

مادة أسس التخدير 1 الكورس الاول

BLOOD AND BLOOD PRODUCTS (PART 1)

Sawa University

جامعة ساوة الاهلية

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كلية التقنيات الصحية والطبية

Department of Anesthesia

قسم تقنيات التخدير

.Second .. Stage

.المرحلة الثانية

...محاضرة رقم 6.

نظري

Lecture No.6

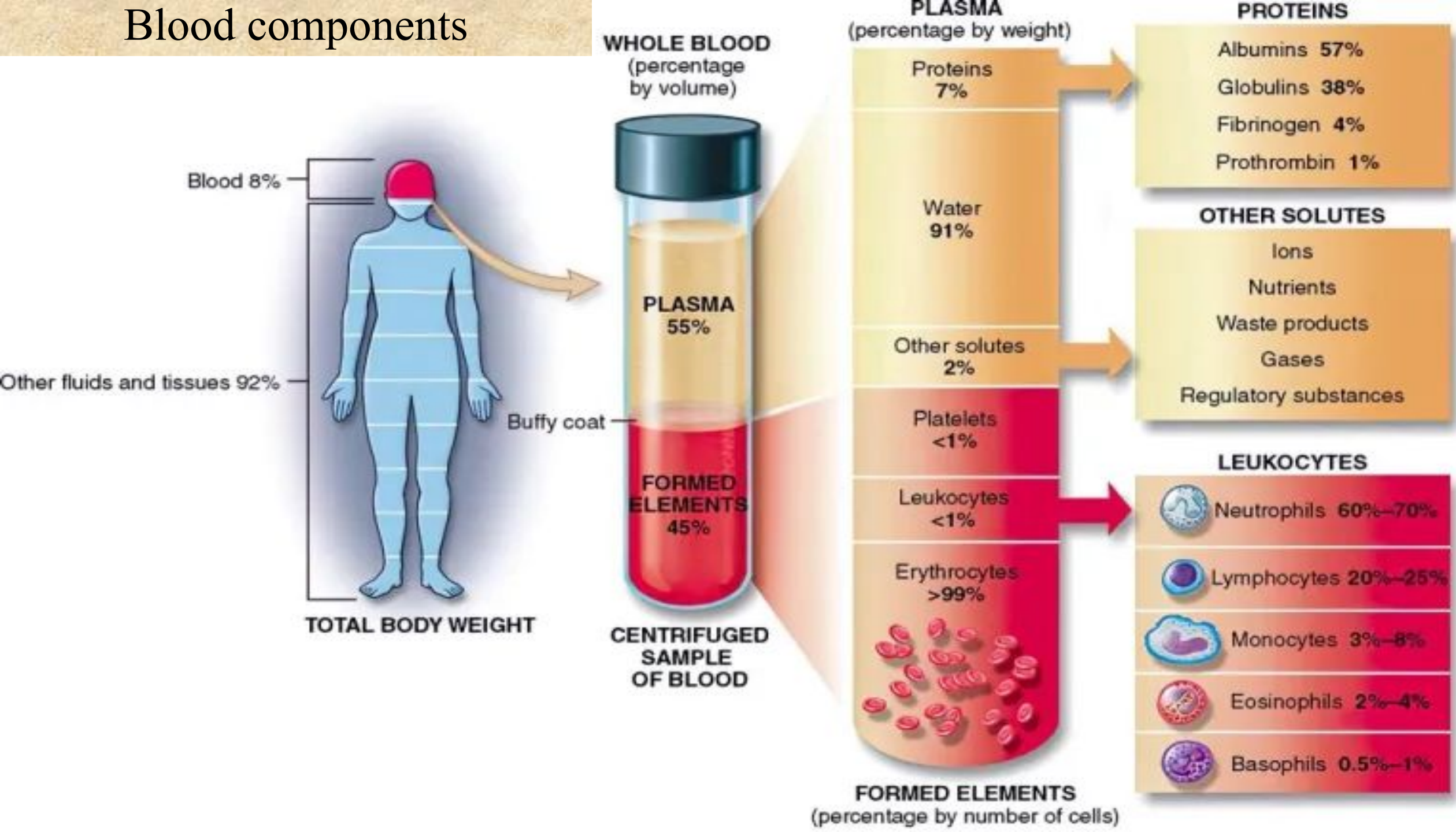
Theoretical

استاذ المادة : د. حسن جساب البركي

Blood And Blood Products

- Blood is the connective tissue consisting of plasma and cellular components.
- Average human has 5 litres of blood i.e., 8% of total body weight.
- It is a transporting fluid that carries vital substances to all parts of the body.

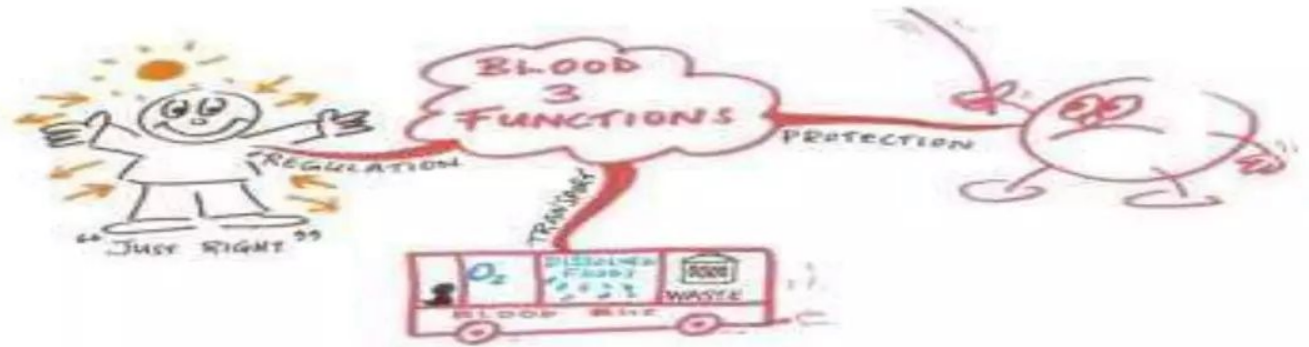
Blood components



Properties Of Blood

- **Colour:**
 - ✓ Oxygen-rich blood : scarlet red bright crimson
 - ✓ Oxygen-poor blood : purple red
- **pH:** 7.35–7.45
- **Temp:** 38°C or 100.4° F
- **Viscosity:** 5 times more viscous than water

Functions Of Blood



TRANSPORTATION

- Respiration
- Nutrient carrier from GIT
- Transportation of hormones from endocrine glands
- Transports metabolic wastes

REGULATION

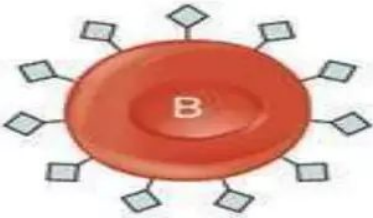
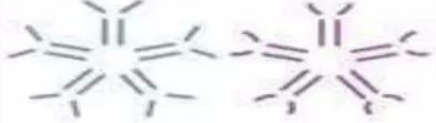
- Regulates pH
- Adjusts and maintains body temperature
- Maintains water content of cells

PROTECTION

- WBC protects against disease by phagocytosis
- Reservoir for substances like water, electrolyte etc.
- Performs haemostasis

Blood Groups & Typing

Blood Type

	A	B	AB	O
Red Blood Cell Type				
Antibodies in Plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in Red blood Cell	 A antigen	 B antigen	 A and B antigens	None
Blood Types Compatible in an Emergency	A, O	B, O	A, B, AB, O (AB ⁺ is the universal recipient)	O (O is the universal donor)
Occurrence	41%	9%	3%	47%

Blood and blood products:

Any therapeutic substance prepared from human blood.

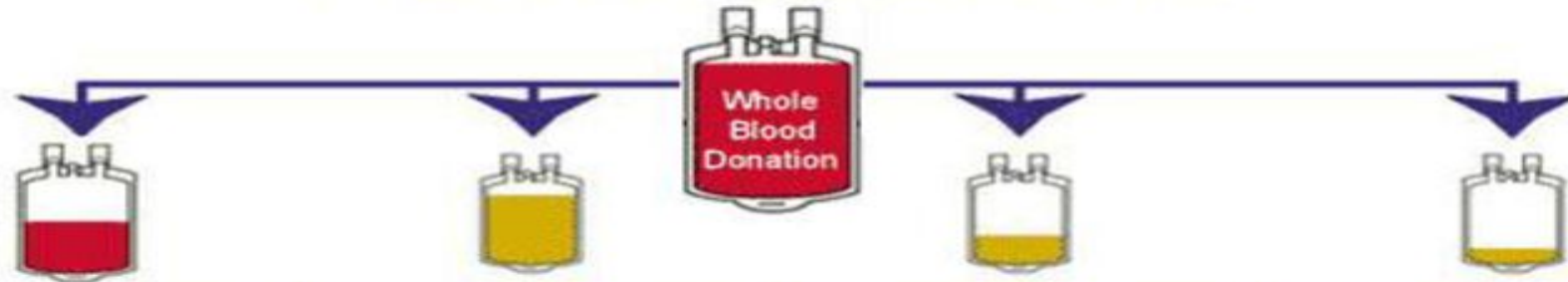
- **Whole blood:** is unseparated blood collected into an approved container containing an anticoagulant-preservative solution.

A constituent separated from whole blood such as:

- 1. Red cell concentrate**
- 2. Plasma**
- 3. Platelet concentrates**
- 4. Cryoprecipitate, prepared from fresh frozen plasma.**

Blood & blood components transfusion

The potential of HUMAN BLOOD



Red Blood Cells	Fresh Frozen Plasma	Concentrate of Platelets	Cryoprecipitate
To increase the amount of red blood cells after trauma or surgery or to treat severe anemia.	To correct a deficiency in coagulation factors or to treat shock due to plasma loss from burns or massive bleeding.	To treat or prevent bleeding due to low platelet levels. To correct functional platelet problems	To treat fibrinogen deficiencies:
S T O R A G E P E R I O D			
42 days in the refrigerator or 10 years in the freezer	1 year in the freezer	5 days at room temperature	1 year in the freezer



Human plasma proteins prepared under pharmaceutical manufacturing conditions such as:

1. **Albumin.**
2. **Coagulation factor concentrates.**
3. **Immunoglobulin**

1 .whole blood

- There have been few widely accepted indications for whole blood in modern transfusion practice.
- **Dose:** 6 ml/kg of WB raise HB% level **1 g/dl.**
- 1 unit of WB raise HB% in average-size adult by ~ 1 g/dl .

Indication for Transfusion of Whole Blood

- Fresh whole blood < 5 days old is often used for exchange transfusion in newborns.
- Stored whole blood can be used in actively bleeding patients who have lost > 30-40% of their blood volume.

- During donation, blood is collected into a sterile, disposable, plastic pack which contains an anticoagulant-preservative solution. This solution usually contains citrate, phosphate, dextrose and often adenine (CPDA)
- During storage, metabolism continues in the red cells and platelets, while some plasma proteins lose their biological activity.



Functions of anticoagulant-preservative solution in blood collection pack

Solutions	Functions
C Sodium citrate	Binds with calcium ions in blood in exchange for the sodium salt so the blood does not clot
P Phosphate	Supports metabolism of the red cells during storage to ensure they release oxygen readily at tissue level
D Dextrose	Maintains the red cell membrane to increase storage life
A Adenine	Provides energy source

Effects of storage on whole blood:

- Reduction in the pH (blood becomes more acidic)
- Rise in plasma potassium concentration (extracellular K^{+})
- Progressive reduction in the red cell content of 2,3 diphosphoglycerate (2,3 DPG)
- Loss of all platelet function in whole blood within 48 hours of donation.
- Reduction in Factor VIII to 10–20% of normal within 48 hours of donation.

2- Red blood cell.

□ **Packed RBCs** are the commonly utilized blood product, providing oxygen-carrying capacity in cases most of acute or chronic blood loss.

Advantages

- Simple and inexpensive to prepare.

Disadvantages

- It has a high ratio of red cells to plasma (high viscosity) thereby increasing the time required for transfusion through a small gauge needle or cannula.

The white cells are a cause of febrile non-haemolytic transfusion reactions in some patients.

□ Leukocyte-depleted red cells

- Special leukocyte filters can be used to remove virtually all the white cells.
- The majority of red cells and platelet transfusions in the United States&UK are currently leukocyte reduced.

Advantages

- Reduces acute transfusion reactions.
- Reduces cytomegalovirus infection (CMV).

Disadvantages

- Cost: special blood packs and equipment are required
- More skill and operator training is needed

PRBCs transfusion guidelines

- **Hemodynamic instability:** Ongoing bleeding with unresponsive (or incompletely responsive) to infusion of 2- 3 Liters crystalloid

- **Hemodynamically Stable:**

- ICU Patients: Hemoglobin <7 g/dL
- Post-Operative: Hgb ≤ 8 g/dL
- Cardiovascular Disease: Hgb ≤ 8 g/dL.
- **Dose:** 4 ml/kg of RBC increase Hemoglobin level 1 g/dl.
- One unit of RBC will raise the hemoglobin of an average

Size adult by ~ 1 g/dl

- Transfuse slowly for first 15 minutes.
- Complete transfusion within 4 hours.

3-White cells (leukocytes)(

- White cell transfusions have no proven clinical uses.
- May be indicated in neutropenic patients with bacterial infections not responding to antibiotics.
- Transfused granulocytes have a very short circulatory life span, so that daily transfusions of 10^{10} granulocytes are usually required

4-plasma

- This is separated from whole blood and frozen at -25°C or colder within 6–8 hours of donation in order to preserve its labile coagulation factors (Factors V and VIII).
- Fresh frozen plasma can be stored for at least one year or longer if low temperatures can be maintained.
- When plasma is stored at a temperature of $2-6^{\circ}\text{C}$, the labile clotting activity of Factors V and VIII will decline to 10–20% within 48 hours.
- Dosage: Initial dose of 15 ml/kg.

Indications of plasma transfusion

- **International normalized ratio (INR) >1.5 with:**
 - Anticipated invasive procedure or surgery.
 - Massive hemorrhage (over one blood volume)
- **Emergent reversal of anticoagulant (warfarin) therapy.**
- **Treatment of isolated factor deficiencies.**
- **The correction of coagulopathy associated with liver disease.**

Coagulopathy (INR) >1.5 with:

1. Active bleeding.
2. Bleeding tendency:

World blood donor day 14th june.

• “Give blood and keep the world beating”.



Any questions?

*Thank
You*