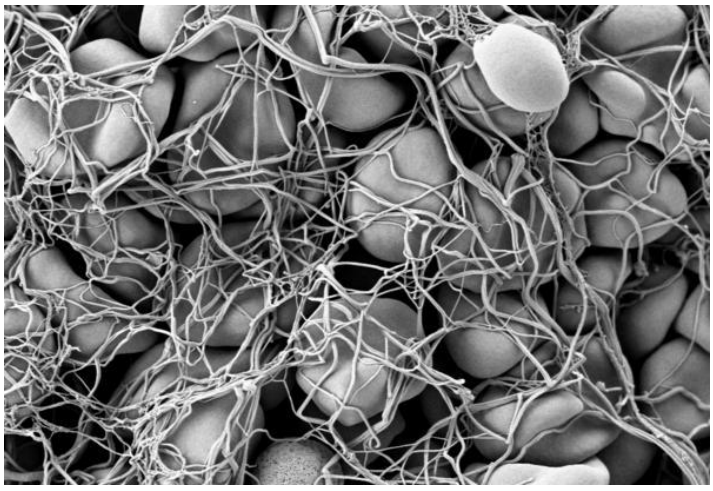
# Anticoagulant

Anticoagulant are drugs that, when added to blood, prevents it from clotting. Anticoagulants do this by suppressing the synthesis or function of various clotting factors that are normally present in the blood. These drugs are frequently used to prevent the formation of blood clots (thrombi) in the veins or arteries or the enlargement of a clot that is circulating in the bloodstream Anticoagulants are very effective in preventing life-threatening conditions e.g. stroke, pulmonary embolism and myocardial infarction.

Anticoagulants come in many different forms, including injections, intravenous (IV) drugs, and oral medications, with treatment options increasing markedly over the past 10 years with the development and wide-scale availability of oral direct thrombin inhibitors and oral direct factor Xa inhibitors. Factor Xa participates in both the intrinsic and extrinsic pathways of blood coagulation).

Clotting factors: Clotting factors are enzymes in normally present in the blood in inactive forms (all proteins, except factor IV) within the clotting cascade necessary to form cross-linked fibrin. They were numbered in the order they were discovered e.g. Factor I: Clotting factor I is also known as fibrinogen, factor II is also known as prothrombin, factor IV in the clotting cascade refers to calcium, factor X is also known as Stuart factor or Stuart Prower factor.



Red Blood Cells in Clot

# Types of Anticoagulants

Anticoagulants generally are of two types: heparin, which is given by injection, and derivatives of coumarin or indandione, which are administered orally.

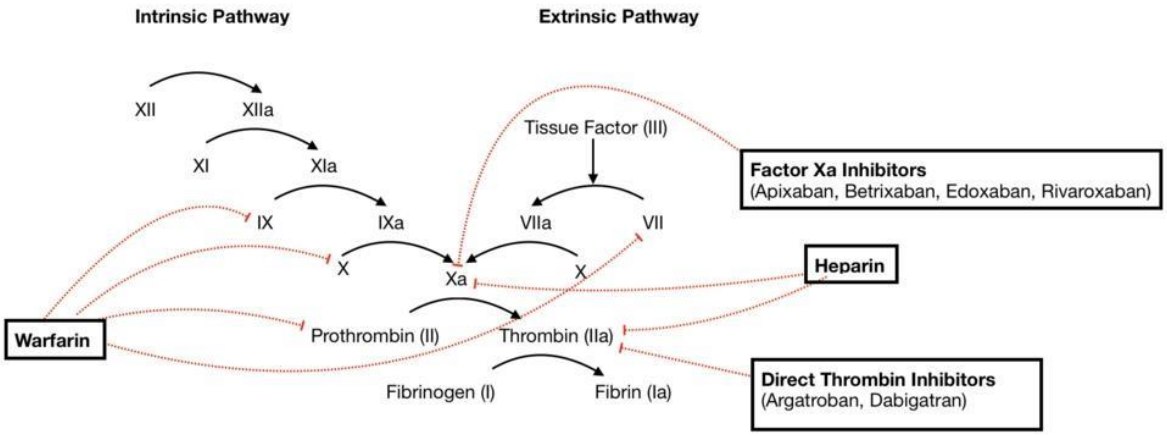
1. **Heparin** is used mainly in hospitalized patients. Heparin is an injectable anticoagulant that activates antithrombin III, which inhibits thrombin and factor Xa, factors necessary in the final stages of blood clotting cascade. There are two types of heparins: high molecular weight heparins and low molecular weight heparins.

2. **Coumarin** derivatives are oral anticoagulants that prevent vitamin K from acting as a cofactor in the hepatic synthesis of the vitamin K-dependent coagulation factors II, VII, IX, and X (as well as the anticoagulants, proteins C and S). Derivatives of coumarin include e.g. Warfarin, an extremely effective anticoagulant but there are a few problems. It can interact with certain foods and can it cause serious interactions with many commonly used medicines. Regular blood monitoring (international normalized ratio-INR) is done to check for effectiveness and safety.

3. **Synthetic indandione derivatives**, oral anticoagulant, a group of synthetic anticoagulants that resemble the coumarins in structure and activity and work by a similar mechanism of action.

4. **Factor Xa inhibitors**, a type of anticoagulant that work by selectively and reversibly blocking the activity of clotting factor Xa, preventing clot formation. They effect factor Xa within the blood and within a preexisting clot, and do not affect platelet aggregation. Used for the treatment and prevention of DVTs and acute PE, and to reduce the risk of stroke and embolism in people with nonvalvular atrial fibrillation.

5. **Thrombin inhibitors** are anticoagulants that bind to and inhibit the activity of thrombin hence preventing blood clots. Thrombin inhibitors inactivate free thrombin and also the thrombin that is bound to fibrin. Used to prevent arterial and venous thrombosis and can be used to prevent and treat deep vein thrombosis or used as prophylaxis in atrial fibrillation to avoid thromboembolism.




Coagulation Cascade and Major Classes of Anticoagulants