Coagulation Or Clotting of Blood

Is a complex process in which fluid blood forms a gelatinous coat or it is the transformation of blood from a liquid into to a solid gel.

- Whenever the vessel is damaged, the net result is formation of prothrombin activator.
- Prothrombin activator is formed in two ways
  a. The extrinsic pathway
  b. The intrinsic pathway

Clotting Factors in Blood and Their Synonyms

Clotting Factor	Synonyms
Fibrinogen	Factor I
Prothrombin	Factor II
Tissue factor	Factor III; tissue thromboplastin
Calcium	Factor IV
Factor V	Proaccelerin; labile factor; Ac-globulin (Ac-G)
Factor VII	Serum prothrombin conversion accelerator (SPCA); proconvertin; stable factor
Factor VIII	Antihemophilic factor (AHF); antihemophilic globulin (AHG); antihemophilic factor A
Factor IX	Plasma thromboplastin component (PTC); Christmas factor; antihemophilic factor B
Factor X	Stuart factor; Stuart-Prower factor
Factor XI	Plasma thromboplastin antecedent (PTA); antihemophilic factor C
Factor XII	Hageman factor
Factor XIII	Fibrin-stabilizing factor
Prekallikrein	Fletcher factor
High-molecular-weight kininogen	Fitzgerald factor; HMWK (high-molecular-weight) kininogen
Platelets	

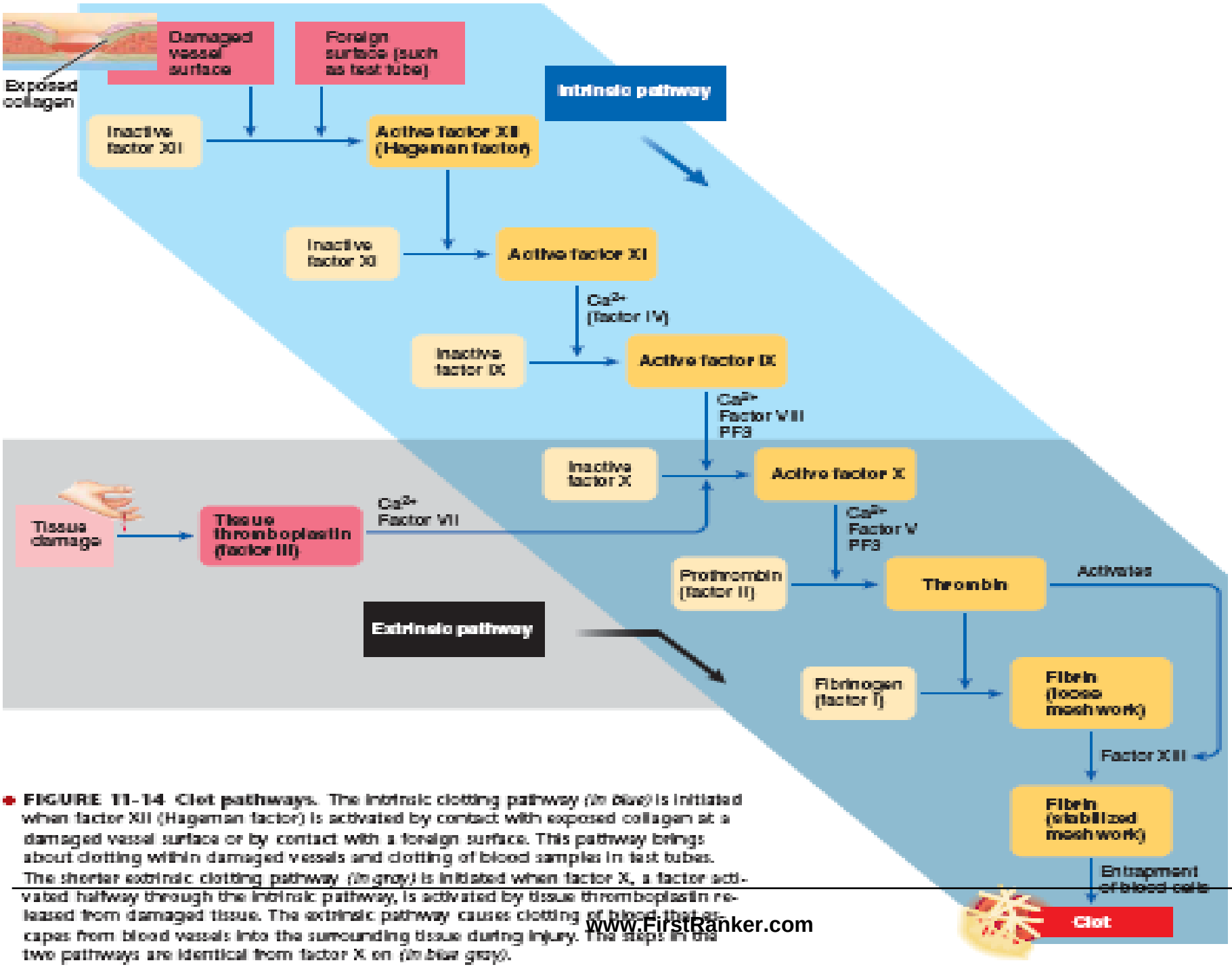
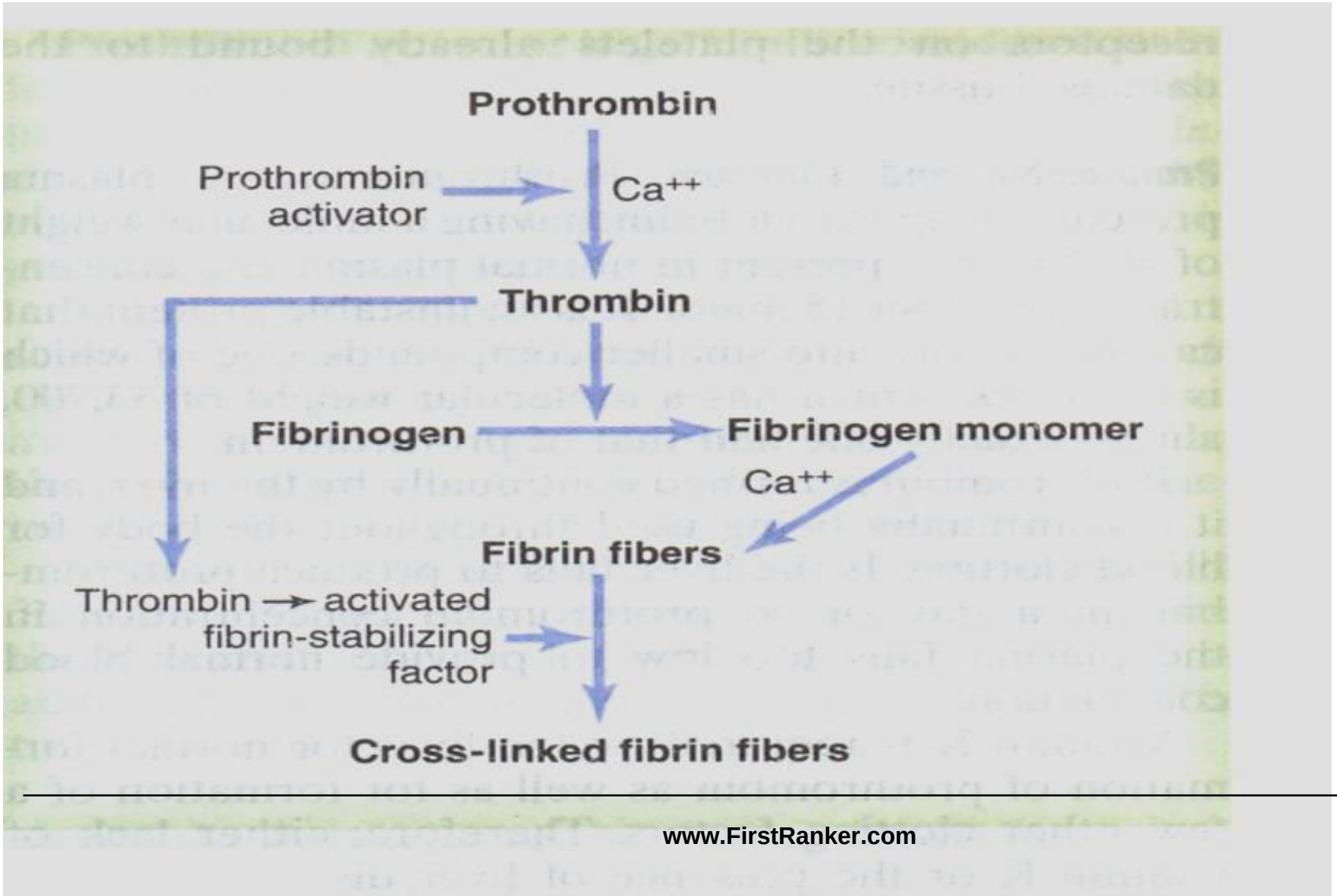


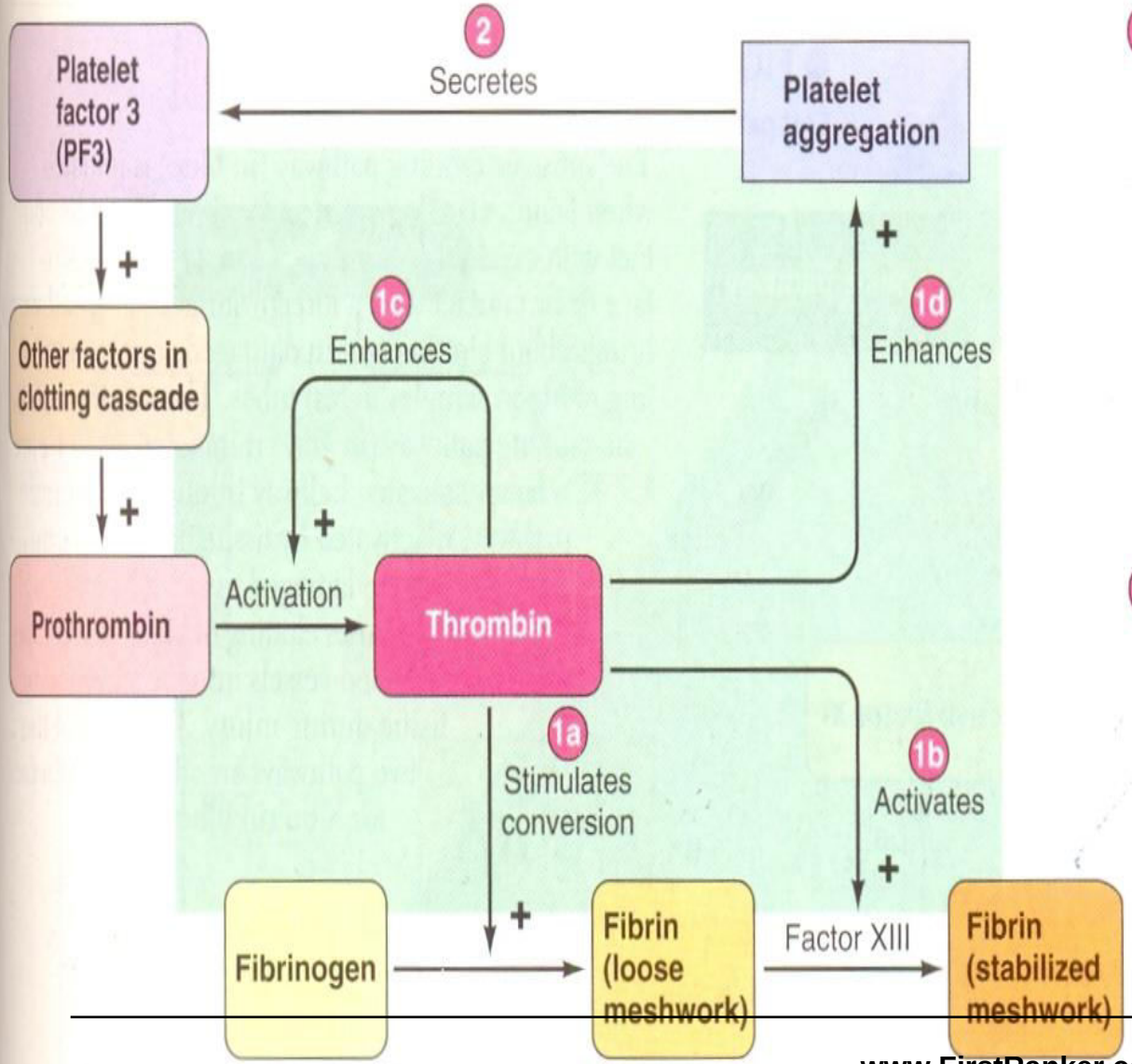
FIGURE 11-14 Clot pathways. The intrinsic clotting pathway *(in blue)* is initiated when factor XII (Hageman factor) is activated by contact with exposed collagen at a damaged vessel surface or by contact with a foreign surface. This pathway brings about clotting within damaged vessels and clotting of blood samples in test tubes. The shorter extrinsic clotting pathway *(in gray)* is initiated when factor X, a factor activated halfway through the intrinsic pathway, is activated by tissue thromboplastin released from damaged tissue. The extrinsic pathway causes clotting of blood that escapes from blood vessels into the surrounding tissue during injury. The steps in the two pathways are identical from factor X on *(in blue gray)*.

Conversion of prothrombin to thrombin and polymerization of fibrinogen to form fibrin fibers



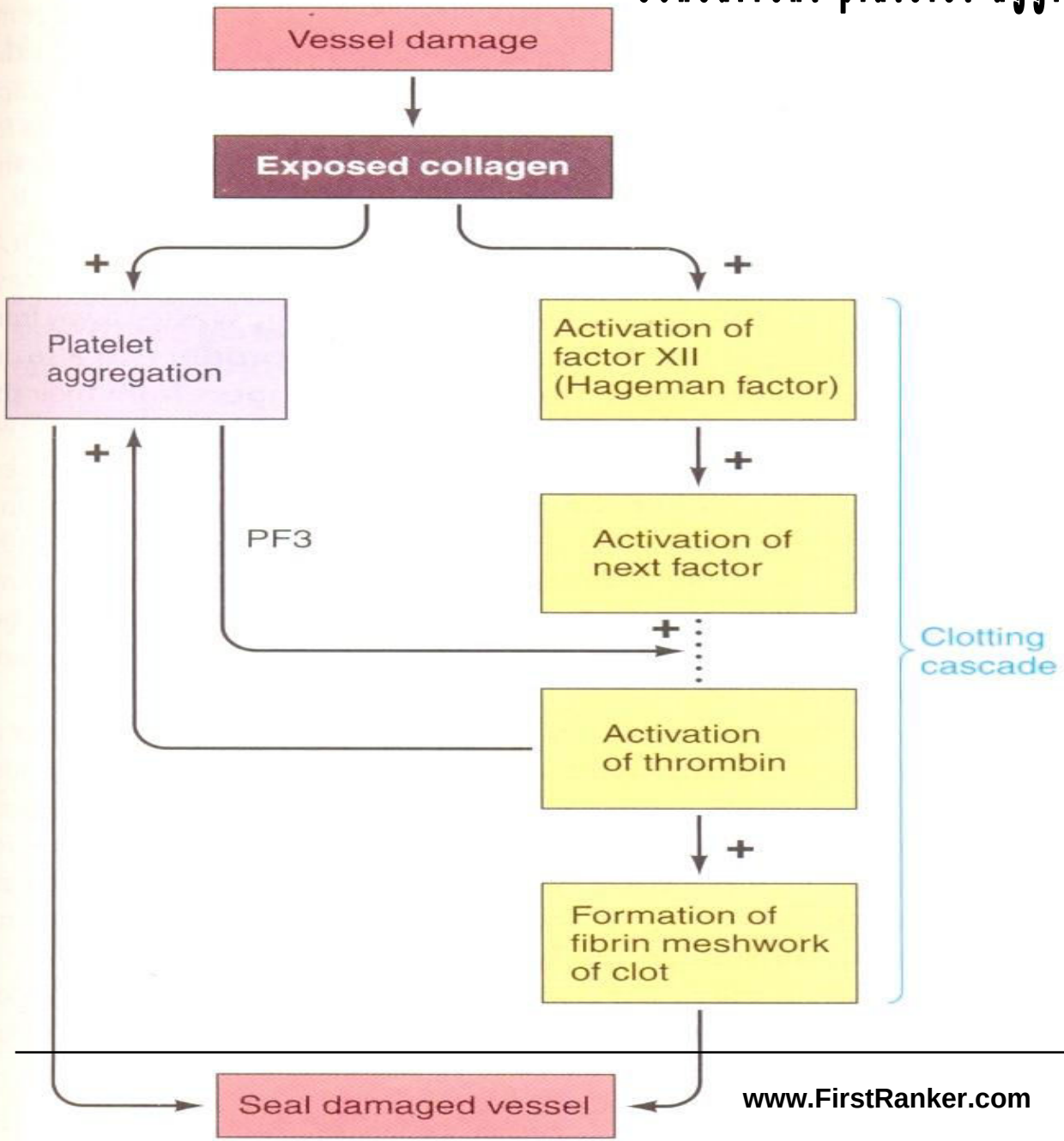
Erythrocytes trapped in the fibrin meshwork of a clot

Roles of Thrombin in Hemostasis



1. Thrombin, which is a component of the clotting cascade, plays multiple roles in hemostasis:
   - a. conversion of fibrinogen to fibrin
   - b. activation of the factor that stabilizes the fibrin meshwork of the clot
   - c. positive-feedback activation of more prothrombin into thrombin
   - d. enhancement of platelet aggregation
2. In positive-feedback fashion, aggregated platelets secrete PF3, which stimulates the clotting cascade that results in thrombin activation.

Concurrent platelet aggregation and clot formation



Role of platelets

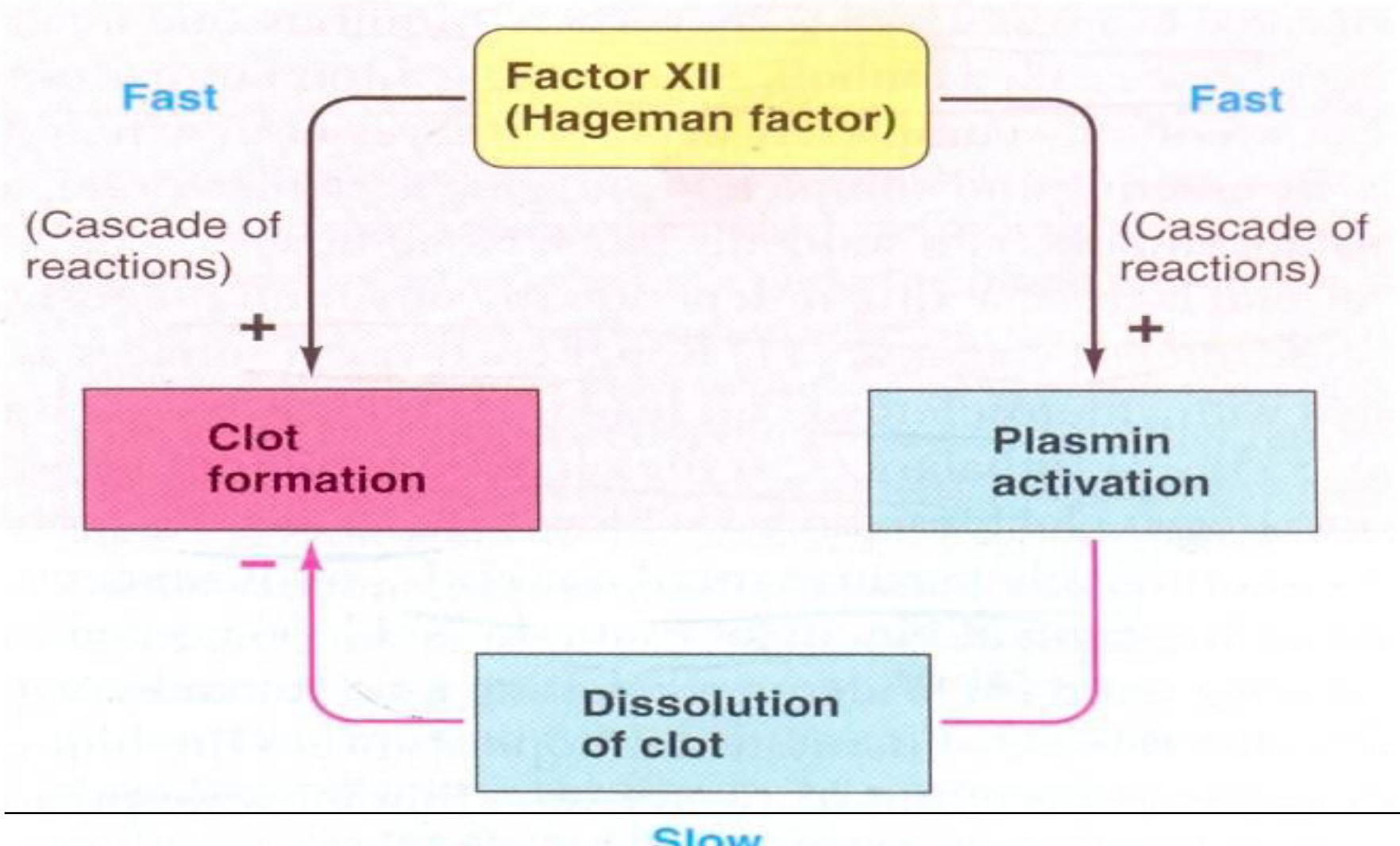
1. Formation of platelet plug
2. Electron micrograph shows that platelets become attached to fibrin as making bonds between fibrin fibers
3. Platelets release procoagulants e.g. fibrin stabilizing factor
4. Platelets cause retraction of clot by thrombosthenin, actin and myosin; pulling the edges of damaged vessel wall together.
5. Secretes platelet derived growth factor (PDGF)
6. Platelets release factors 1 - 7

PF-1 act as factor V

PF-3 act as thromboplastin

~~PF-5 act as fibrinogen~~

Fibrinolytic system



Fibrinolytic system

Plasminogen Activator → Plasminogen → Plasmin → Fibrin →

Fibrin Degradation Products

FDPs.

- Prevent platelet aggregation
- Inhibit thrombin formation
- Prevent fibrin polymerization

Plasmin digests fibrin plus factors I,II,V,VIII and XII