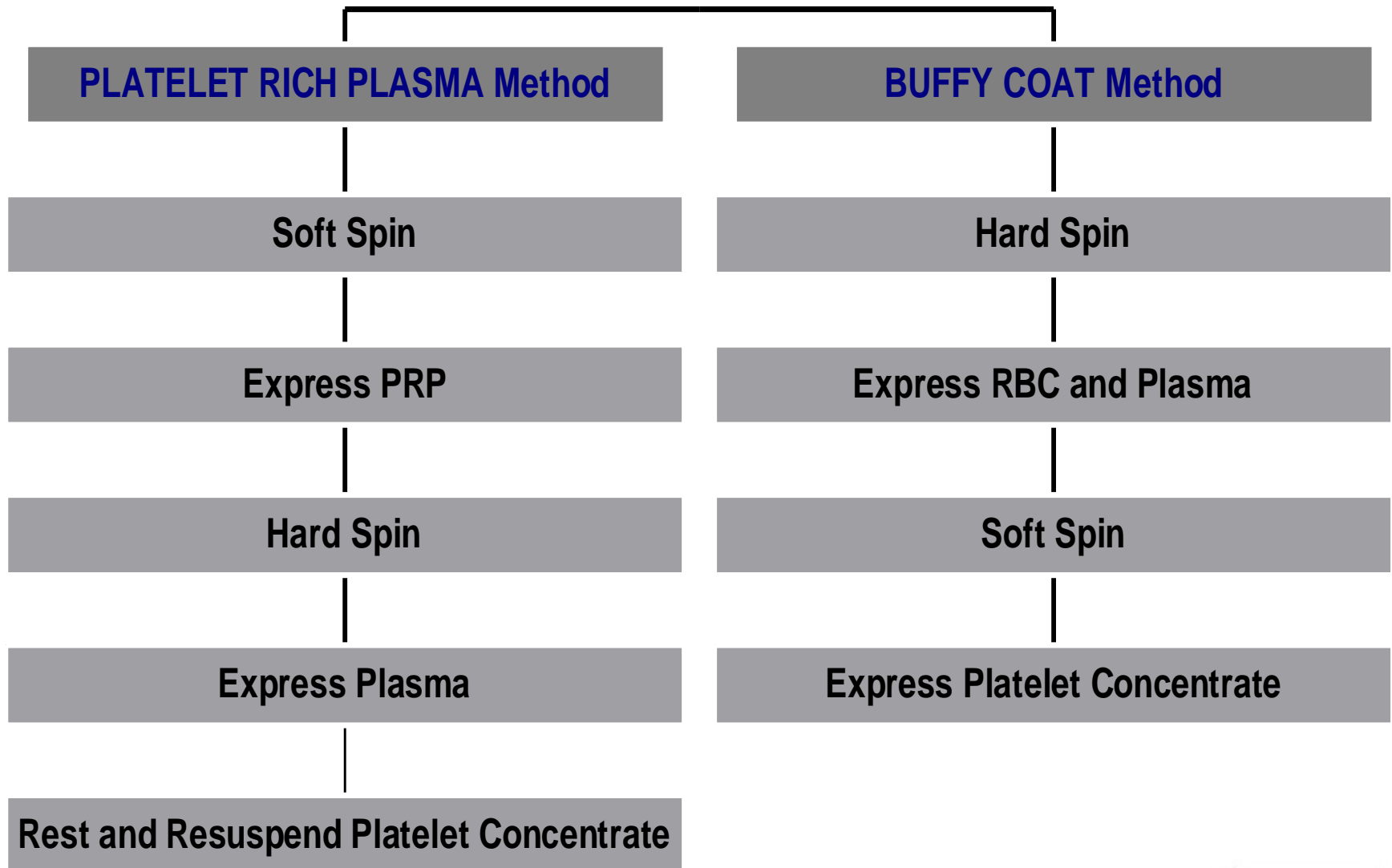
PRECENTRIFUGATION

- Allow for 2 Hours of Resting Time
 - Maintains pH of Platelets
 - Better Separation

CENTRIFUGATION

- Proper balancing and Packing of Cups
 - Consistent Yield
 - Good Interface
 - back to back arrangement of bags
- Speed and Time of Centrifugation
 - Dictates yields
 - Cellular injury
- Gentle Handling
 - prevents mixing at interface
- Resuspension of platelets before storage

Platelet Preparation Steps



Platelet Preparation Buffy Coat Method



Triple Bag Showing Separated Blood Components



Packed Red Blood Cells

Platelet Concentrate

Plasma

Preparation of Cryoprecipitate

Fresh Frozen Plasma

*Slow thaw at 4°C
in Cold Room or
Blood Bank Refrigerator*

*Thaw in cryobath at 4°C
Hard spin at 4°C*

Cryopoor plasma

Cryoprecipitate

Storage and Shelf Life of Components

Component	Storage temp	Shelf life	Compatibility
Red cells	+ 2°-6°C	35 days	ABO / Rh
Red cells with additive solution	+ 2°-6°C	42 days	ABO / Rh
FFP	- 30°C	1 year	ABO
CPP	- 30°C	5 year	ABO
Platelets	+ 22°C ± 2°C	5 days	preferably ABO match
Cryoprecipitate	- 30°C	1 year	any group

Blood component – transfer to clinical areas

- When blood or its component is issued from the blood bank, the time of issue must always be recorded.
- Blood or its components should be issued in a cold box or insulated carrier which will keep the temperature under +10 °C.



WHO Manual on the management, maintenance and use of blood cold chain equipment



Blood component – transfer to clinical areas

- Platelet concentrates should be issued from the blood bank in a carrier that will keep the temperature at between +20 °C and +24 °C.
- Platelets should be transfused as soon as possible.

Blood component – transfer to clinical areas

- FFP and cryoprecipitate are thawed at between between +30 °C and +37 °C in the blood bank before issue and transported to the ward at ambient temperature.
- They must be used immediately and should NEVER be refrozen.

Specialized Equipment



Cell Separator



Sterile Connecting Device

Leucocyte Reduction of Blood Components

Methods

- Washing (saline washed red cells)
- Freezing and Thawing
- Buffy coat removal
- Microaggregate filtration
- Specific leucodepletion filters
- Low leucocyte apheresis devices (cell separators)

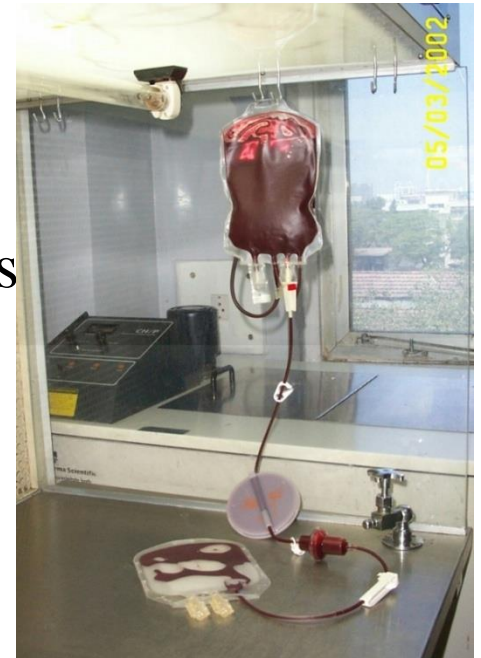
Leucocyte Reduction of Blood Components

- Of various methods

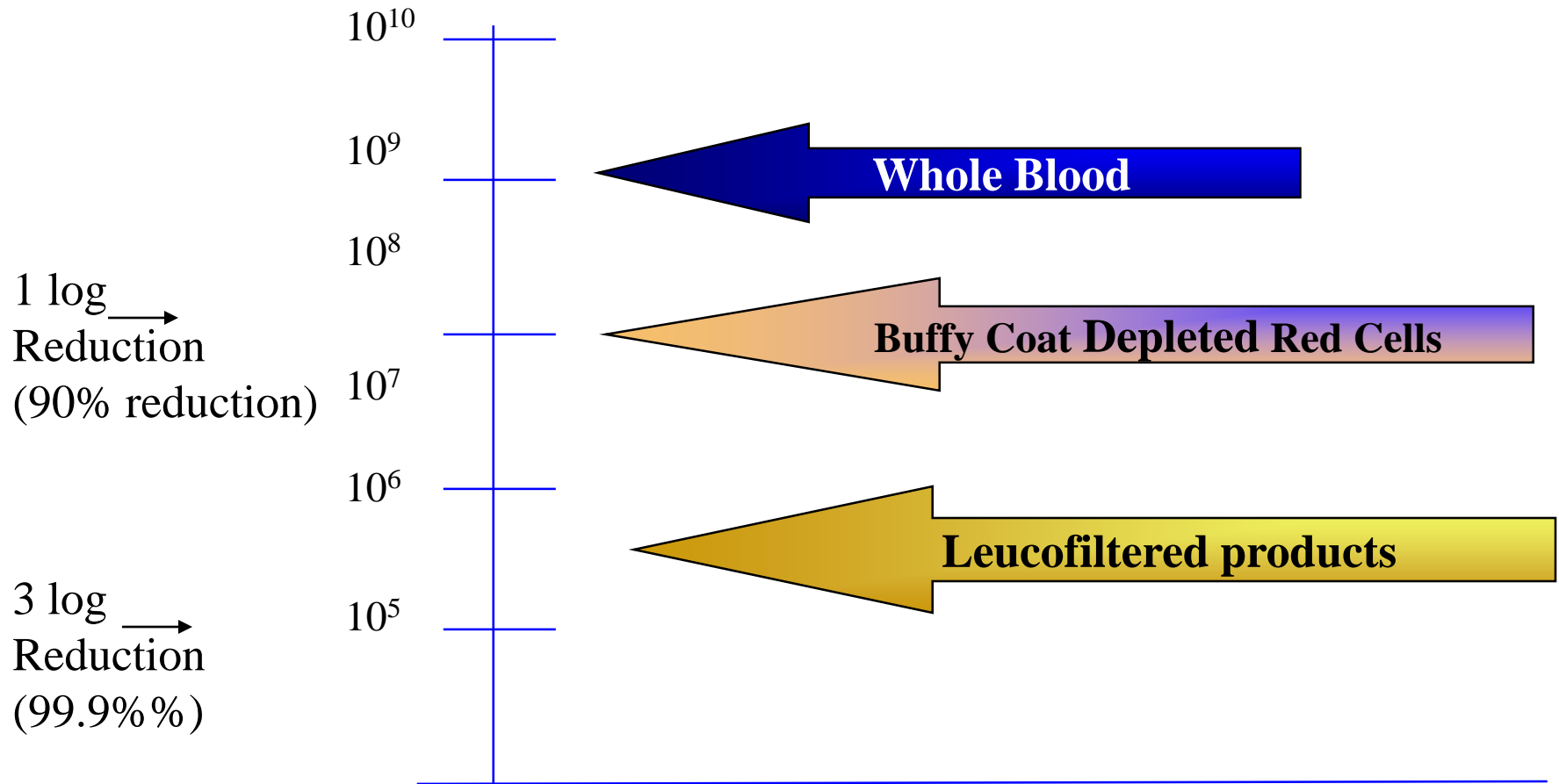
Leucocyte filters most efficient – 99.99% (4 log depletion)

Leucofiltration can be done

- At the bedside
- In the laboratory before issue
- Leucocyte reduction using inline filters



Concept of Log Reduction



IRRADIATED BLOOD

- For Gamma irradiation (cesium or cobalt) dose is 25 Gy
- Prevents transfusion associated graft-versus-host disease (TA GvHD)

INDICATION:

- Bone Marrow Transplant
- Congenital immunodeficiency
- Premature infants
- Intrauterine transfusions
- First degree relatives



Plasma Derivatives

- They are prepared in fractionation centres from plasma pools
 1. Albumin
 2. Factor VIII concentrate
 3. Fibrinogen
 4. Immunoglobulins
 5. Other coagulation Factors
- Plasma derivatives are not blood components, which are prepared in the blood bank

Learning Outcome

At the end of this presentation participants will have understood the process involved in separation of blood components and the various blood components that can be prepared



NACO website: www.naco.gov.in

