



HEMATOLOGY - FIRST COURSE

LAB -3- ANTICOAGULANTS

Sawa University

جامعة ساوة الاهلية

College of health and medical techniques

كلية التقنيات الصحية والطبية

Department of Medical Laboratories

قسم تقنيات المختبرات الطبية

Third Stage

المرحلة الثالثة

محاضرة رقم ٢

Lecture No. 3

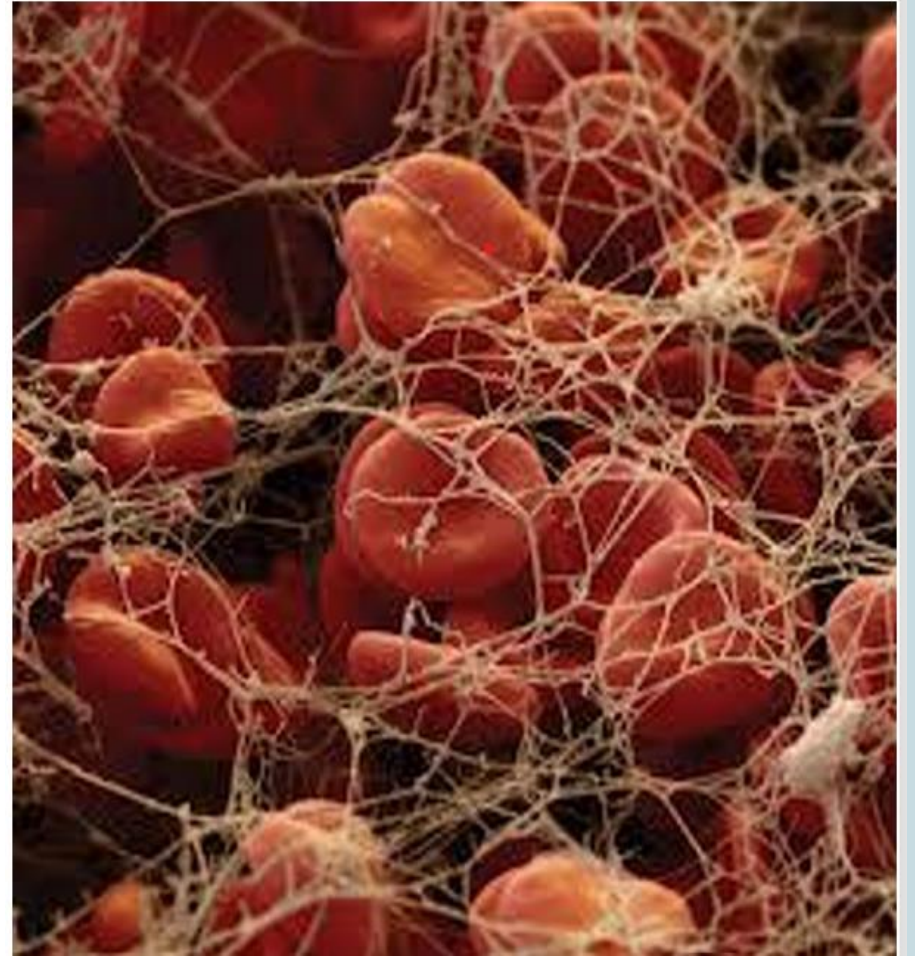
الجانب العملي

Practical

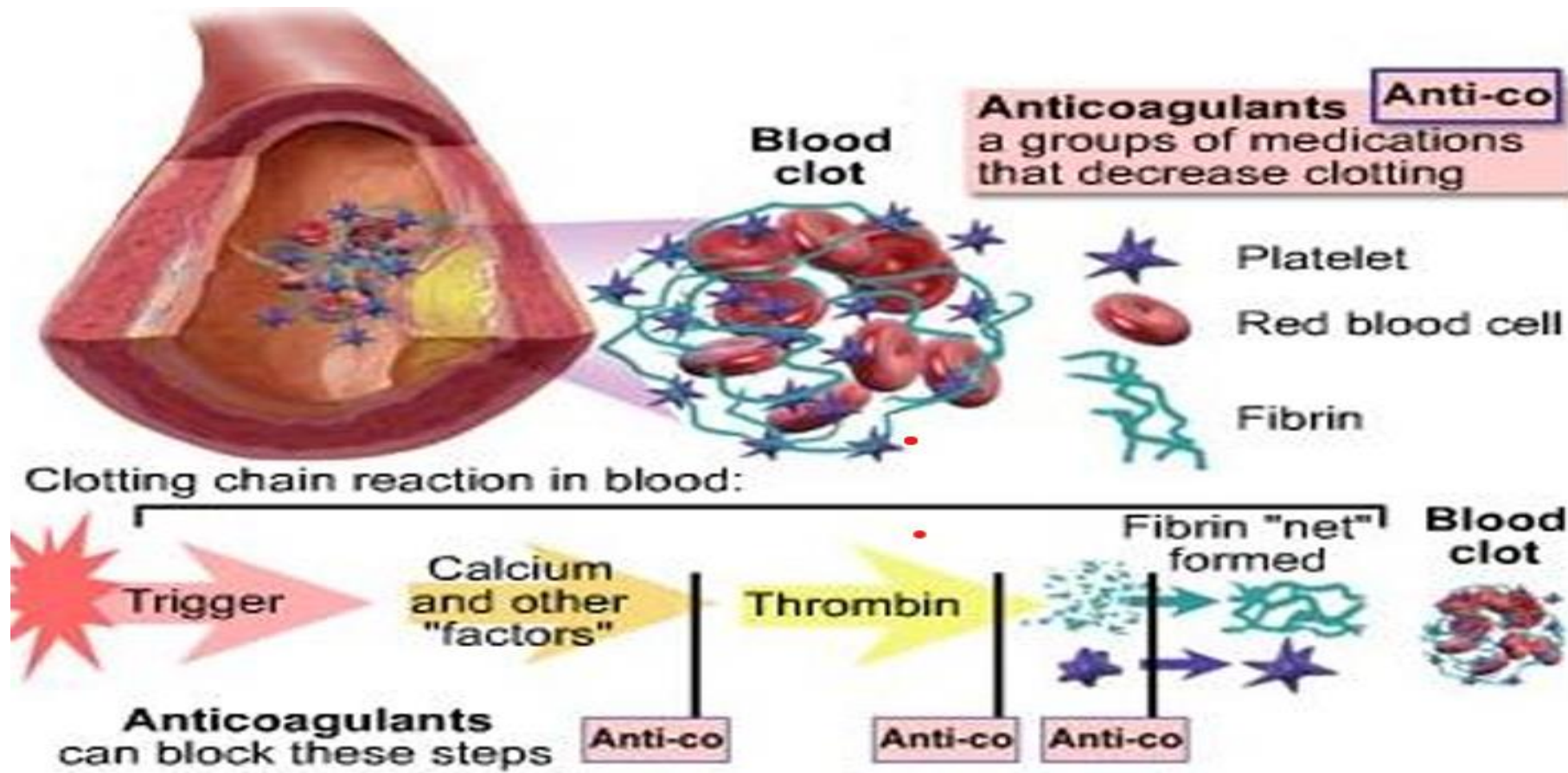
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ANTICOAGULANTS

Anticoagulants are medicines that prevent blood clots from forming in the bloodstream. This reduces the risk of medical problems that are caused by blood clots – such as heart attacks.



Anticoagulants



Properties of a good anticoagulant

1. **good anticoagulant must not hemolysis the RBCs.**
2. **good anticoagulant must not change the composition of blood.**
3. **good anticoagulant must not change the morphology, size, shape or appearance of the cells. :**

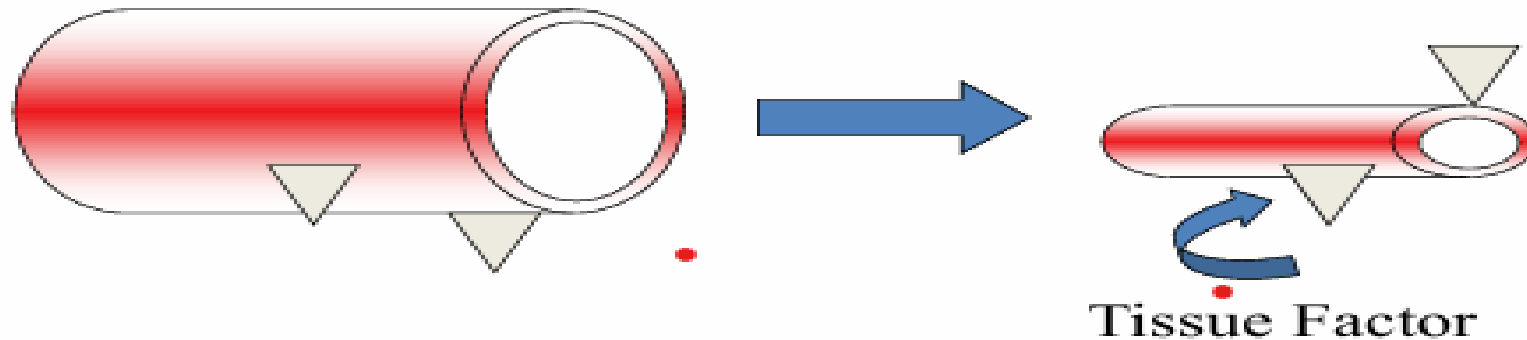
Blood Clotting

- **Vascular Phase**
- **Platelet Phase**
- **Coagulation Phase**
- **Fibrinolytic Phase**



Vascular Phase

- Vasoconstriction
- Exposure to tissues activate Tissue factor and initiate coagulation



Platelet Phase

- (endothelial cells) prevent platelet adhesion and aggregation
- platelets contain receptors for fibrinogen and von Willebrand factor
- after vessel injury Platelets adhere and aggregate.
- Loose their membrane and form a viscous plug

Coagulation Phase

❖ Two major pathways :

A-Intrinsic pathway **B**-Extrinsic pathway

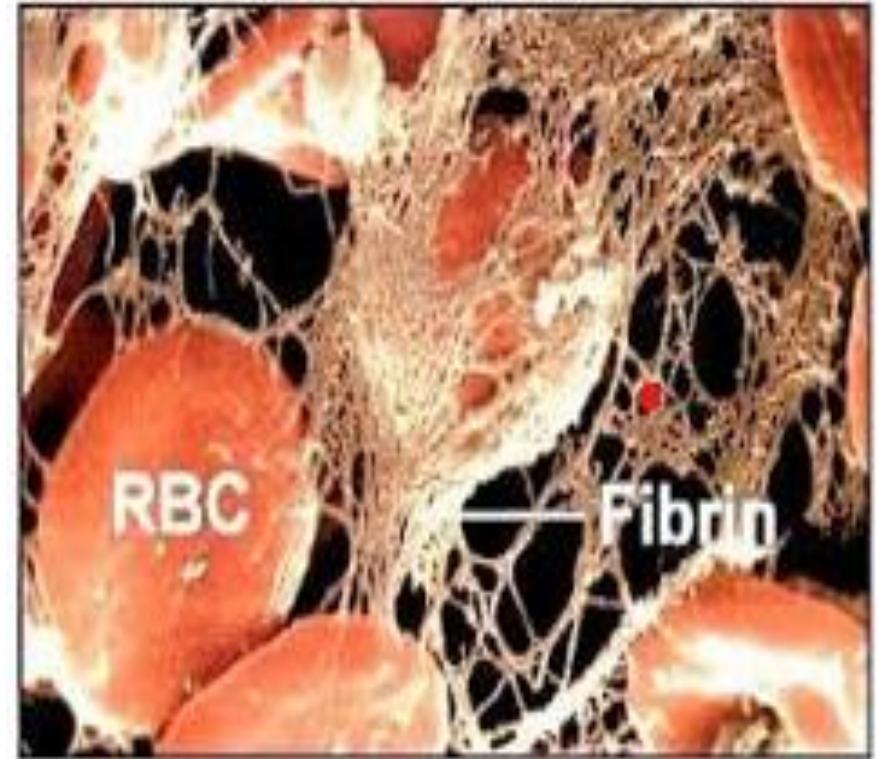
❖ Both converge at a common point.

❖ 13 soluble factors are involved in clotting.

❖ Biosynthesis of these factors are dependent on Vitamin K1 and K2 .

❖ Normally inactive and sequentially activated.

❖ Hereditary lack of clotting factors lead to hemophilia -A



Intrinsic pathway and Extrinsic pathway

Intrinsic Pathway

- ⦿ All clotting factors are within the blood vessels
- ⦿ Clotting slower
- ⦿ Activated partial thromboplastin test (aPTT)

Extrinsic Pathway

- ⦿ Initiating factor is outside the blood vessels - tissue factor
- ⦿ Clotting - faster - in Seconds
- ⦿ Prothrombin test (PT)

Anticoagulant drugs to treat thromboembolism

Drug Class	Prototype	Action	Effect
Anticoagulant Parenteral	Heparin	Inactivation of clotting Factors	Prevent venous Thrombosis
Anticoagulant Oral	Warfarin	Decrease synthesis of Clotting factors	Prevent venous Thrombosis
Antiplatelet drugs	Aspirin	Decrease platelet aggregation	Prevent arterial Thrombosis
Thrombolytic Drugs	Streptokinase	Fibinolysis	Breakdown of thrombi

Uses

- **Acute myocardial infarction**
- **Arterial and venous thrombosis**
- **Pulmonary embolism**

Contra indications :

- **Stroke**
- **Major surgery**
- **Brain neoplasm**
- **Active bleed**

For various purposes, a number of different anticoagulants are available:

❖ **Ethylene diamine tetra acetic acid (EDTA) :**

The sodium and potassium salts of EDTA are powerful anticoagulants and are the most widely used anticoagulants for hematologic investigations, such as complete blood count(CBC), Hb , PCV, total leukocyte count, differential leukocyte count and platelets count.



Chemical Action :

EDTA acts by its chelating effect on the calcium molecules in the blood. It removes calcium ions, which are essential for coagulation.

Uses :

EDTA is the choice anticoagulant for blood counts and blood films. It is also ideal for platelet counts as it prevents platelets from clumping.

This anticoagulant, however, is not suitable for coagulation studies because it destroys clotting factors V and VIII.

❖ Heparin

A polymer of varying chain size

Mechanism of action :

- binds to the enzyme inhibitor antithrombin III (AT), causing a conformational change that results in its activation
- The activated AT then inactivates thrombin, factor Xa and other proteases.



❖ Warfarin

- **Warfarin**, sold under the brand name Coumadin
- Mechanism of action inhibits the vitamin K-dependent synthesis of biologically active forms of the clotting factors II , VII , IX and X.



Quiz

- ✓ What do we mean by anticoagulants?
- ✓ Mention the most important properties of a good anticoagulant.
- ✓ Comparison between Intrinsic pathway and Extrinsic pathway in blood clotting ?
- ✓ What is heparin? What is its mechanism of action?

Any questions?

*Thank
You*