Blood Clotting Factors List, Names and Roles

Hemostasis is the physiological process that stops bleeding at the site of vascular injury. It involves a complex interaction between blood vessels, platelets, and plasma clotting factors. Hemostasis is broadly divided into:

- **Primary hemostasis** : Formation of a **soft platelet plug**
- **Secondary hemostasis** : Formation of a **stable fibrin clot** by converting fibrinogen into fibrin

Primary Hemostasis

This phase involves:

1. **Vasoconstriction** : Narrowing of blood vessels to reduce blood flow
2. **Platelet adhesion** : Platelets adhere to exposed subendothelial collagen
3. **Platelet activation** : Platelets change shape and release granule contents
4. **Platelet aggregation** : Platelets stick together forming a soft plug

Secondary Hemostasis

- Involves the **coagulation cascade** , where **fibrinogen** is converted to **fibrin** , stabilizing the platelet plug into a hard, insoluble clot.
- This process requires multiple **clotting factors** working through three interconnected pathways:
    - **Intrinsic pathway**
    - **Extrinsic pathway**
    - **Common pathway**

Coagulation Pathways and Clotting Factors

Pathway	Clotting Factors Involved	Notes
Intrinsic	XII (Hageman), XI (Plasma thromboplastin antecedent), IX (Christmas factor), VIII (Anti-hemophilic factor A)	Activated by damage inside vessel; slower pathway
Extrinsic	III (Tissue factor), VII (Stable factor)	Activated by external trauma; faster pathway
Common	X (Stuart-Prower), V (Labile factor), II (Prothrombin), I (Fibrinogen), XIII (Fibrin-stabilizing factor)	Final pathway producing fibrin clot

High yield Points

- **Factor IV = Calcium ion (Ca^{2}?)** : Essential cofactor in all three pathways for enzymatic activation
- Many clotting factors are **serine proteases** , including Factors II, VII, IX, and X, meaning they act as enzymes to cleave peptide bonds in the cascade.
- Most clotting factors are synthesized in the **liver hepatocytes** , including:
  - I (Fibrinogen), II (Prothrombin), V, VII, IX, X, XI, XII, XIII
- Exceptions:
  - **Factor VIII (Anti-hemophilic factor A)** is produced by **endothelial cells**
  - **Factor III (Tissue factor or thromboplastin)** is expressed by **extrinsic tissues** and endothelial cells

Factor	Name/Function	Source	Notes
I	Fibrinogen	Liver	Precursor to fibrin
II	Prothrombin	Liver	Converted to thrombin
III	Tissue factor (Thromboplastin)	Endothelial cells/tissues	Initiates extrinsic pathway
IV	Calcium ion	Dietary/Plasma	Cofactor in coagulation
V	Labile factor	Liver	Cofactor in common pathway
VII	Stable factor	Liver	Initiates extrinsic pathway
VIII	Anti-hemophilic factor A	Endothelial cells	Deficiency ? Hemophilia A
IX	Christmas factor	Liver	Deficiency ? Hemophilia B
X	Stuart-Prower factor	Liver	Activation ? Common pathway
XI	Plasma thromboplastin antecedent	Liver	Intrinsic pathway
XII	Hageman factor	Liver	Initiates intrinsic pathway
XIII	Fibrin-stabilizing factor	Liver	Cross-links fibrin to stabilize clot