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PHARMACEUTICAL BIOTECHNOLOGY

UNIT 5

TOPIC :

- d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.



Blood Products: Collection, Processing and Storage of Whole Human Blood, Dried Human Plasma and Plasma Substitutes

- Blood products are therapeutic preparations obtained from human blood and used for the prevention and treatment of blood loss, anemia, coagulation disorders, burns, shock, and other medical conditions.

Blood products include:

1. Whole Human Blood
2. Human Plasma
3. Dried Human Plasma
4. Plasma Protein Fractions
5. Plasma Substitutes

These products are collected, processed, stored, and administered under strict quality control measures.

Whole Human Blood

Whole human blood is blood collected from a healthy donor and mixed with an anticoagulant solution to prevent clotting.

It contains all normal blood components:

- Red Blood Cells (RBCs)
- White Blood Cells (WBCs)
- Platelets
- Plasma

Composition of Blood

Component	Percentage
Plasma	55%
RBCs	44-45%
WBCs & Platelets	<1%

Collection of Whole Human Blood

Donor Selection

The donor should:

- Be healthy

- Be free from infectious diseases
- Have normal hemoglobin levels
- Meet age and weight requirements

Blood Collection Procedure

1. Donor screening and medical examination.
2. Sterilization of collection site.
3. Blood is collected from a vein using sterile equipment.
4. Blood is collected into sterile blood bags containing anticoagulants.

Common Anticoagulants

- CPD (Citrate Phosphate Dextrose)
- CPDA-1 (Citrate Phosphate Dextrose Adenine)
- ACD (Acid Citrate Dextrose)

These prevent clotting and maintain cell viability.

Processing of Whole Blood

After collection:

Testing

Blood is tested for:

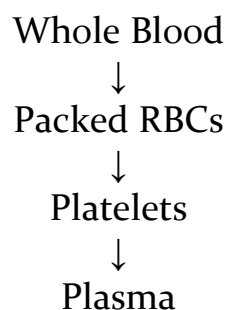
- HIV
- Hepatitis B
- Hepatitis C
- Syphilis
- Malaria

Blood Grouping

- ABO typing
- Rh typing

Component Separation

Using centrifugation:



↓
Cryoprecipitate

Storage of Whole Human Blood

Storage Conditions

Parameter	Value
Temperature	2–6°C
Shelf Life	35–42 Days

Depends on anticoagulant-preservative used.

Precautions

- Maintain cold chain.
- Avoid freezing.
- Monitor storage temperature continuously.

Uses of Whole Human Blood

- Severe blood loss
- Major surgery
- Trauma
- Hemorrhage
- Exchange transfusion

Human Plasma

Plasma is the liquid portion of blood obtained after removal of blood cells.

It contains:

- Water
- Proteins
- Electrolytes
- Clotting factors
- Nutrients

Uses of Plasma

- Burns
- Shock
- Coagulation disorders
- Hypoproteinemia
- Liver disease

Dried Human Plasma

- Dried human plasma is plasma from which water has been removed by freeze-drying (lyophilization).
- It can be reconstituted with sterile water before administration.

Preparation of Dried Human Plasma

Step 1: Plasma Collection

- Plasma is separated from whole blood by centrifugation.

Step 2: Freezing

- Plasma is rapidly frozen.

Step 3: Lyophilization (Freeze-Drying)

- Water is removed under vacuum.
- Plasma proteins remain stable.

Step 4: Sealing

- Product is sealed in sterile containers.

Storage of Dried Human Plasma

Conditions

- Cool and dry place
- Protected from moisture and light

Advantages

- Long shelf life
- Easy transportation
- Rapid reconstitution

Uses of Dried Human Plasma

- Emergency blood replacement
- Burns
- Shock
- Military medicine
- Disaster management

Advantages of Dried Plasma

1. Easy storage.
2. Long stability.

3. Lightweight.

Plasma Substitutes

- Plasma substitutes are sterile solutions used to increase blood volume when plasma is unavailable.
- They do not contain blood cells or plasma proteins but help maintain circulation and blood pressure.

Characteristics of Ideal Plasma Substitute

1. Non-toxic
2. Non-antigenic
3. Sterile
4. Stable
5. Easy to administer
6. Long shelf life
7. Maintains osmotic pressure
8. Economical

Classification of Plasma Substitutes

1. Natural Plasma Expanders

Human Albumin

- Obtained from plasma proteins
- Maintains colloidal osmotic pressure

Plasma Protein Fraction

- Contains albumin and globulins
- Used in shock and burns

2. Synthetic Plasma Expanders

Dextran

Produced by bacterial fermentation.

Types

- Dextran 40
- Dextran 70

Uses

- Shock
- Burns

- Blood volume expansion

Storage of Plasma Substitutes

- Store at room temperature.
- Protect from contamination.
- Use sterile containers.
- Avoid extreme temperatures.

Advantages of Plasma Substitutes

1. Readily available.
2. No blood group matching required.
3. Long shelf life.
4. Easy storage.
5. Useful in emergencies.

Limitations of Plasma Substitutes

1. Do not carry oxygen.
2. Cannot replace blood cells.
3. Temporary effect.
4. Some may cause allergic reactions.