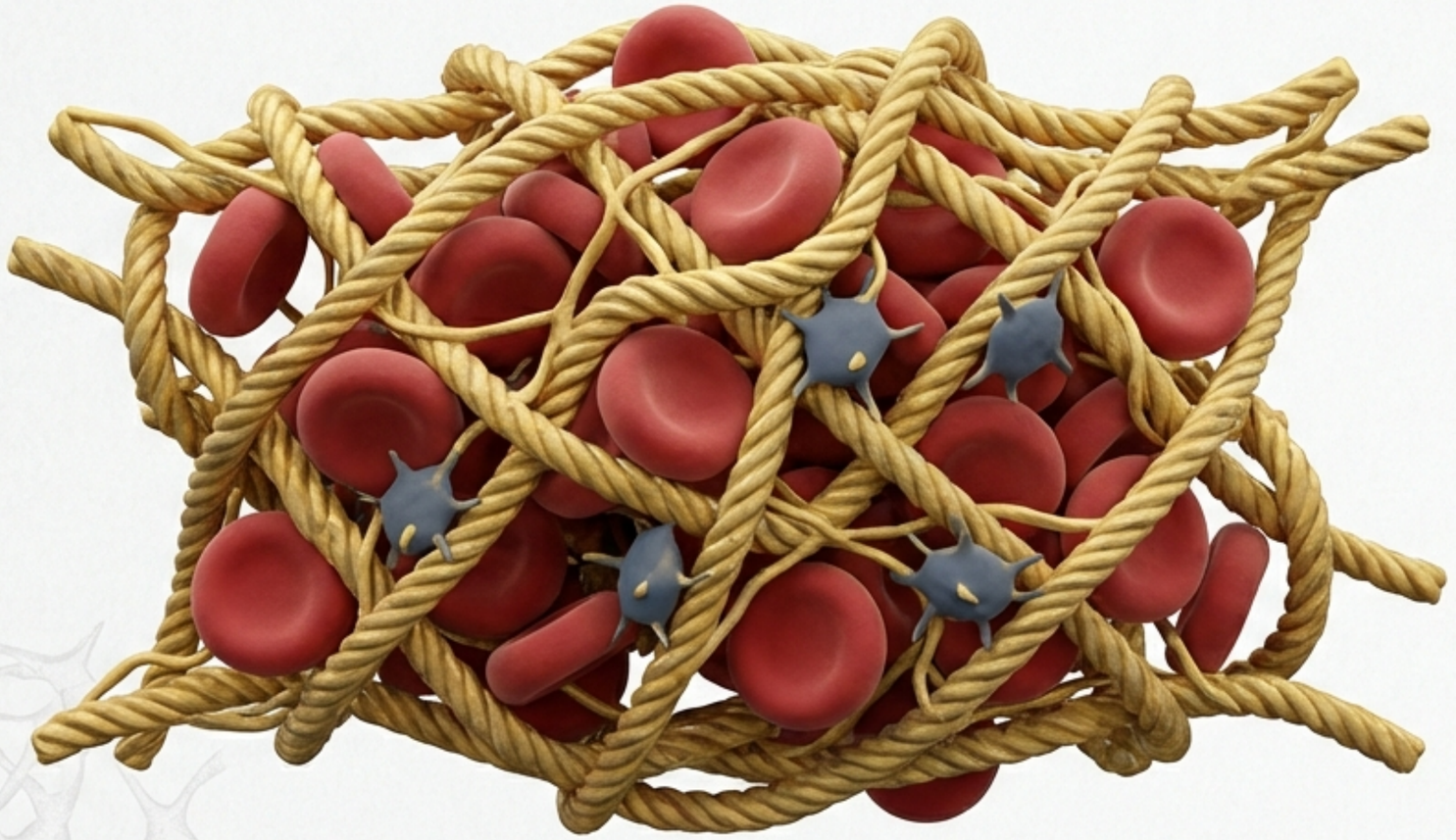
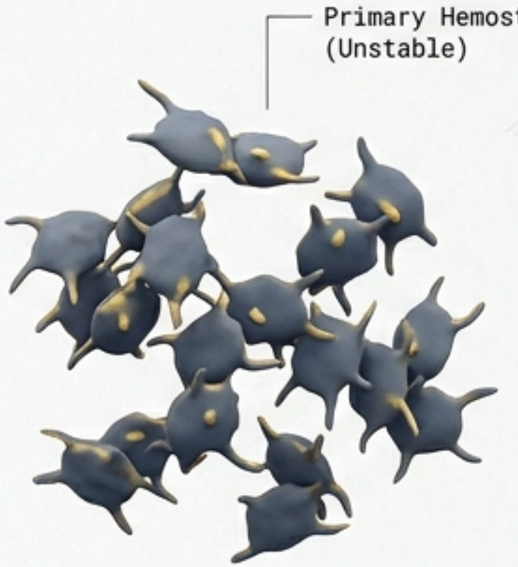
Secondary Hemostasis & Coagulation Disorders

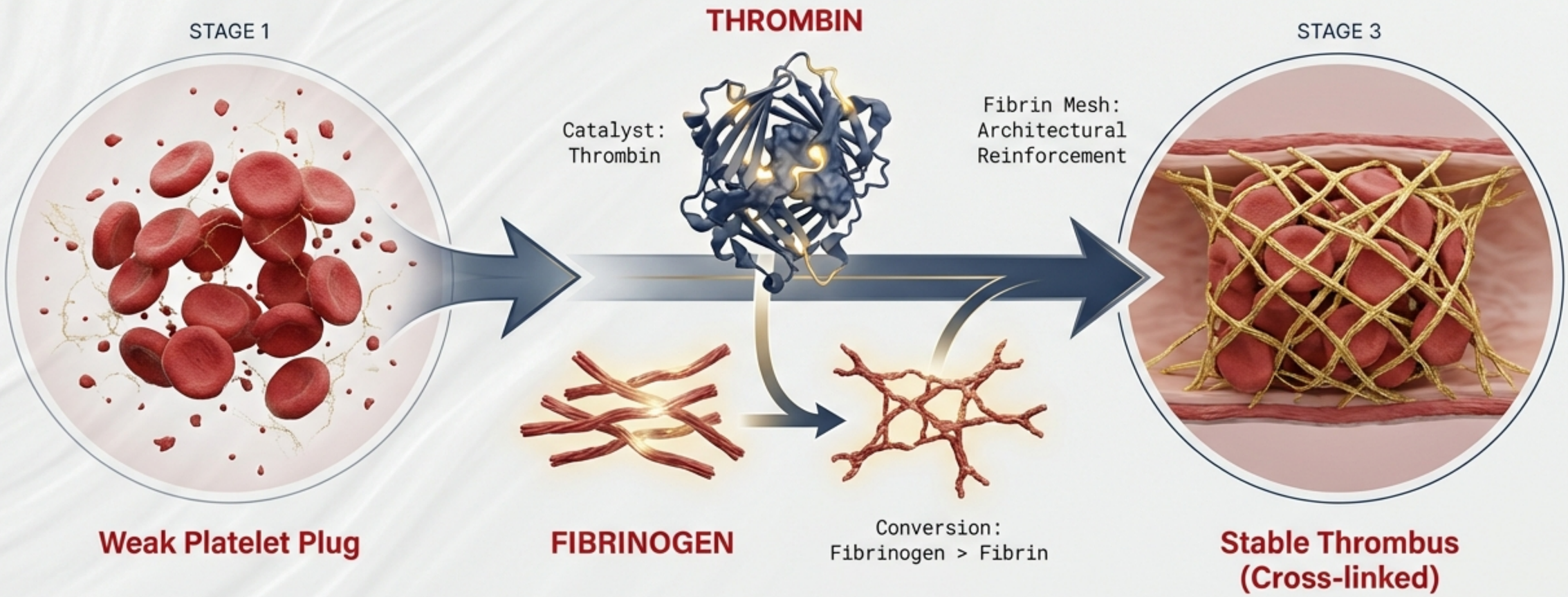
Mechanisms, Pathology, and Diagnostic Differentiators



Fibrin Mesh.



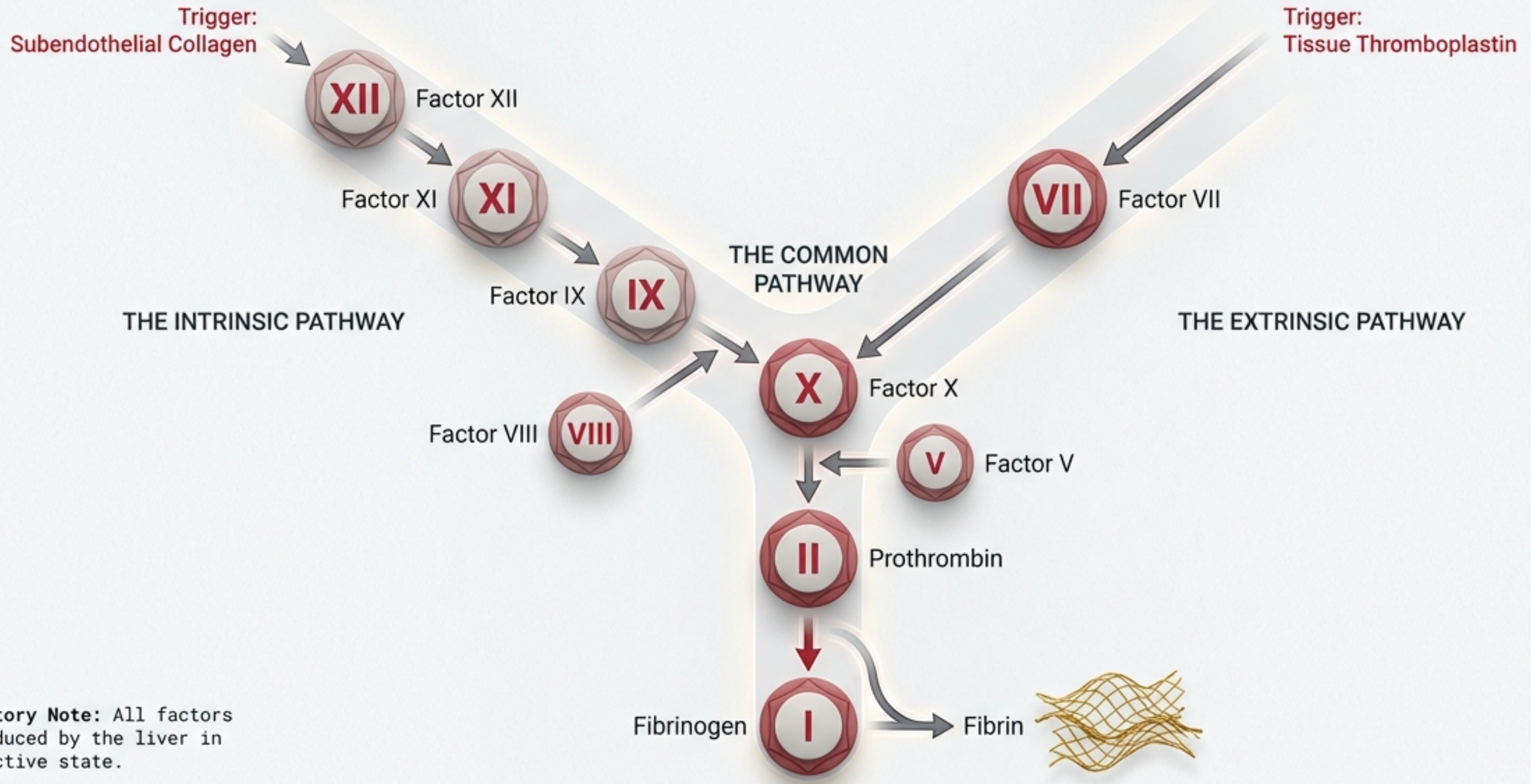
The Objective: Stabilizing the Platelet Plug



Secondary hemostasis exists to stabilize the temporary platelet plug via the coagulation cascade. Without this architectural reinforcement, the plug remains unstable and prone to failure.

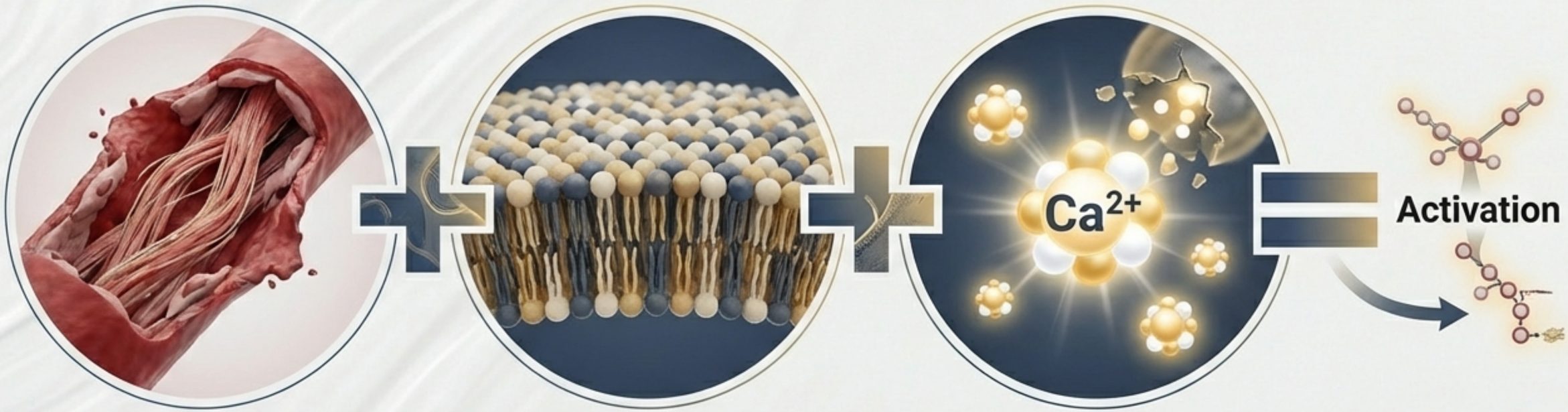
BIOLOGICAL ARCHITECTURE

The Machinery: The Coagulation Cascade



Factory Note: All factors produced by the liver in inactive state.

Activation Requirements



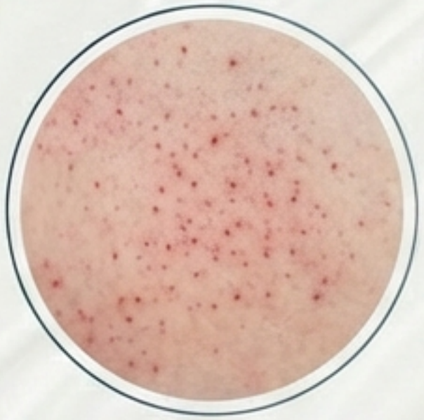
Exposure
(Thromboplastin or Collagen)

Phospholipid Surface

Calcium
(from Platelet Dense Granules)

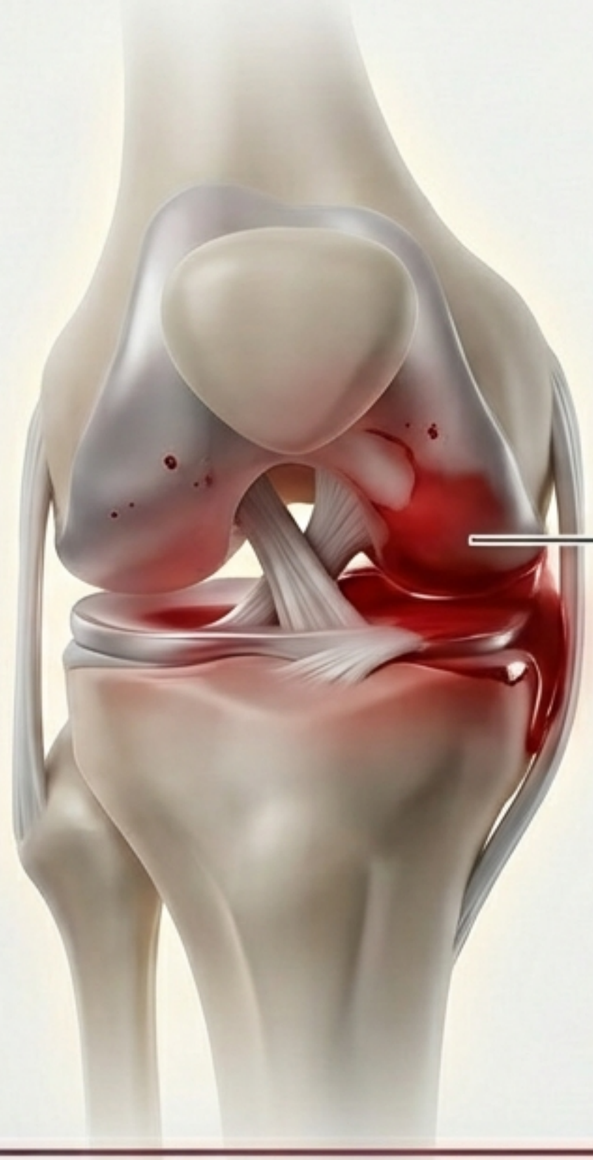
Activation is not automatic. The cascade requires specific environmental triggers, a phospholipid workspace, and chemical fuel.

Clinical Features of Failure



Primary Defect:
Petechiae (Mucosal/Skin)

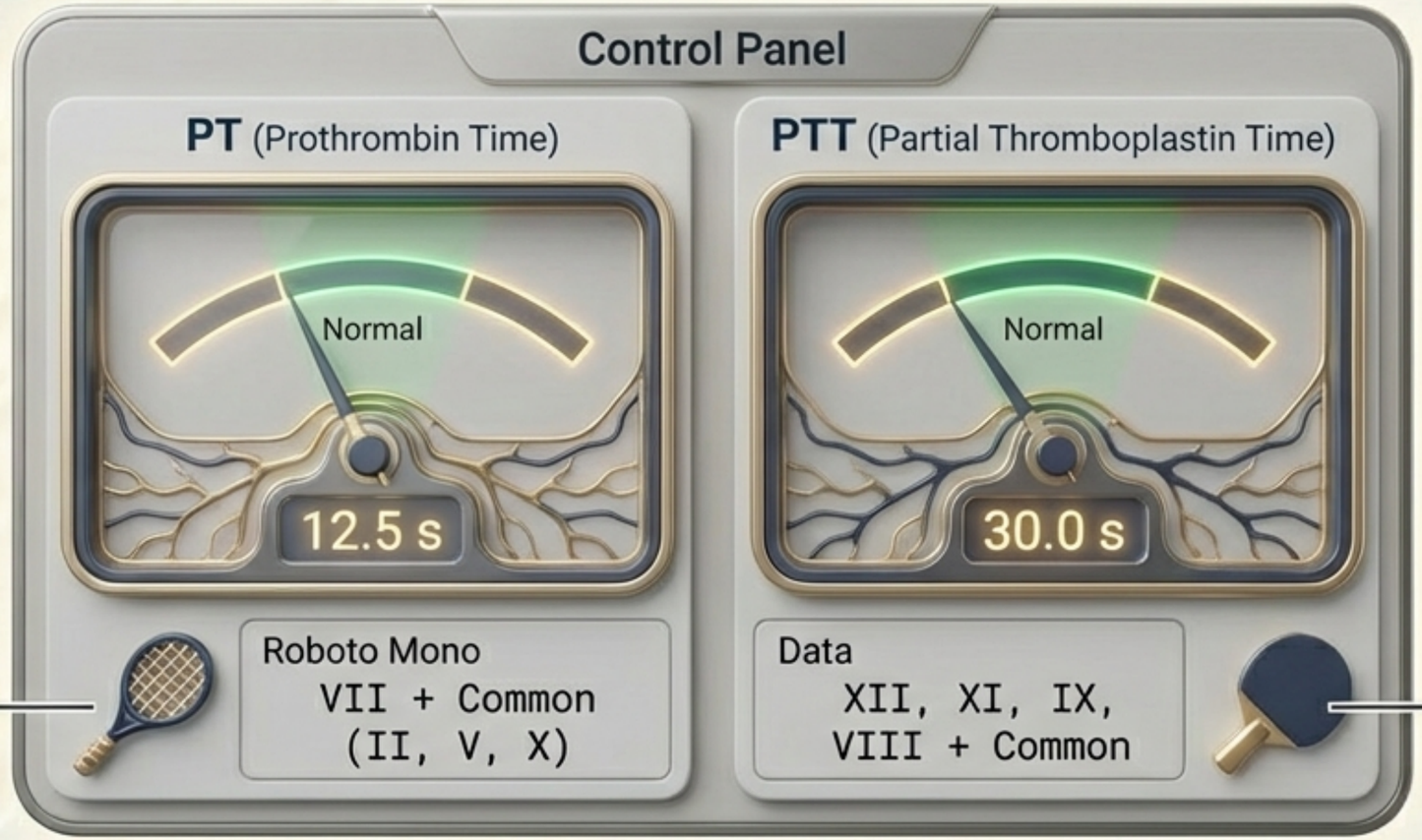
- Deep Tissue Bleeding (Muscles/Joints)
- Post-Surgical Rebleeding
  (e.g., wisdom teeth extraction)
- Delayed onset compared to primary defects



Secondary Defect:
Deep Tissue &
Joint Bleeding

The Diagnostic Toolkit

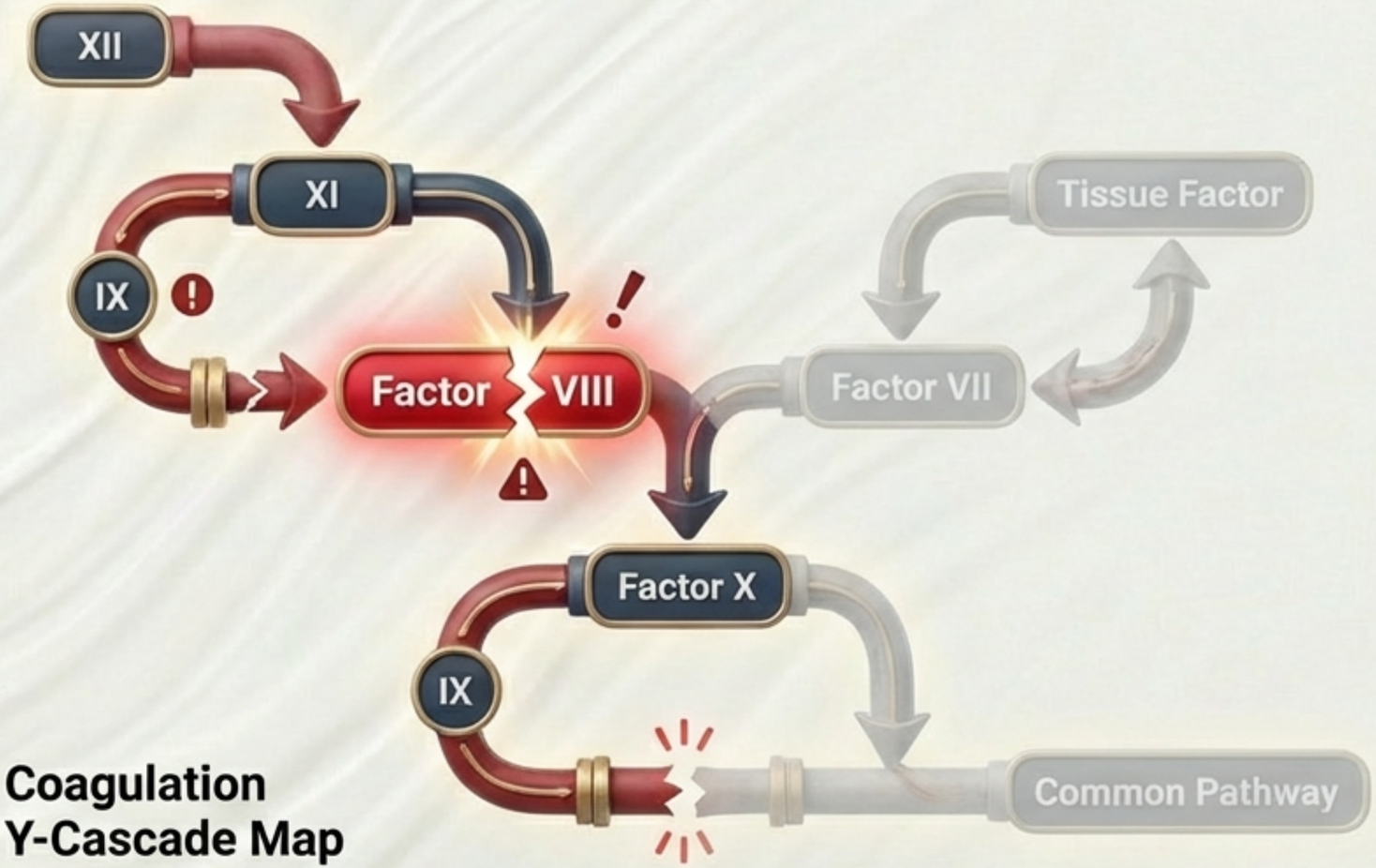
Play Tennis
(Outside = Extrinsic)



Play Table Tennis
(Inside = Intrinsic)

These two tests act as a compass, isolating specific arms of of the coagulation cascade to localize the defect.

Hemophilia A: The Factor VIII Defect



Coagulation Y-Cascade Map

Genetics:

X-linked recessive (80% males) or *de novo* mutation.

Lab Profile:

PTT: [PROLONGED] (Intrinsic Defect)

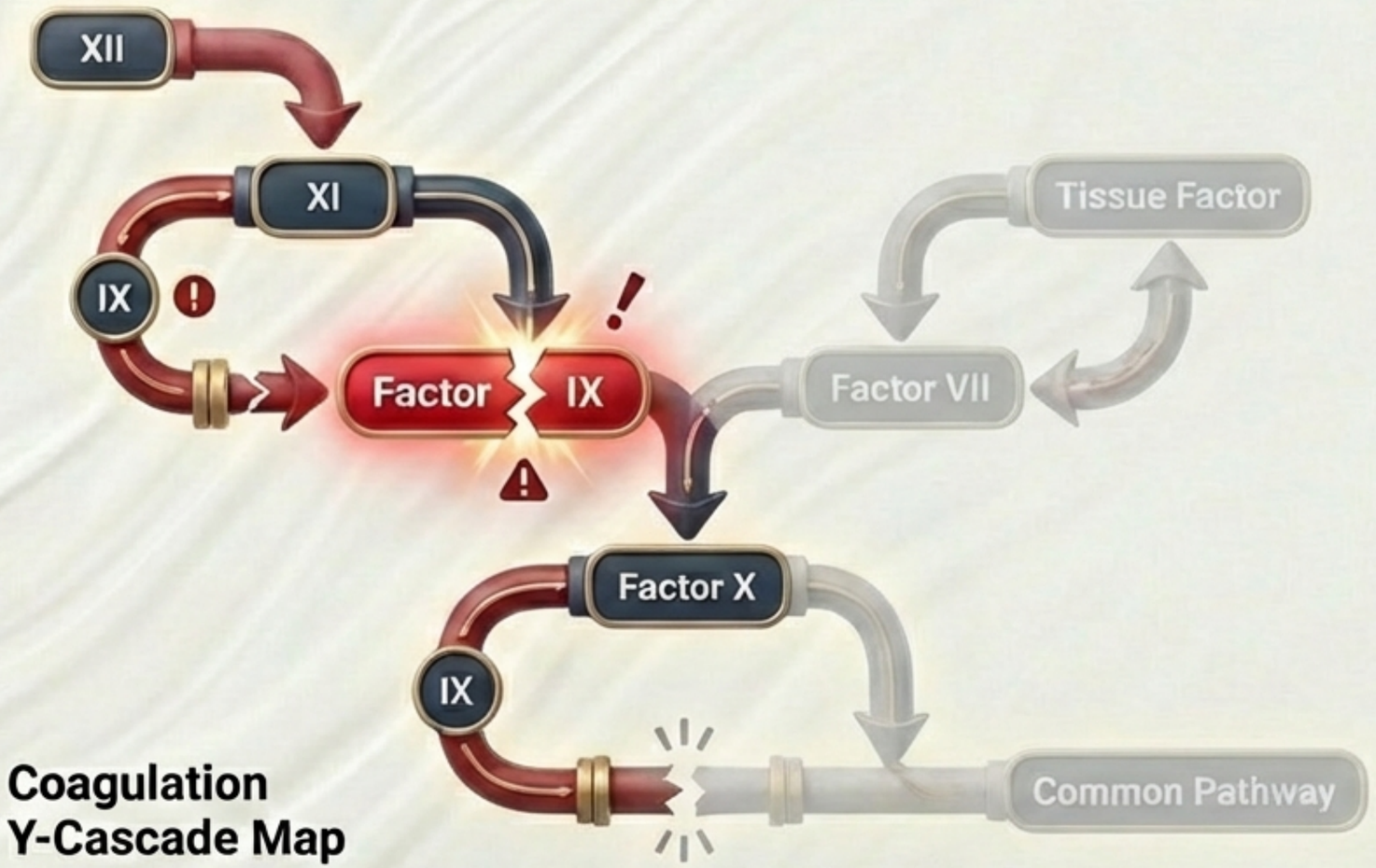
PT: [NORMAL]

Platelets: [NORMAL]

Treatment:

Recombinant FVIII

Hemophilia B (Christmas Disease)



Coagulation Y-Cascade Map

Clinical Presentation:
Indistinguishable from Hemophilia A.

Genetics:
Factor IX Deficiency.

Differentiation:
Requires specific factor assay.

Lab Profile:
PTT: [PROLONGED]
PT: [NORMAL]

The Mimic: Coagulation Factor Inhibitors

The Mixing Study

Patient Plasma
(High PTT)

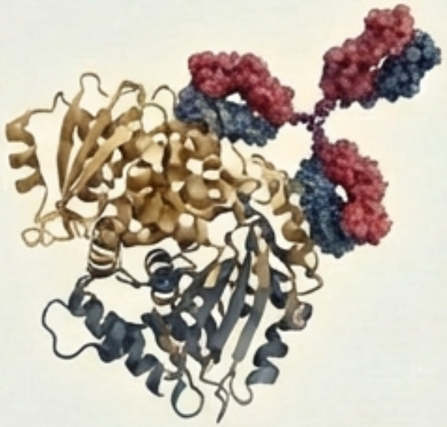
Normal Plasma
(All Factors)

PTT Corrects. → Normal plasma replaced the missing factor.

→ **Hemophilia** (Deficiency).

PTT Does Not Correct. → Patient antibodies neutralized the added factors.

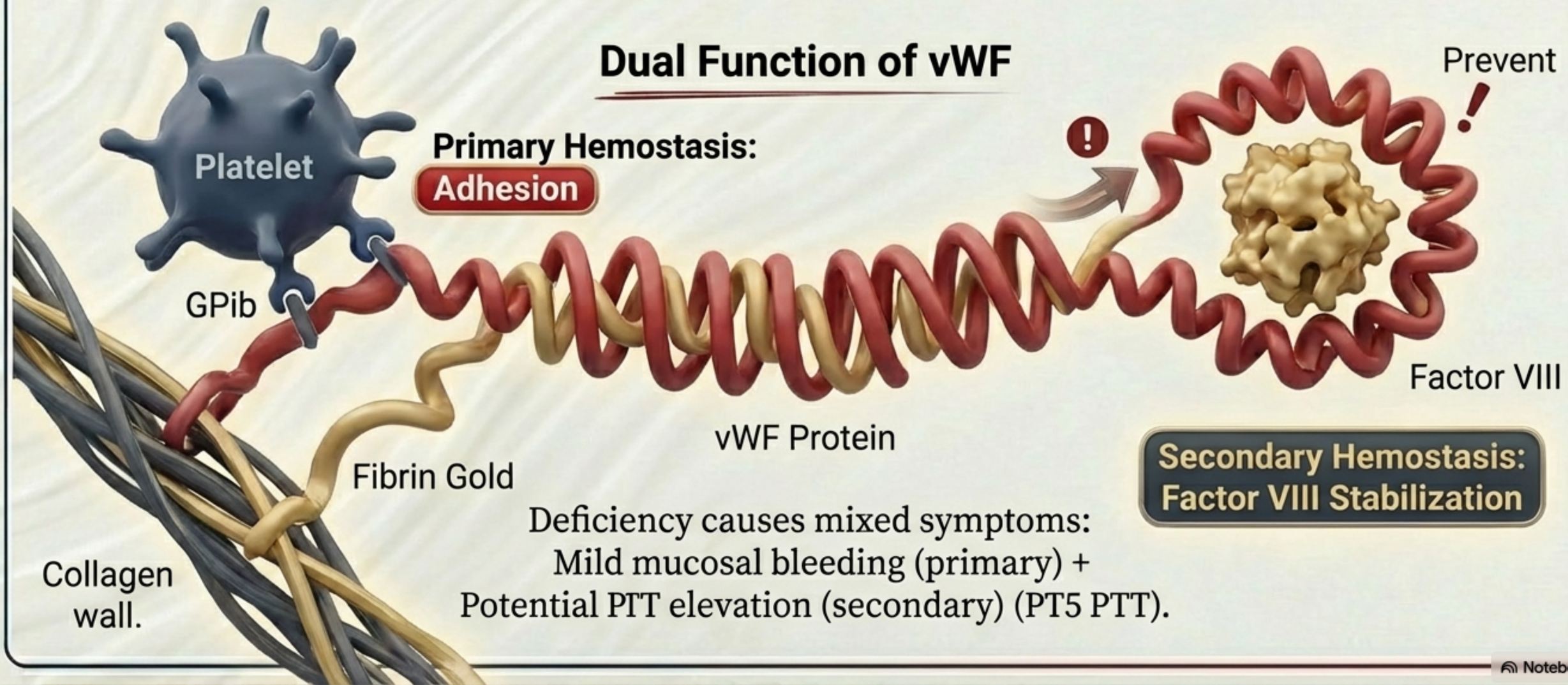
→ **Inhibitor Present** (e.g., Anti-FVIII)



Antibody blocking Factor VIII.

Von Willebrand Disease: A Complex Defect

The most common inherited coagulation disorder.

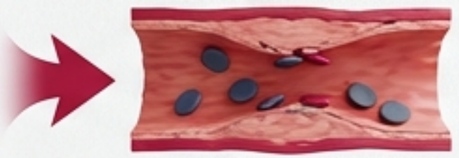


Deficiency causes mixed symptoms:
Mild mucosal bleeding (primary) +
Potential PTT elevation (secondary) (PT5 PTT).

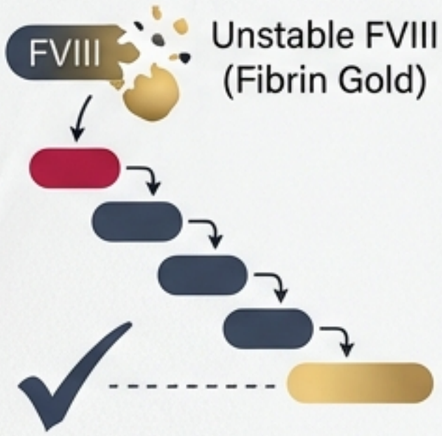
Diagnosing & Treating vWD

Lab Values

Bleeding Time:
[PROLONGED]
(Adhesion defect)

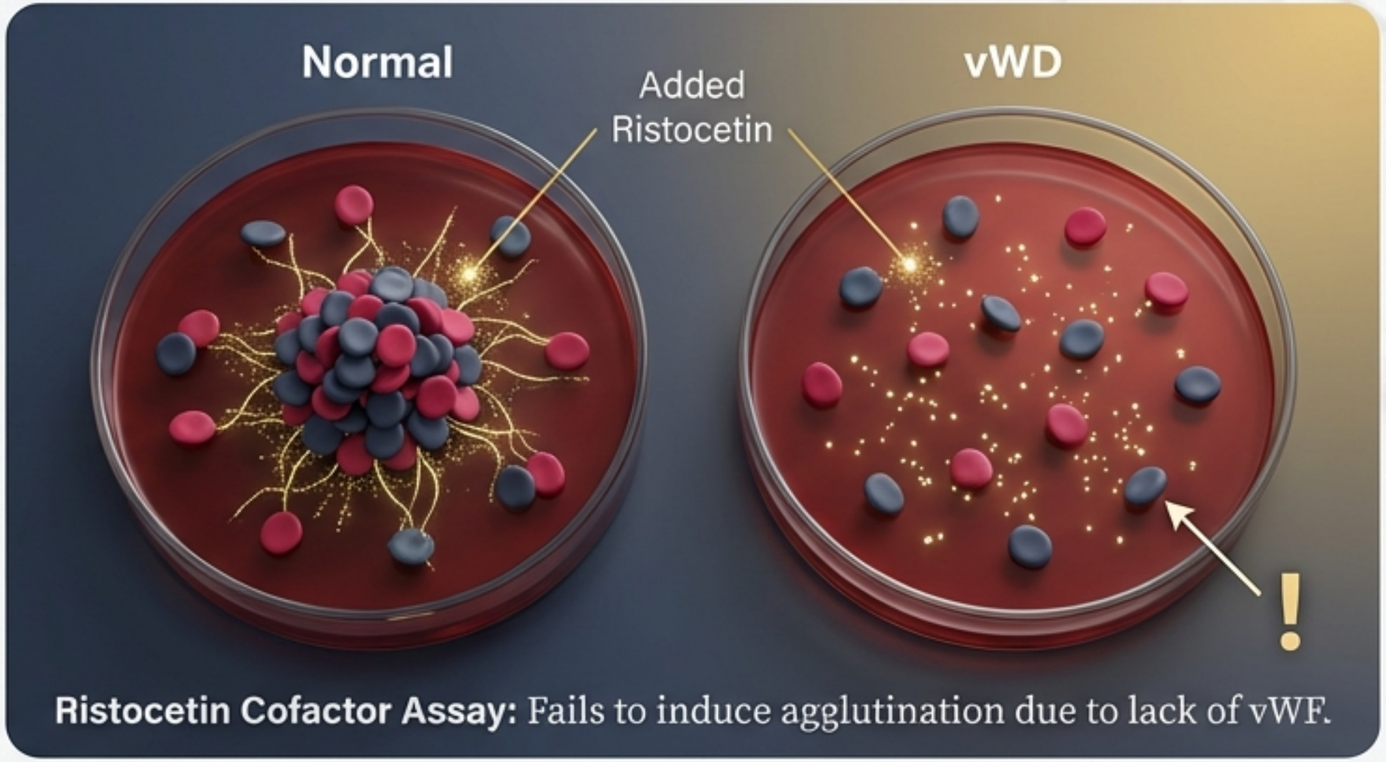


PTT:
[PROLONGED]
(Destabilized FVIII)



PT:
[NORMAL] ✓

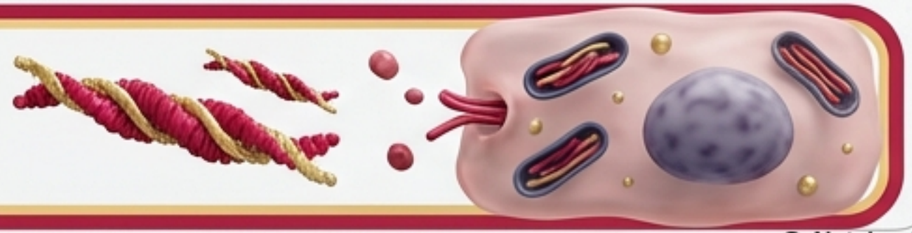
The Ristocetin Test



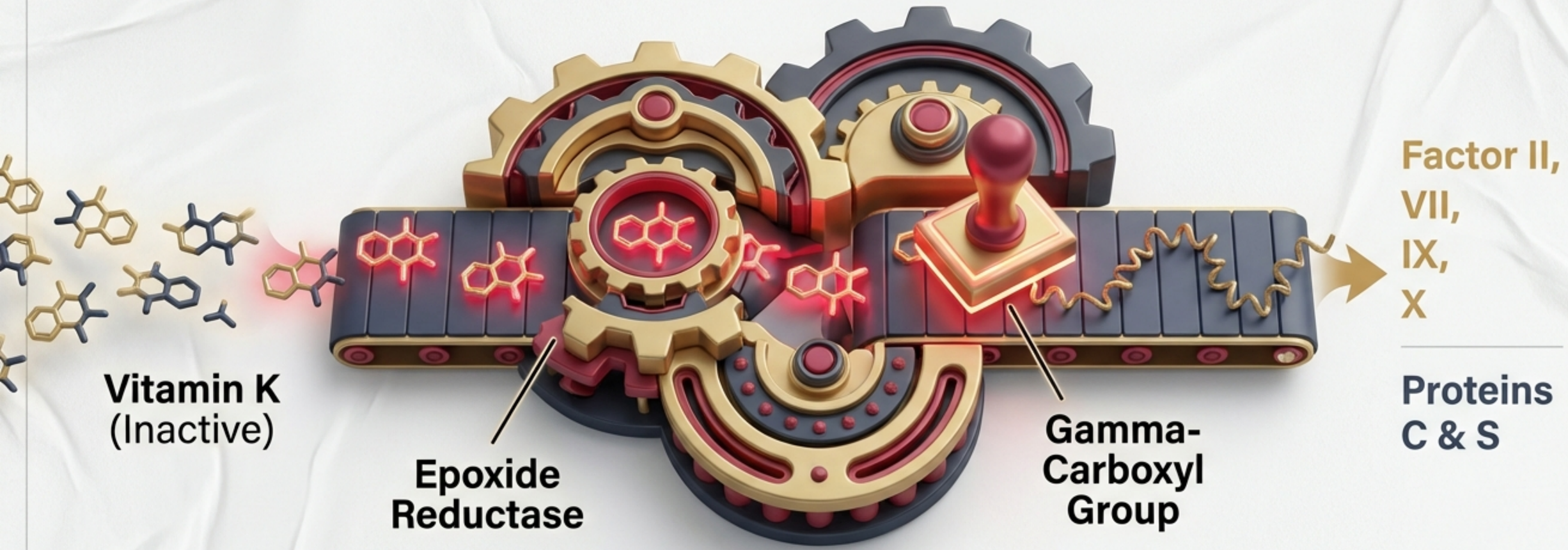
Ristocetin Cofactor Assay: Fails to induce agglutination due to lack of vWF.

Treatment: Desmopressin

(Induces vWF release from endothelial Weibel-Palade bodies).



Supply Chain: The Role of Vitamin K



Gamma-carboxylation is essential for function.
Disruption affects factors in BOTH the Intrinsic and Extrinsic pathways.

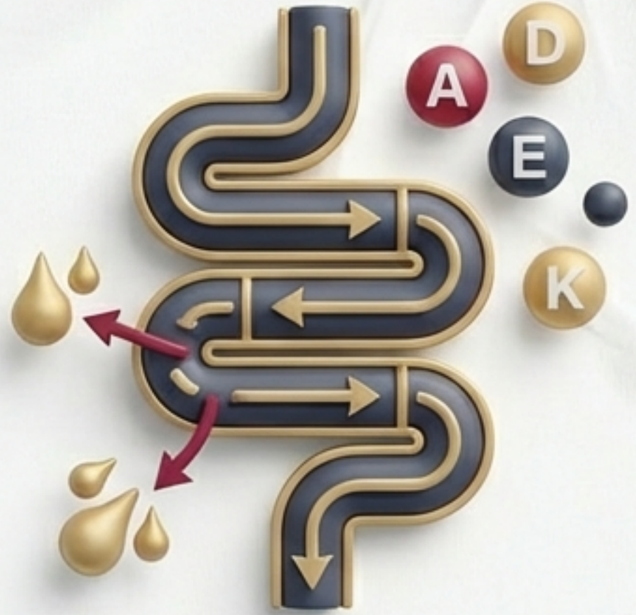
Causes of Vitamin K Deficiency

Newborns

Sterile gut lacks synthesizing bacteria. Requires prophylactic injection at birth.

Antibiotics

Long-term therapy destroys Vitamin K-producing gut flora.

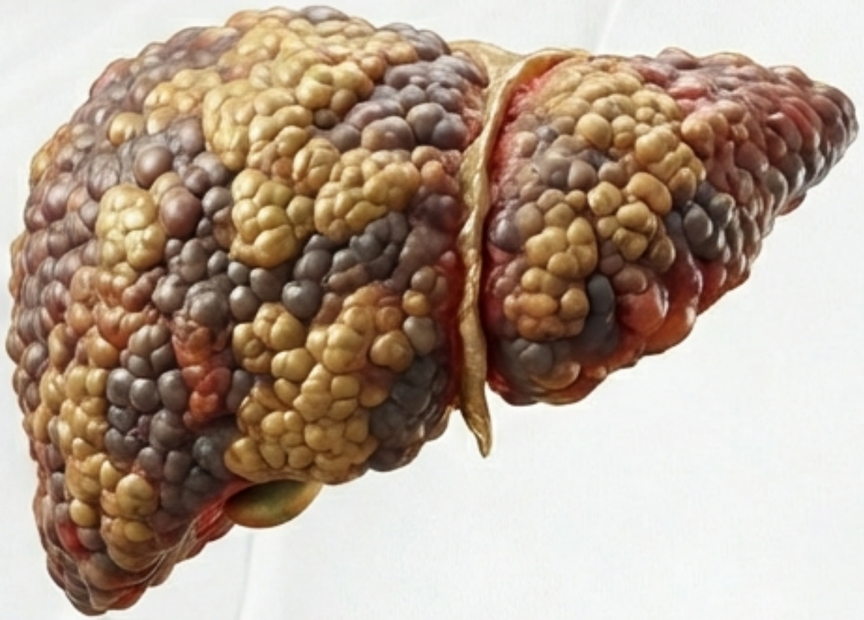


Malabsorption

Deficiency of fat-soluble vitamins (A, D, E, K).

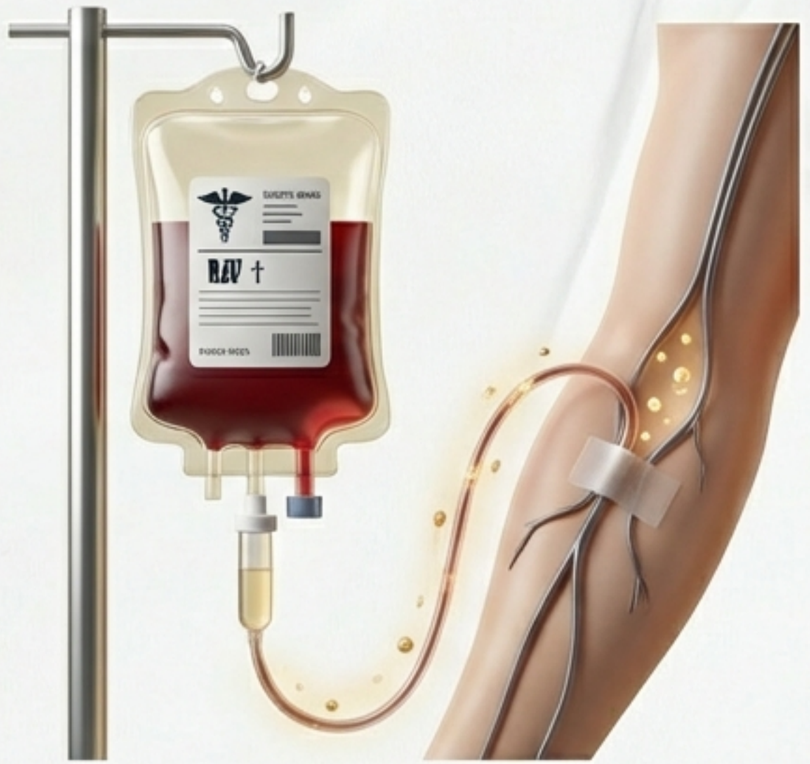
Systemic Causes: Liver Failure & Dilution

The Factory Shutdown



Decreased production of factors + Decreased activation of Vit K. Monitored via **PT**.

The Dilution Effect



Adding volume without coagulation factors leads to relative deficiency.

Clinical Summary Matrix

Disorder	Pathology	PT	PTT	Clinical Notes
Hemophilia A	Factor VIII Def	Normal	UP (Prolonged) in Fibrin Gold →	X-linked. PTT corrects with mixing.
Hemophilia B	Factor IX Def	Normal	UP (Prolonged) in Fibrin Gold →	Clinically identical to A.
Coag Inhibitor	Anti-FVIII Antibody	Normal	UP (Prolonged) in Fibrin Gold →	PTT does NOT correct with mixing.
Von Willebrand	vWF Def	Normal	UP (Prolonged) in Fibrin Gold →	Increased Bleeding Time. Ristocetin Abnormal.
Vit K Def / Liver	General Failure	UP (Prolonged) in Fibrin Gold →	UP (Prolonged) in Fibrin Gold →	Affects Factors II, VII, IX, X, C, S.