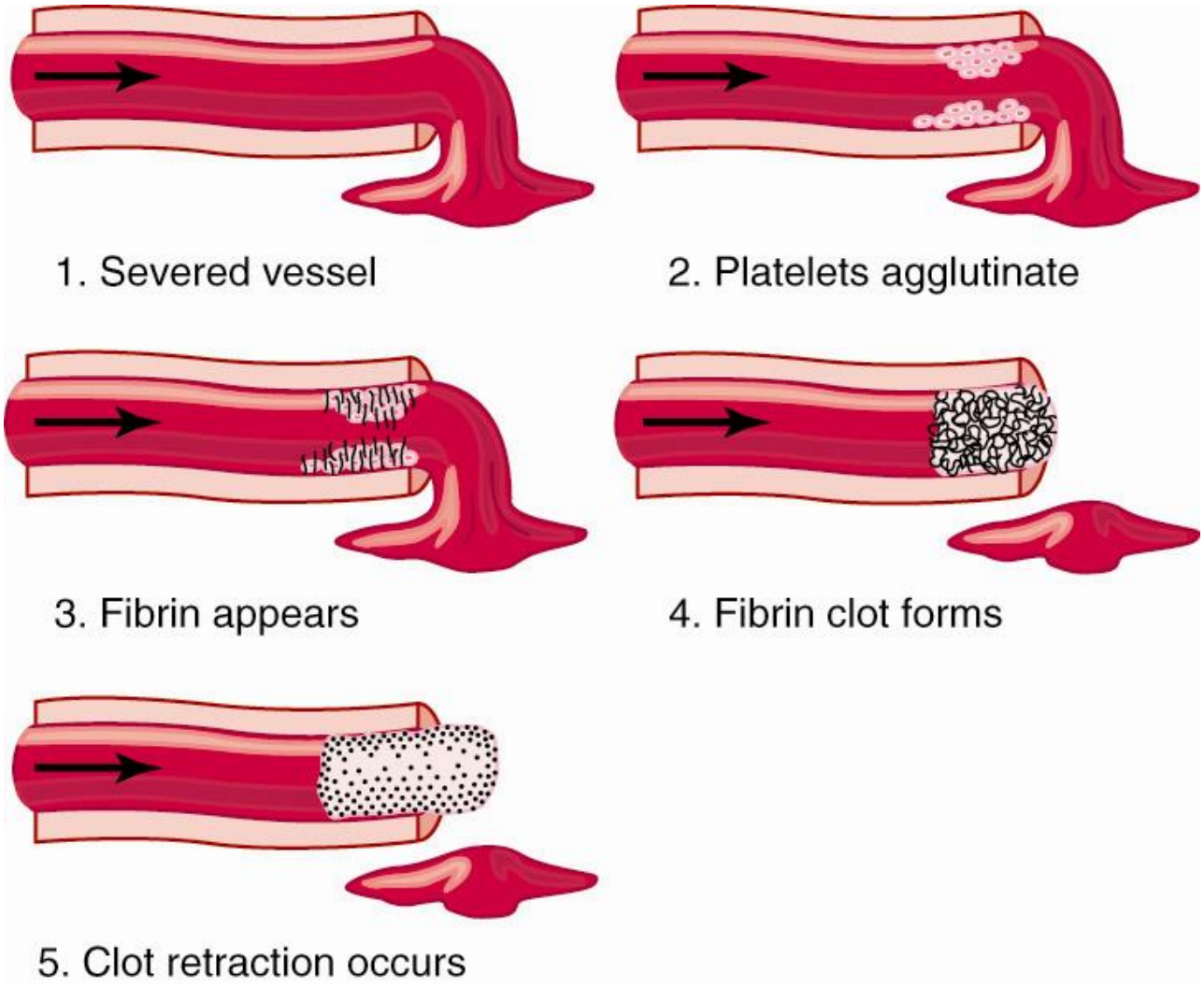
Hemostasis
and
Blood Coagulation

Hemostasis

1. Vascular Spasm
2. Platelet plug
3. Formation of clot
4. Clot Retraction

Steps of Hemostasis



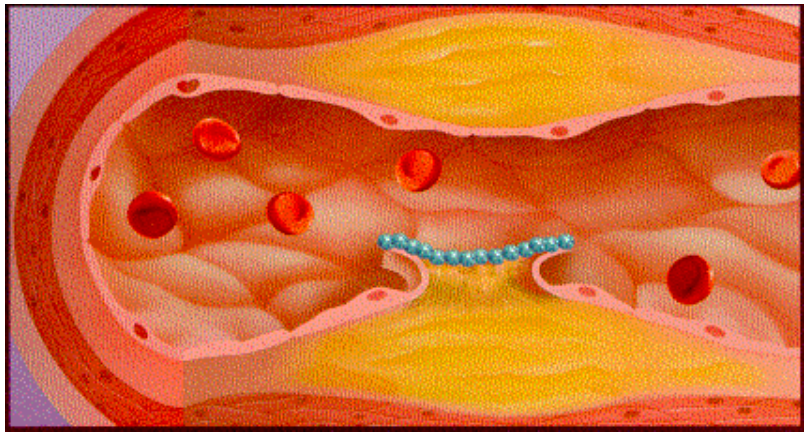
Platelet Functions

Begins with Platelet activation

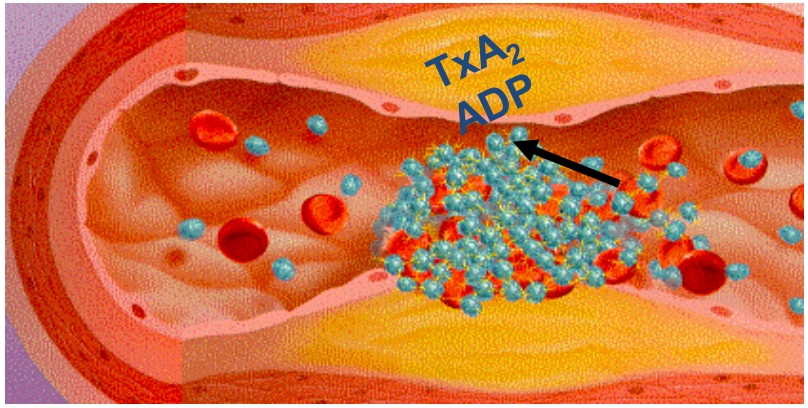
Platelet Activation

- Adhesion
- Secretion
- Aggregation

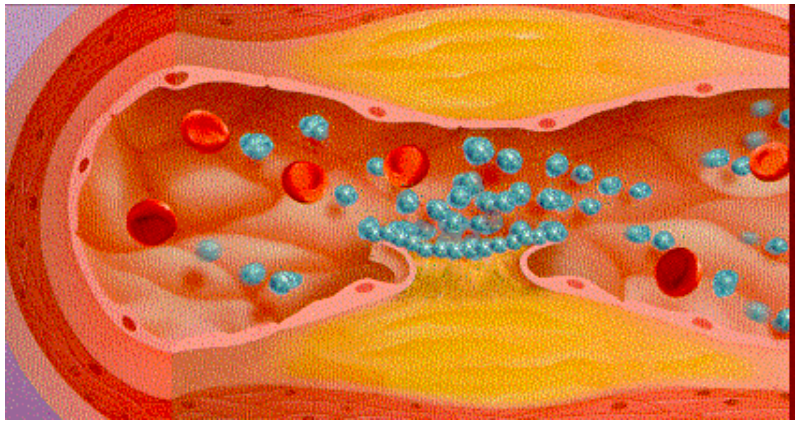
Platelet function



Adhesion



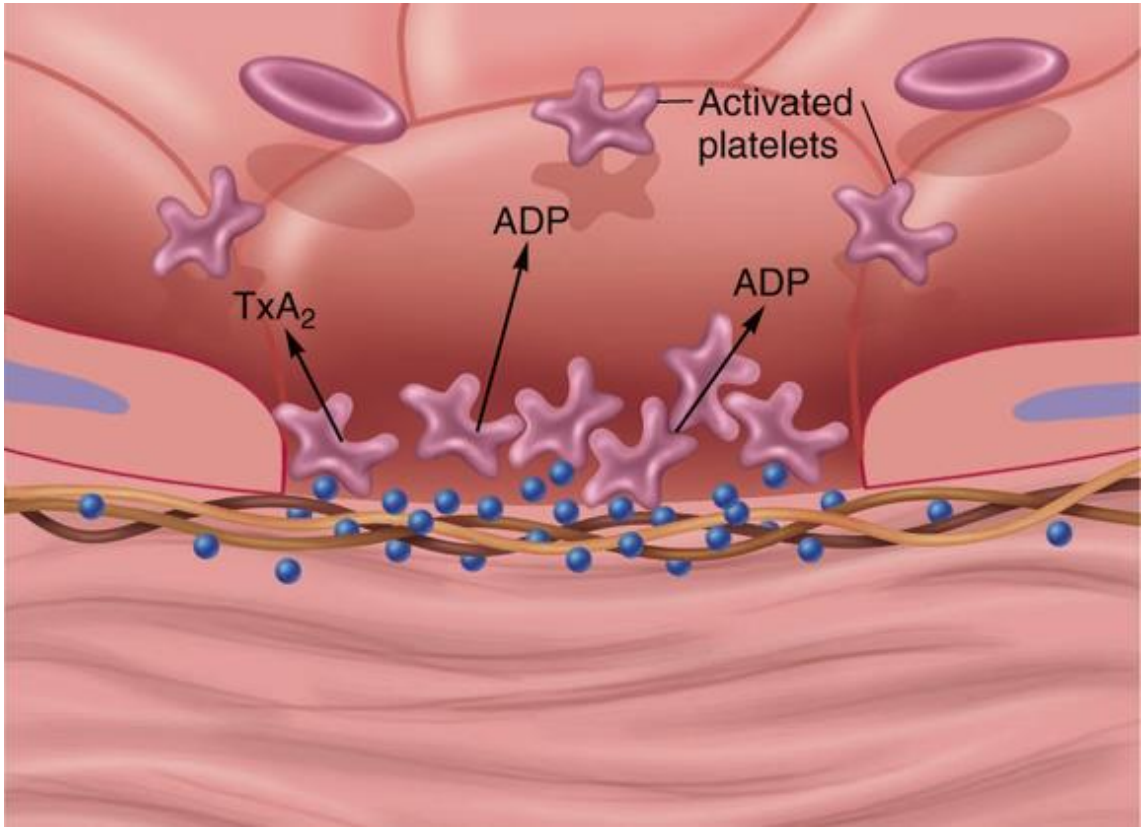
Secretion



Aggregation

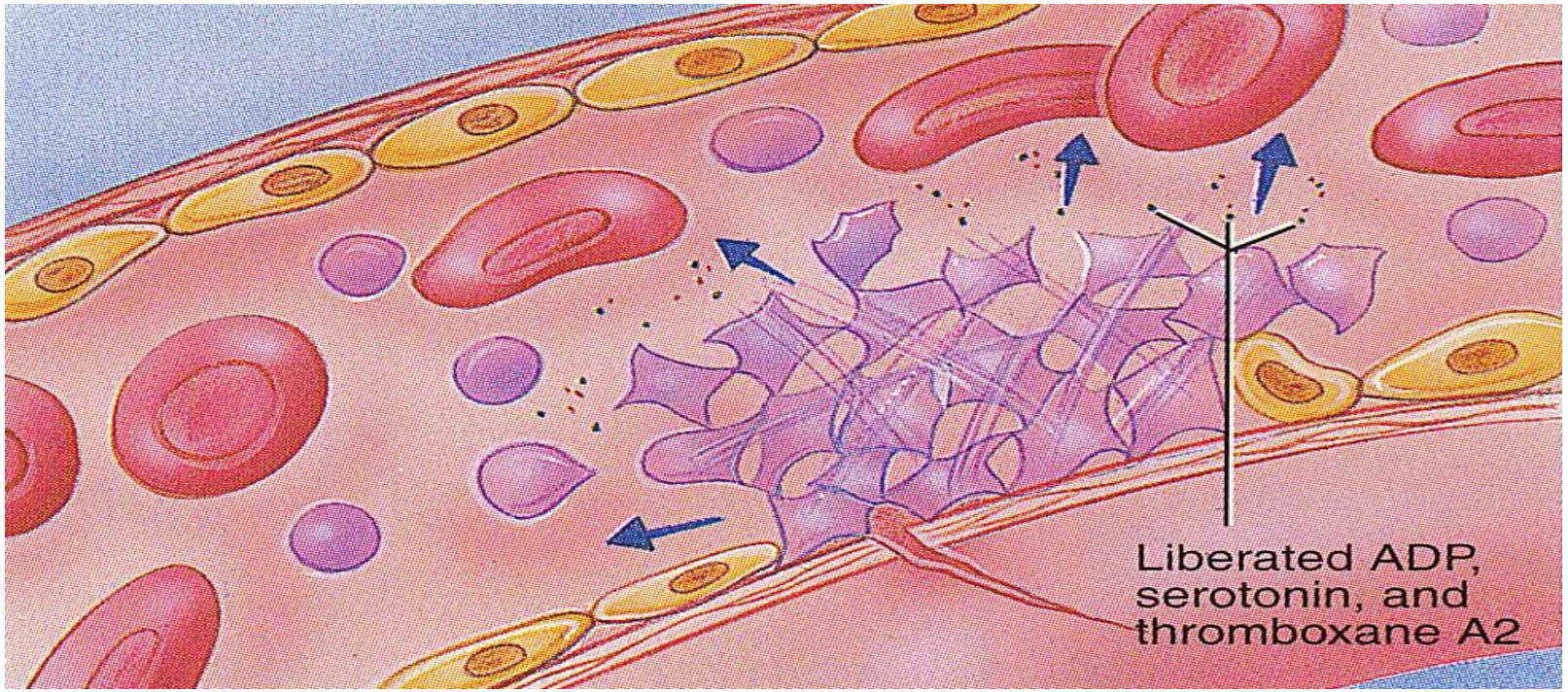
Platelet Adhesion

Platelets stick to Von WilleBrand Factor released from the damaged endothelial cells in vessel wall



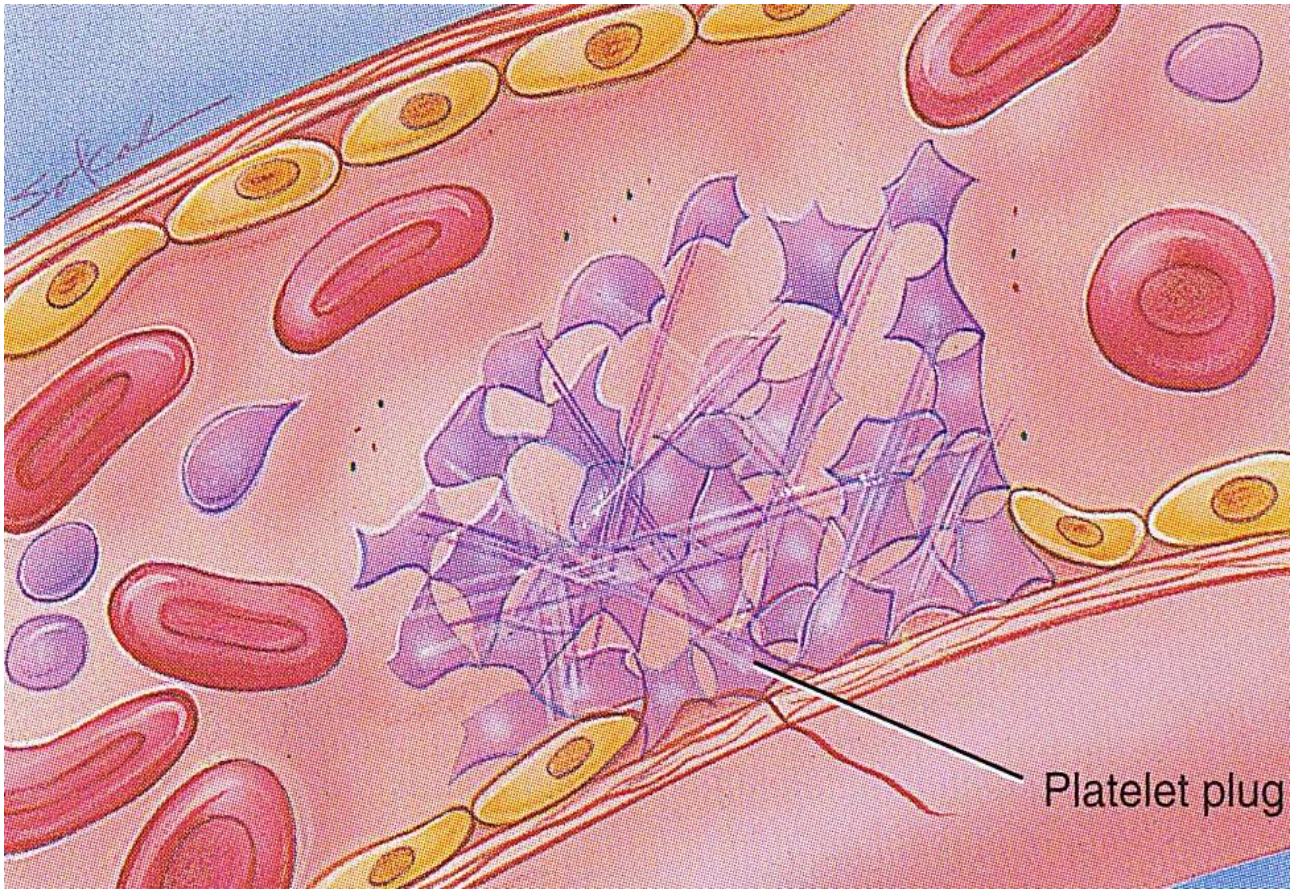
Platelet Release Reaction

- Platelets activated by adhesion
- Extend projections to make contact with each other
- Release Thromboxane A2, Serotonin & ADP activating other platelets
- Serotonin & Thromboxane A2 are vasoconstrictors.
- ADP causes stickiness



Platelet Aggregation

- Activated platelets stick together and activate new platelets to form a mass called a Platelet Plug
- Plug reinforced by fibrin threads formed during clotting process

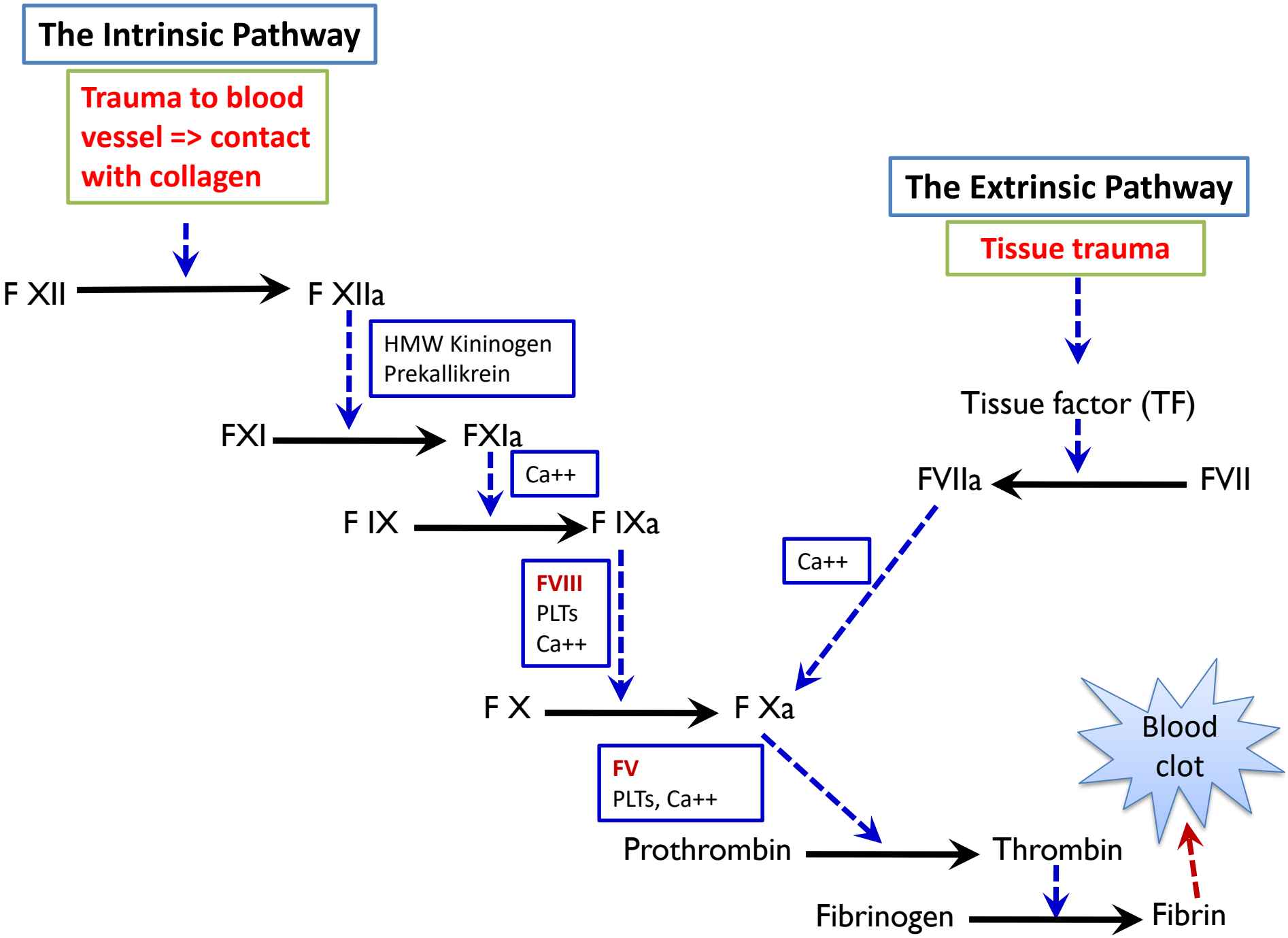


Blood coagulation

- Initiation on blood coagulation occurs by two ways:

1. ***The extrinsic pathway***: initiated by trauma to the tissue.

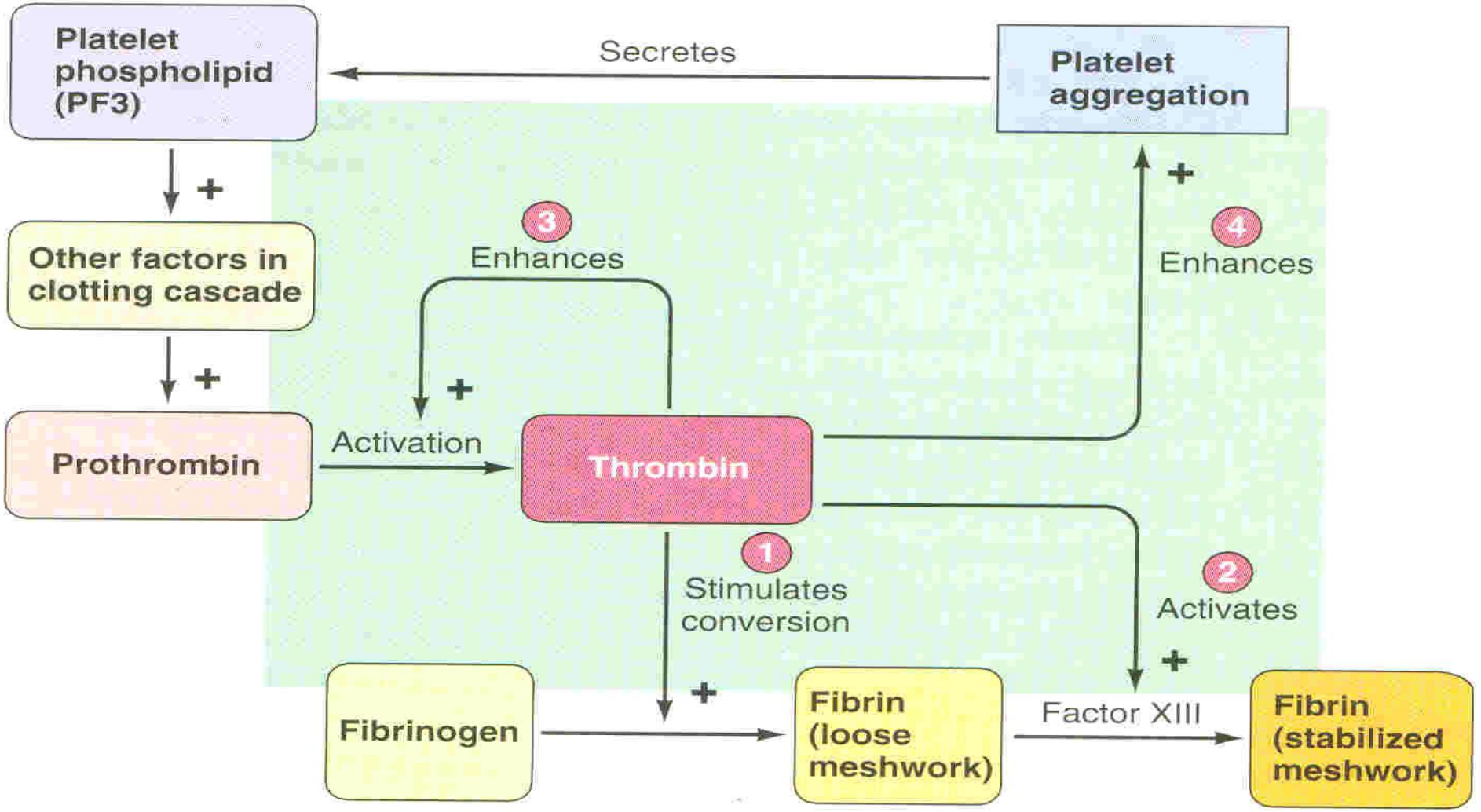
2. ***The intrinsic pathway***: initiated by injury to the blood vessel.


The Intrinsic Pathway
Trauma to blood vessel => contact with collagen
F XII
F XIIa
HMW Kininogen
Prekallikrein
FXI
FXIa
Ca++
F IX
F IXa
FVIII
PLTs
Ca++
F X
F Xa
FV
PLTs, Ca++
Prothrombin
Thrombin
Fibrinogen
Fibrin
Blood clot
The Extrinsic Pathway
Tissue trauma
Tissue factor (TF)
FVIIa
FVII
Ca++

ROLE OF CALCIUM IONS IN CLOTTING

- No $Ca^{++} \rightarrow$ No Clotting
- Blood samples are prevented from clotting by adding:
  - Citrate ions $\rightarrow$ Deionization of Ca^{++}
  - Oxalate ions $\rightarrow$ ppt the Ca^{++}

ROLE OF THROMBIN IN HEMOSTASIS



Coagulation Defects

I. Hepatic (liver) Disease

e.g. Hepatitis, Cirrhosis

Decreased formation of clotting factors

Increased clotting time

II. Vitamin K deficiency

required for II (prothrombin), VII, IX, and X

III. Hemophilia

Factor VIII (hemophilia A , 1/10,000),

Factor IX (hemophilia B, 1/100,000)

IV. Thrombocytopenia

Low number of platelets

HEMOPHILIA

- **HEMOPHILIA - A**
  - Classic Hemophilia
  - 85 % cases
  - Def. Of factor VIII
- **HEMOPHILIA - B**
  - 15 % cases
  - Def. Of factor IX

HEMOPHILIA

- **Genetic disorders**
- **Transmitted by female chromosome as recessive trait, it is X linked.**
- **Occurs exclusively in male. Females are carriers.**
- **<u>Clinical Features</u>**

  Easy bruising, massive bleeding after trauma or operation, hemorrhages in joints

  – Rx

  - **Injection of factor VIII (Hemophilia A)**
  - **Injection of factor IX (Hemophilia B)**

THROMBOCYTOPENIA

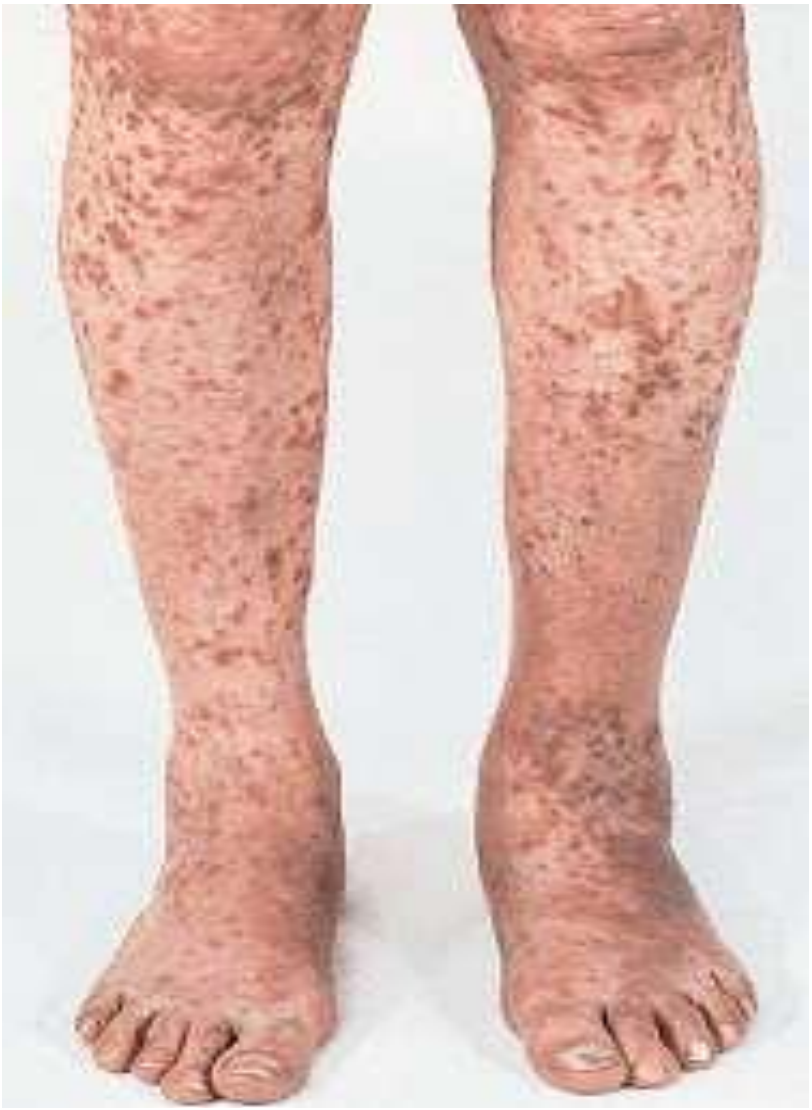
- PLT count upto 50,000 ul
- Less than 10,000 ------ Fatal
- ETIOLOGY
- Decreased production
  - Aplastic anemia
  - Leukemia
  - Drugs
  - Infections (HIV, Measles)

THROMBOCYTOPENIA

- **Clinical Features**
  - **Easy brusability**
  - **Epistaxis**
  - **Gum bleeding**
  - **Hemorrhage after minor trauma**
  - **Petechiae/Ecchumosis**

THROMBOCYTOPENIA

- **Diagnosis**
  - **PLT decreased**
  - **Bleeding Time increased**
- **Rx**
  - **Rx of the underlying cause**
  - **PLT concentrates**
  - **Fresh whole blood transfusion**
  - **Splenectomy**



Thank you
For
NOT
SLEEPING!