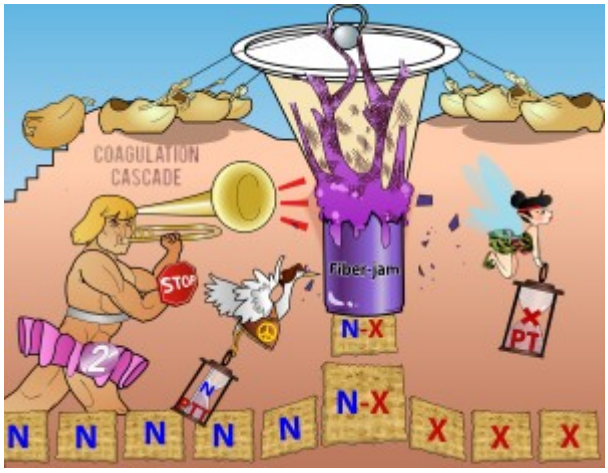
Coagulation Cascade Overview

The coagulation cascade is the mechanism by which blood clots, and is important to understand. It outlines the basis of hemostasis and disorders of this cascade can lead to hypercoagulability or conversely, problems with clotting leading to hemorrhage.



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Secondary Hemostasis
(2) Tutu He-man with Stop-sign
The coagulation cascade is the process of secondary hemostasis, as primary hemostasis is the process of platelets forming a plug at the site of injury immediately.

Intrinsic Pathway
N-triscuit Pathway
The intrinsic pathway is also known as the contact activation pathway. This is one of two pathways the coagulation cascade can follow to form fibrin, which forms a plug with platelets to coagulate. First, activated platelets activate factor XII, which activates factor XI. Factor XI (with Ca²⁺) activates IX, which requires factor VIII (and Ca²⁺) to activate factor X. The cascade then enters the common pathway.

Partial Thromboplastin Time (PTT)
Partial PTT clotting-hourglass
The intrinsic pathway can be measured by partial thromboplastin time (PTT), which can be normal, increased in hypocoagulable states, or decreased in hypercoagulable conditions. Heparin function is monitored with this test.

Heparin
Hippie-heron
Heparin is an anticoagulant which activates antithrombin, decreasing fibrin formation and inactivating factor X. This affects the intrinsic pathway and is monitored with PTT.

Extrinsic Pathway
X-triscuit Pathway
The extrinsic pathway, also known as the tissue factor pathway, is the primary pathway for initiating coagulation. It begins with thromboplastin (tissue factor and Ca²⁺) activating factor VII. Factor VII activates factor X. The cascade then enters a common pathway.

Prothrombin Time (PT)
PT clotting-hourglass
Prothrombin time (PT) is used to measure coagulation time in the extrinsic pathway. Often it is used to monitor drugs which alter this pathway, such as warfarin (coumadin).

Warfarin
War-fairy
Warfarin, an anticoagulant, exerts its primary effects on the extrinsic pathway (specifically factor VII) and is monitored with PT.

Common Pathway
Converging Pathway
The common pathway is the convergence of the extrinsic and intrinsic pathways. From this point on in the cascade, both pathways follow the same route: where activated factor X, in conjunction with factor V (and Ca²⁺), works to activate factor II (prothrombin to thrombin).

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Thrombin

Trombone

The main product of the coagulation cascade is thrombin (factor IIa). Thrombin then converts fibrinogen (factor I) to fibrin (factor Ia).

Convert Fibrinogen to Fibrin

Fiber-jam to Fibers

Factor IIa (thrombin) converts fibrinogen to fibrin (factor Ia). Fibrin, with the help of Ca²⁺ and factor XIIIa, forms a mesh.

Stabilizes the Platelet Plug

Plate Plug Stabilized

A fibrin mesh is formed from fibrin (factor Ia), which stabilizes platelet plugs formed in primary hemostasis.

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