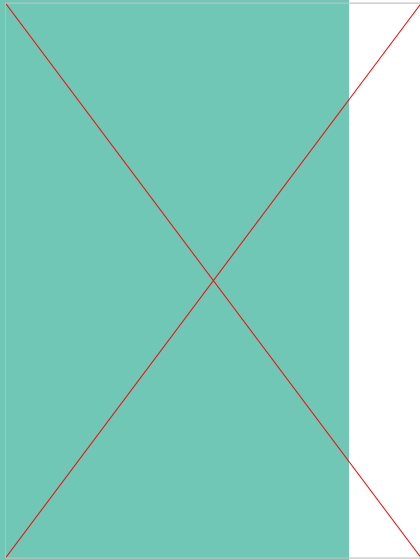




PRACTICAL BLOOD TRANSFUSION

ANTICOAGULANT IN BLOOD TRANSFUSION(PART1)

Sawa University

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الاهلية

كلية التقنيات الصحية

Department of Medical

والطبية

Laboratories.....

قسم تقنيات المختبرات

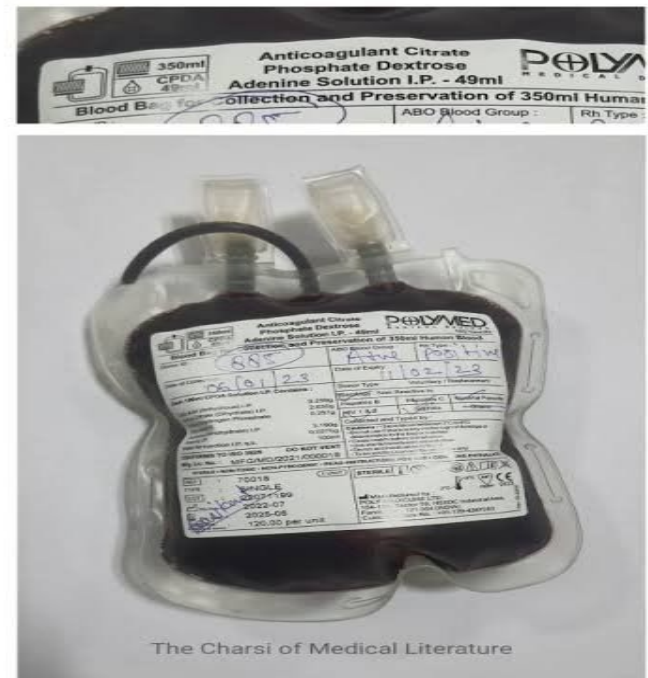
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الطبية

تدريسي المادة :د. هبة محمد عبد الواحد

What Are Anticoagulants?

- Chemical substances that inhibit blood clotting.
- Preserve cellular components (RBCs, platelets) and plasma proteins.
- Must maintain pH, osmolarity, and nutrient supply for storage.



Functions in Blood Banking

- Prevent coagulation during collection and storage.
- Maintain red blood cell ,platelet and plasma integrity.
- Facilitate safe transfusion without thrombotic complications.
- Extend shelf life of blood products.

Common Anticoagulants

- **CPD**: Citrate, Phosphate, Dextrose.
- **CPDA-1**: Citrate, Phosphate, Dextrose, Adenine.
- **ACD-**: Acid, Citrate, Dextrose .
- **Heparin**: rarely used.



Mechanism of Action

CPD, CPDA

- **Citrate:** Binds calcium → inhibits coagulation cascade.
- **Phosphate:** Buffers pH.
- **Dextrose:** Provides energy.
- **Adenine:** support ATP production.

ACD

Acid: stabilizes blood
Citrate...
Dextrose...

Heparin: Activates antithrombin III → prevents thrombin formation.

Additive solutions: **SAGM**, used usually with CPD/ CPDA to extend RBC storage, up to 42 day.

Blood Component Preservation

- Whole blood, CPD stored for 21 day
CPD-A stored for 35 day
- RBC, CPD/ CPDA; stored for 35 day
with additive solution, stored up to 42 day
- Platelets, ACD/CPD stored for 5-7 days.
- Plasma, ACD/ CPD stored for up to 1 year.

Storage Considerations

- **Temperature:**
 - RBCs: 1–6°C
 - Platelets: 20–24°C, gentle agitation
 - Plasma: -18°C or lower

Citrate Toxicity

- Excess citrate → hypocalcemia in patients.
- Symptoms: Tingling, arrhythmias, hypotension.
- Usually occurs in rapid or massive transfusions.

Heparin in Transfusion

- Rarely used in standard transfusion.
- Mainly in apheresis or plasma collection.
- Risk: Bleeding if administered incorrectly.



Practical Lab Considerations

- Mix anticoagulant and blood immediately during collection.
- Maintain sterility and avoid clot formation.
- Label and store according to blood component type.

Summary

- Anticoagulants are essential for safe transfusion.
- Choice depends on blood component and storage duration.
- Monitoring pH, temperature, and metabolites ensures efficacy.

Anticoagulants in Blood Transfusion

Blood Component	Anticoagulant / Solution	Mechanism / Notes	Storage Duration
Whole Blood	CPD, CPDA-1	Citrate chelates Ca^{2+} → prevents clotting: Phosphate buffers pH	CPD: 21 days, CPDA-1: 35 days
Red Blood Cells (RBCs)	CPD, CPDA-1 Additive solution (SAGM)	Maintains ATP & 2,3-DPG. reduces hemolysis (mannitol in SAGM)	35–42 days depending on additive
Platelets	ACD, CPD (sometimes heparin for apheresis)	Prevents clotting during collection; platelets stored at room temperature	5–7 days
Plasma	Citrate (ACD, CPD)	Prevents clotting	Frozen plasma: up to 1 year
Apheresis collections	Heparin (occasionally)	Inhibits thrombin via antithrombin III	Immediate processing required: not for long-term storage

● **SAGM, as an additive solution can store the RBC for up to:**

1. 15 day.
2. 30 day.
3. 42 day.
4. 45 day.

Plasma can be stored at:

1. 10 C for 1 year.
2. -18 C for 1 month.
3. -18 C for 1 year.
4. 2-6 C for 5 days.



References

1. Murphy MF, et al. Practical Transfusion Medicine. 5th edition.
2. Roback JD, et al. AABB Technical Manual. 20th edition.
3. Fung MK, et al. Blood Components: Principles and Practice.