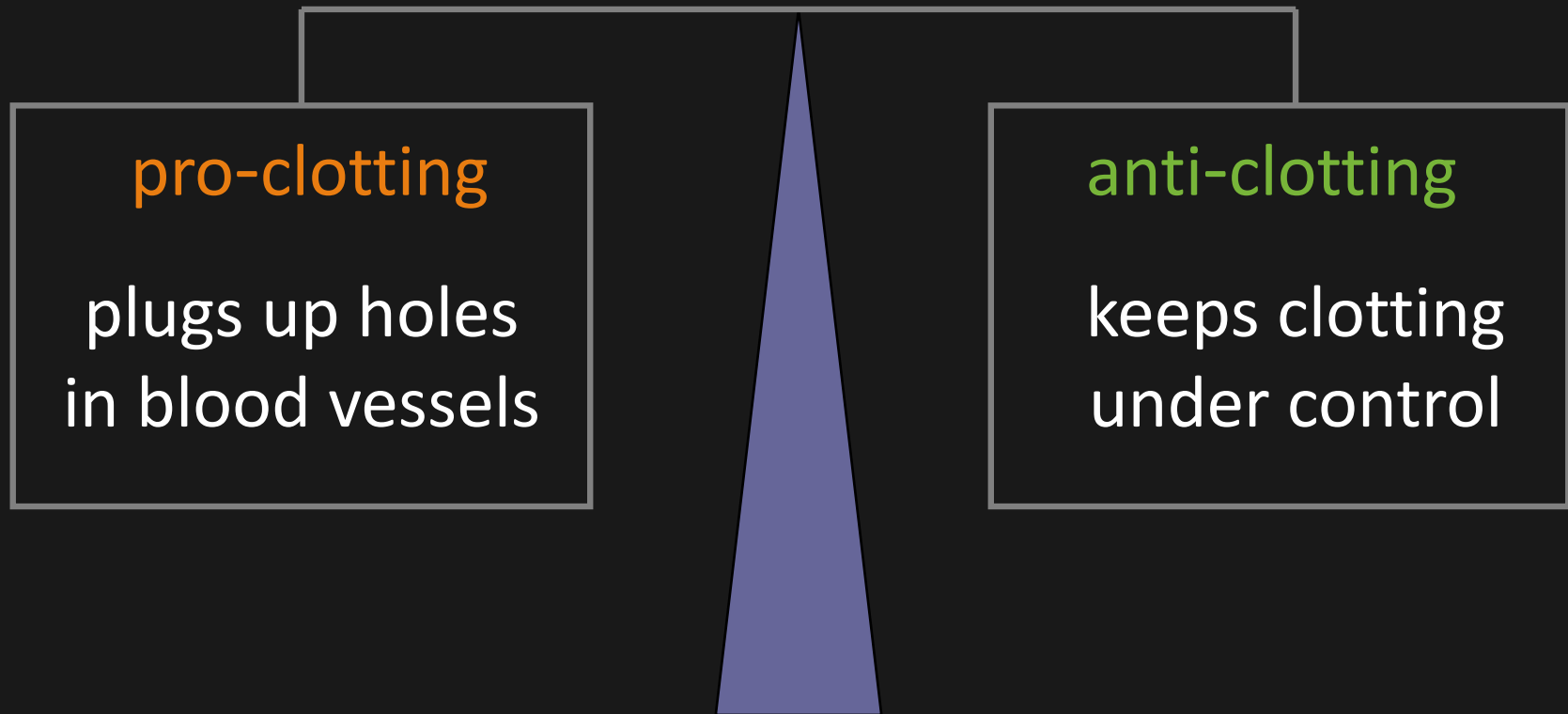


A photograph showing the lower legs and feet of a person wearing black high-heeled shoes with red soles. The person is walking on a light-colored, patterned carpet. The background is dark, with a vertical wooden element visible. The lighting is dramatic, highlighting the legs and shoes.

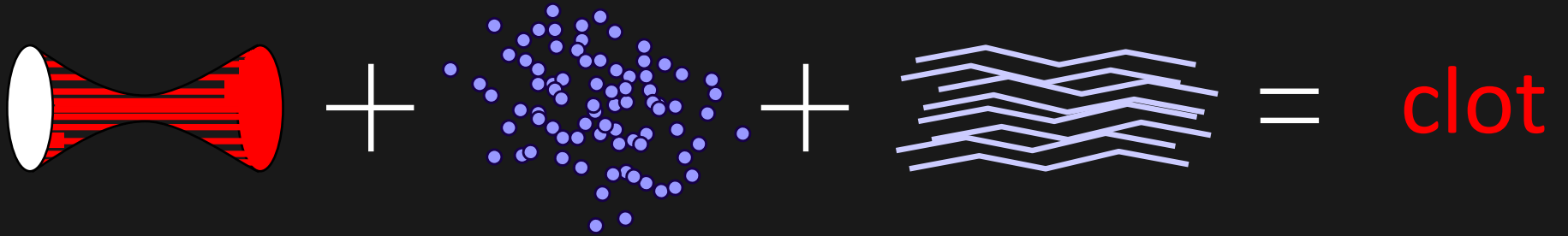
# General Principles of Hemostasis

Kristine Krafts, M.D.

# Hemostasis is a balancing act!



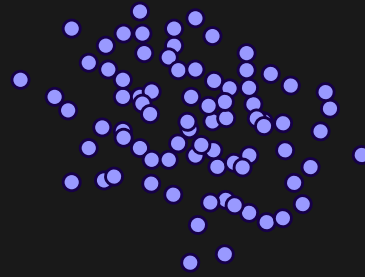
# Pro-Clotting



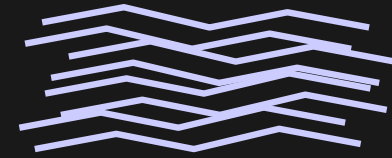
# Pro-Clotting



vessels

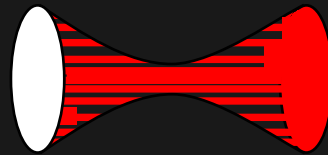


platelets



cascade

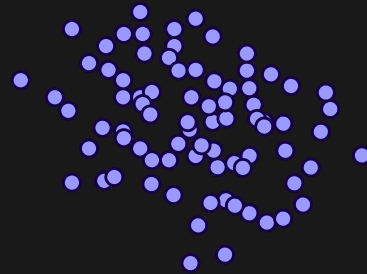
# Pro-Clotting



Blood vessel constricts.

- Blood loss decreases
- Platelets and factors meet

# Pro-Clotting



Platelets form a plug.

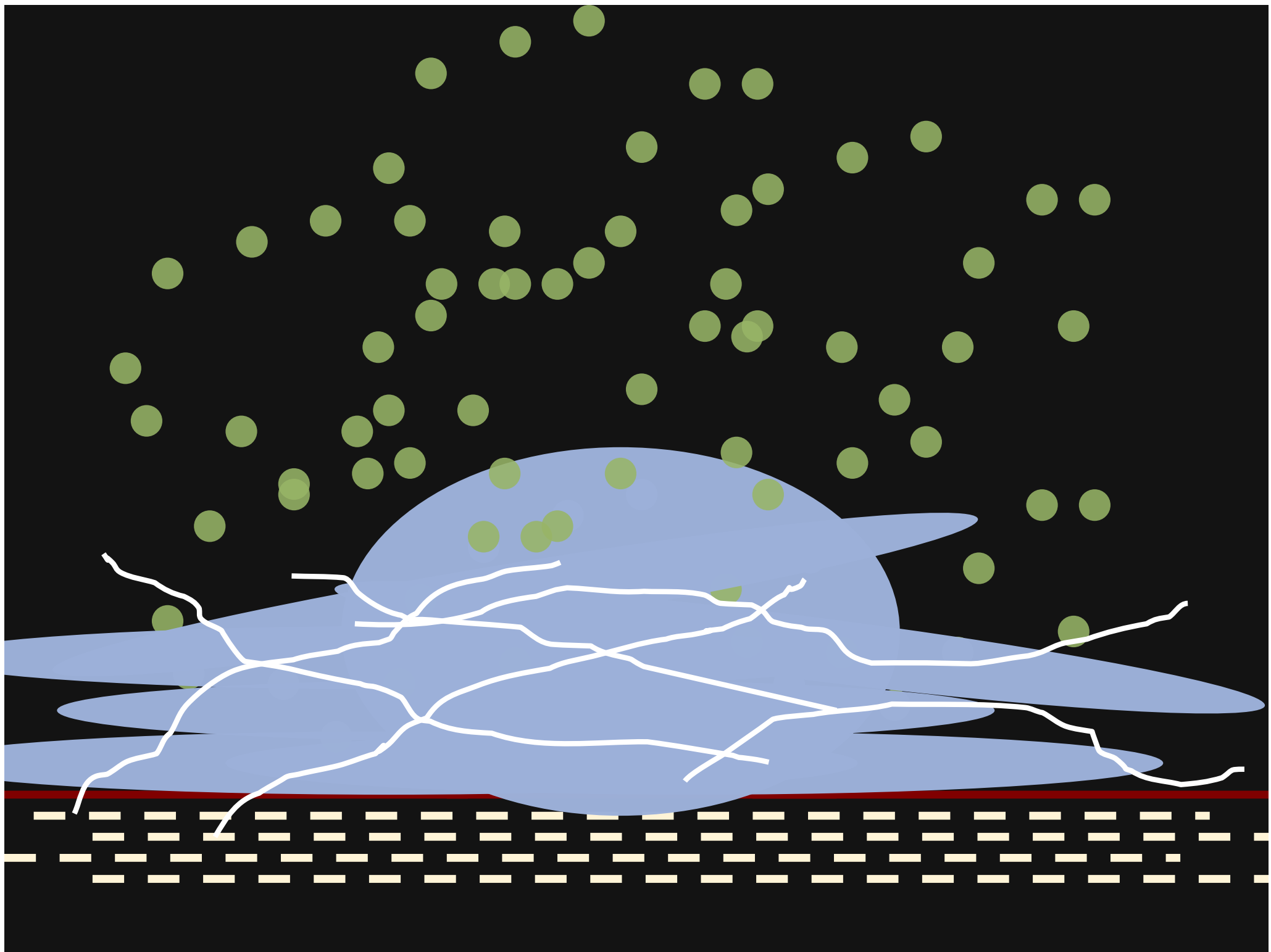
- Proteins are exposed
- Platelets adhere
- Granules release contents
- Platelets aggregate
- Phospholipids are exposed

# Pro-Clotting



## Fibrin seals up plug.

- Tissue factor is exposed
- Cascade begins
- Cascade makes fibrin
- Fibrin solidifies plug

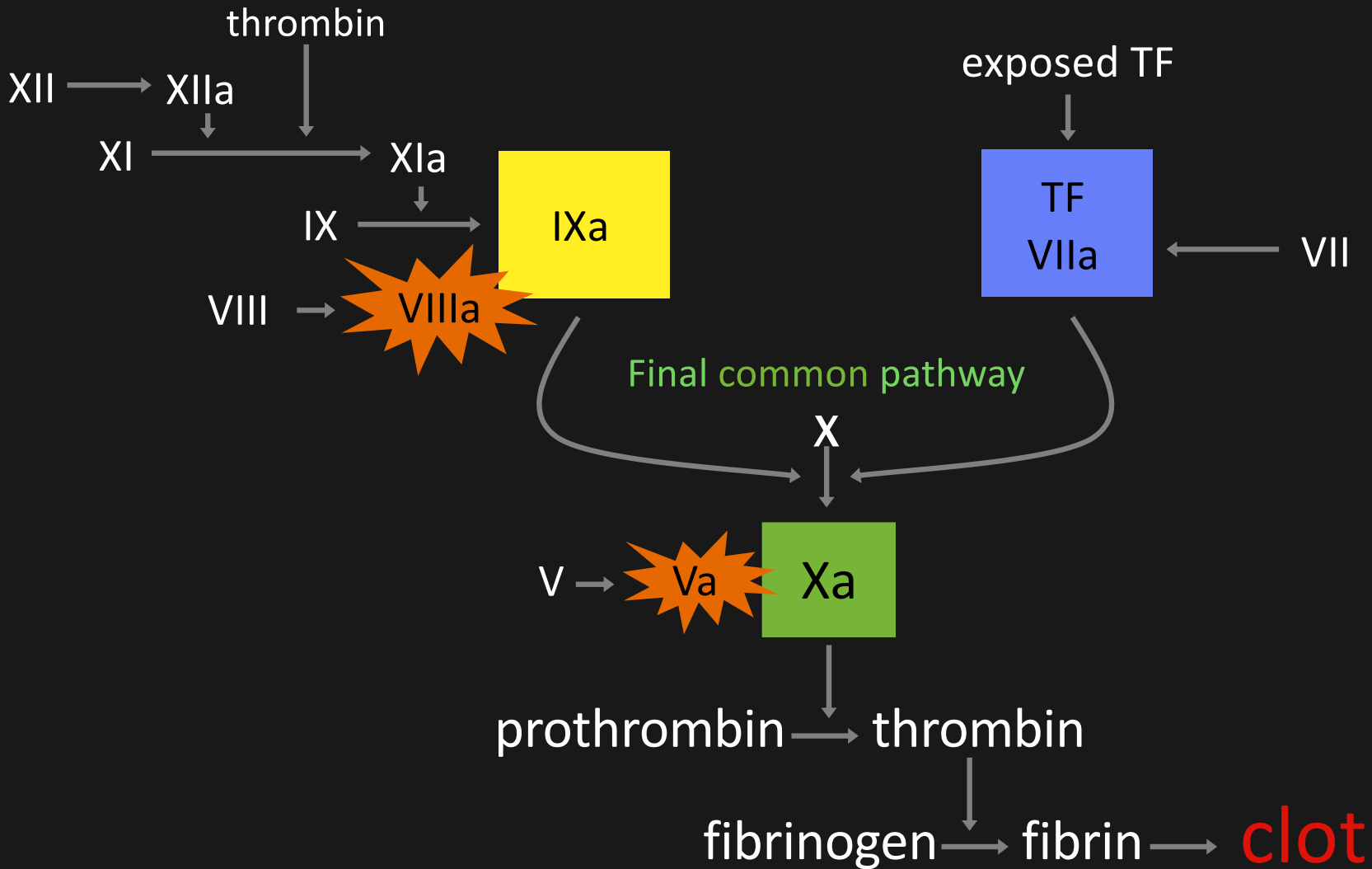




# Coagulation Cascade

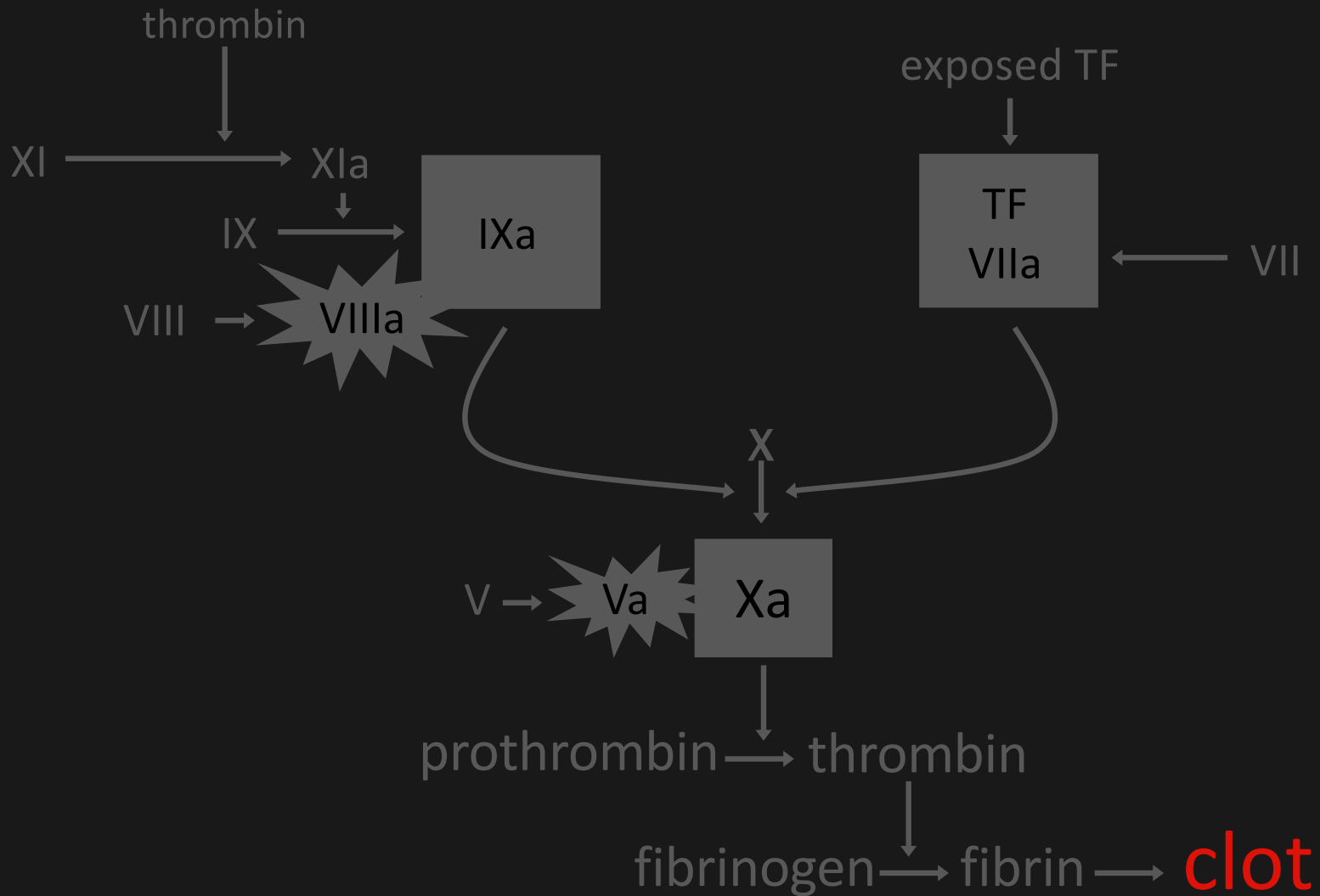
Intrinsic

Extrinsic



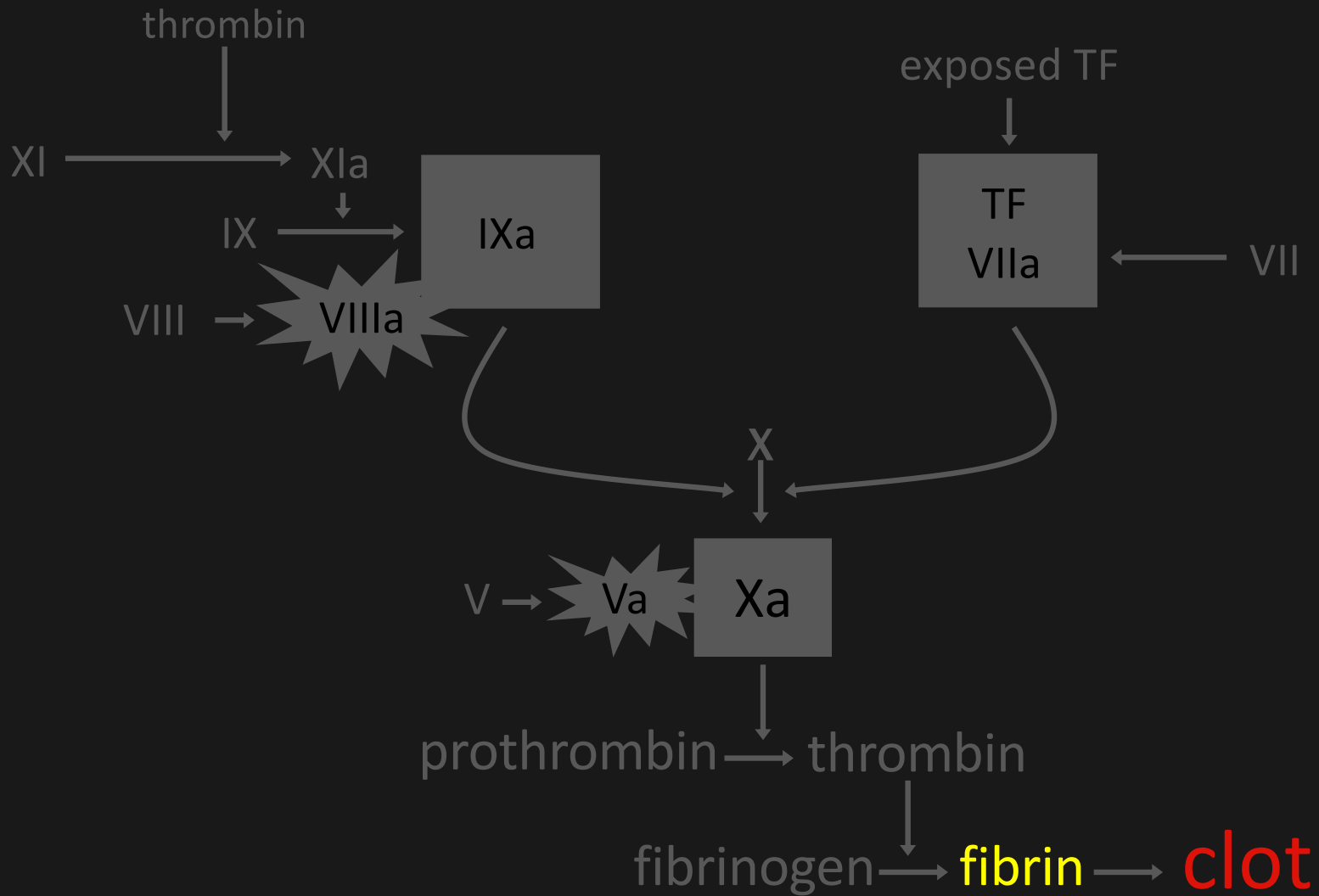
## Intrinsic

## Extrinsic



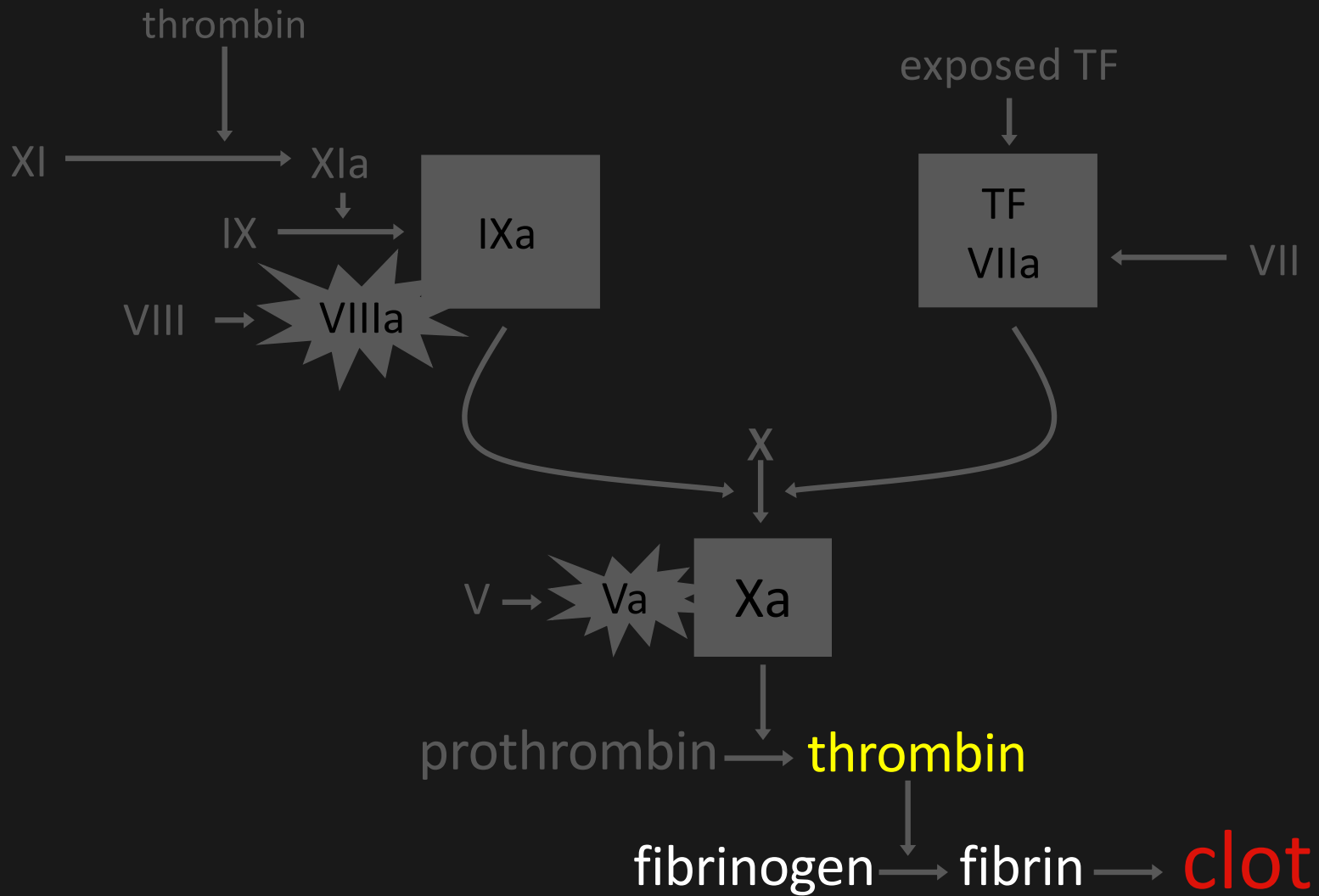
## Intrinsic

## Extrinsic



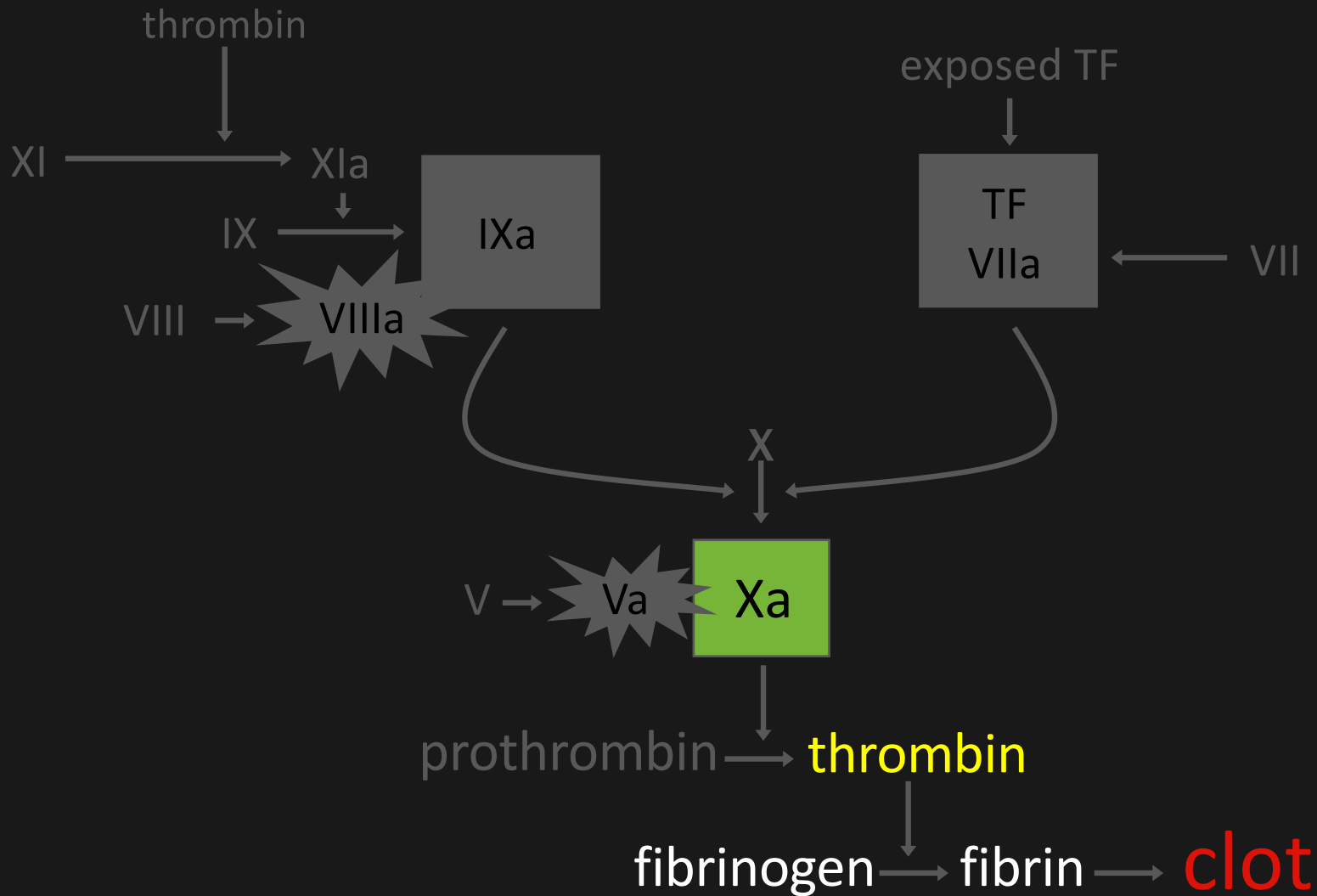
## Intrinsic

## Extrinsic



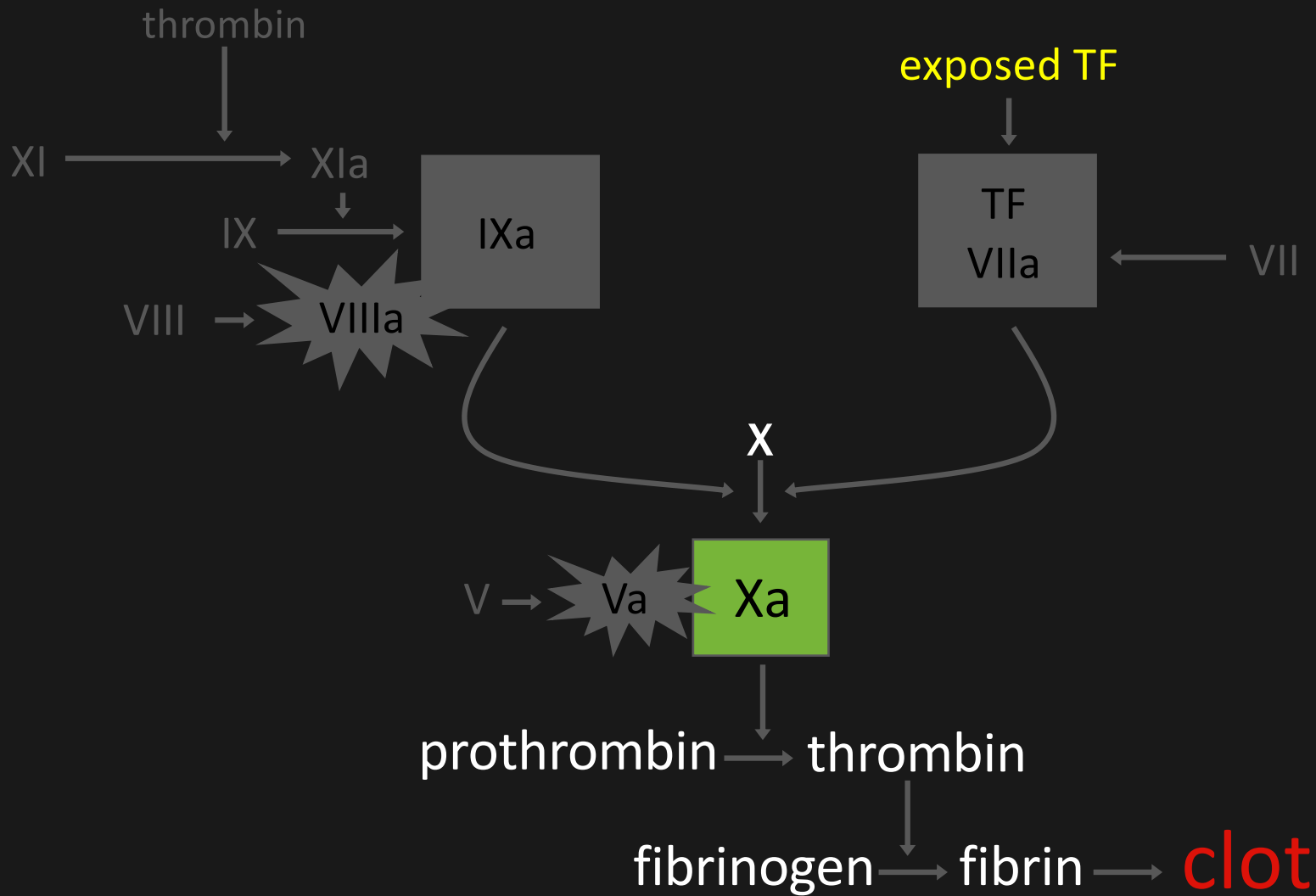
## Intrinsic

## Extrinsic



## Intrinsic

## Extrinsic

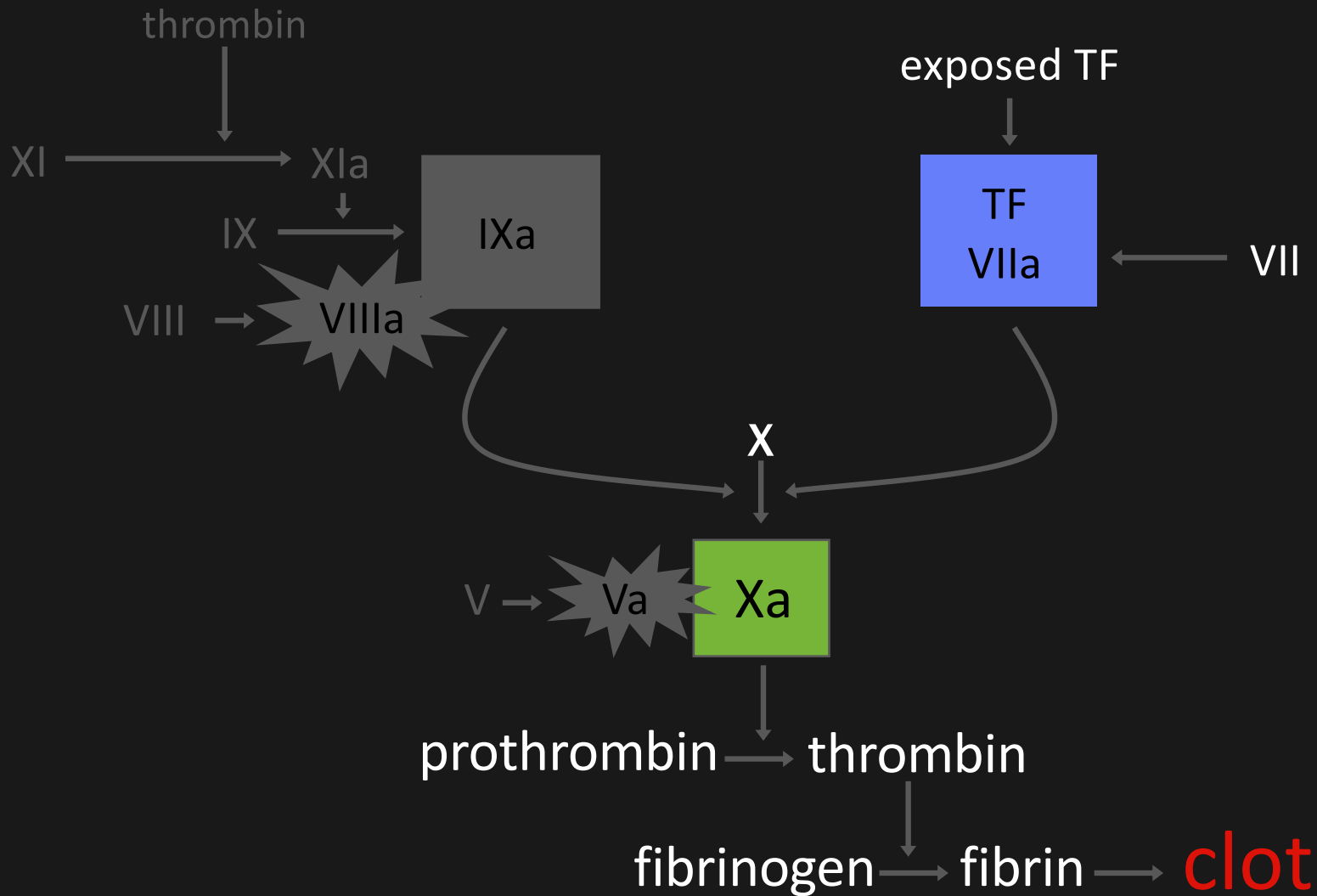


## Where does tissue factor come from?

- “Hidden” cells exposed during injury
- Microparticles floating in blood
- Endothelial cells and monocytes (during inflammation)

## Intrinsic

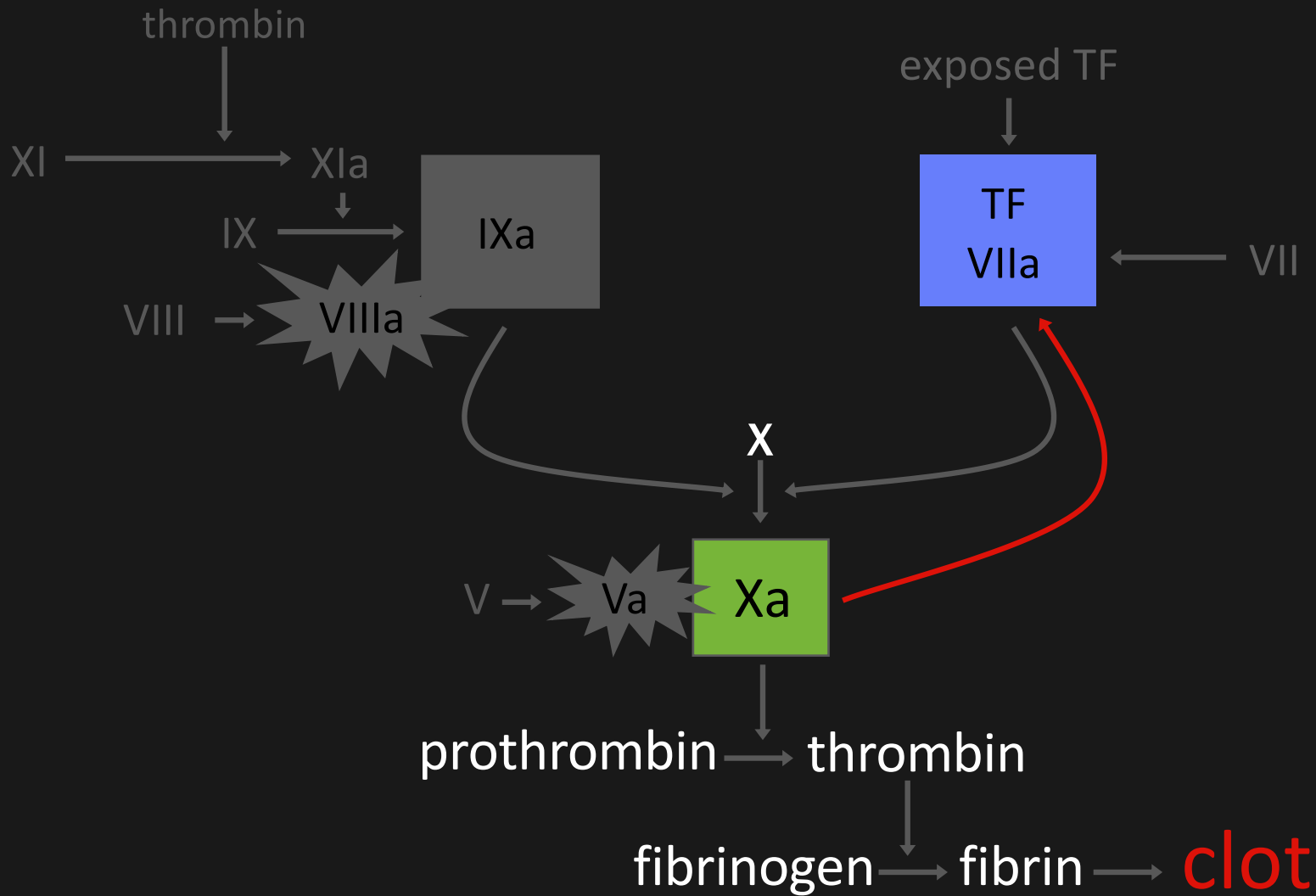
## Extrinsic





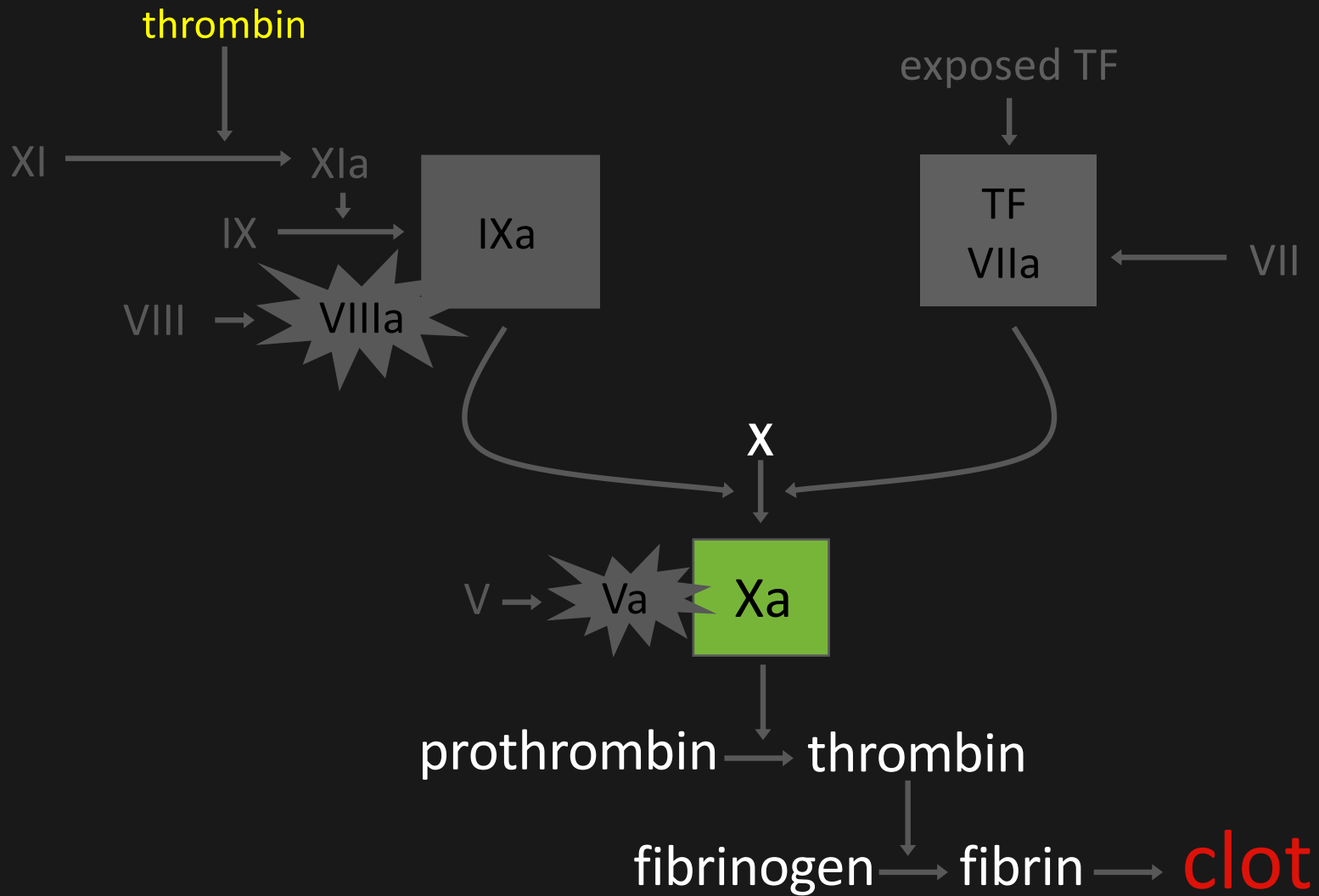
## Intrinsic

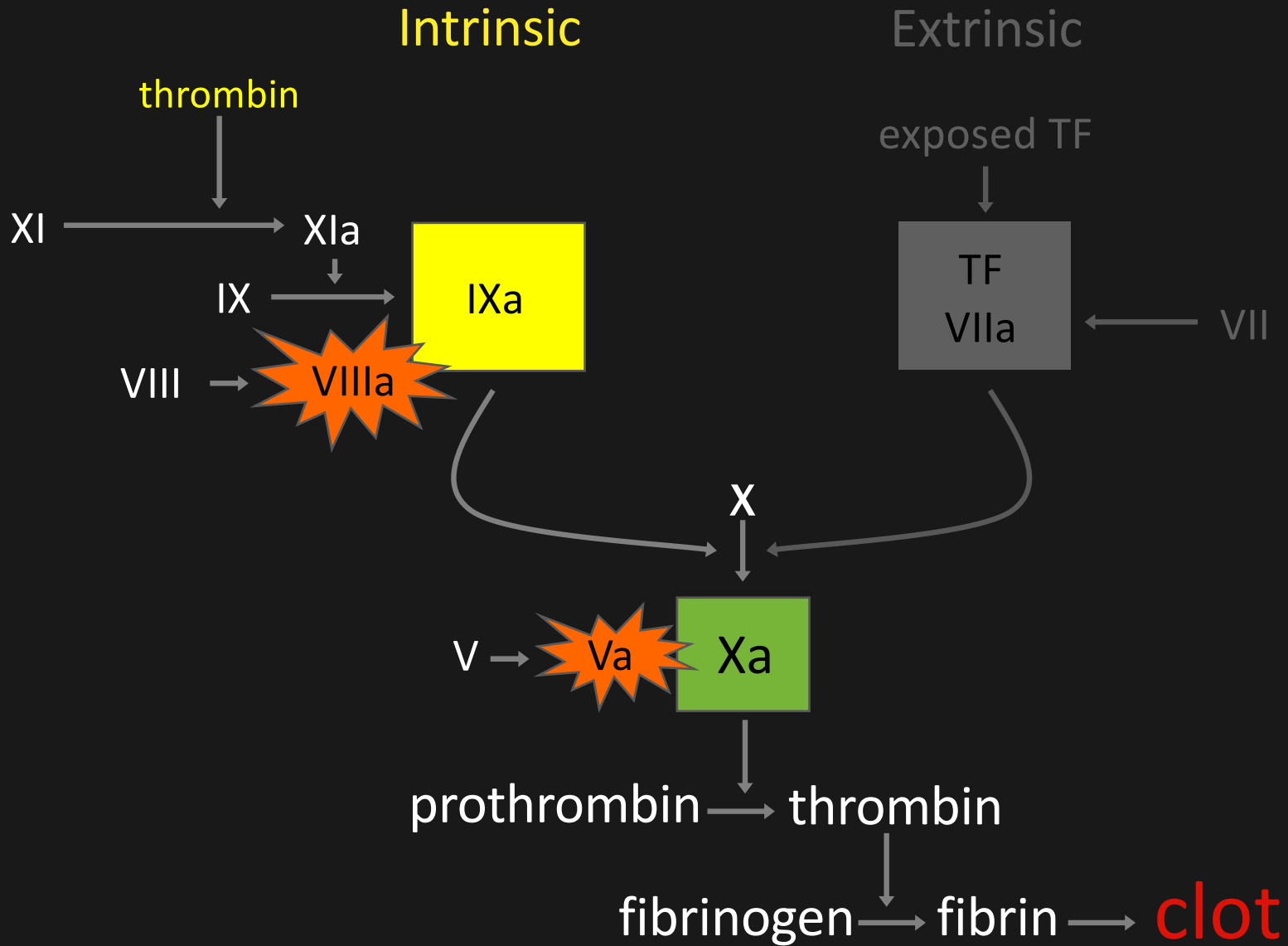
## Extrinsic



## Intrinsic

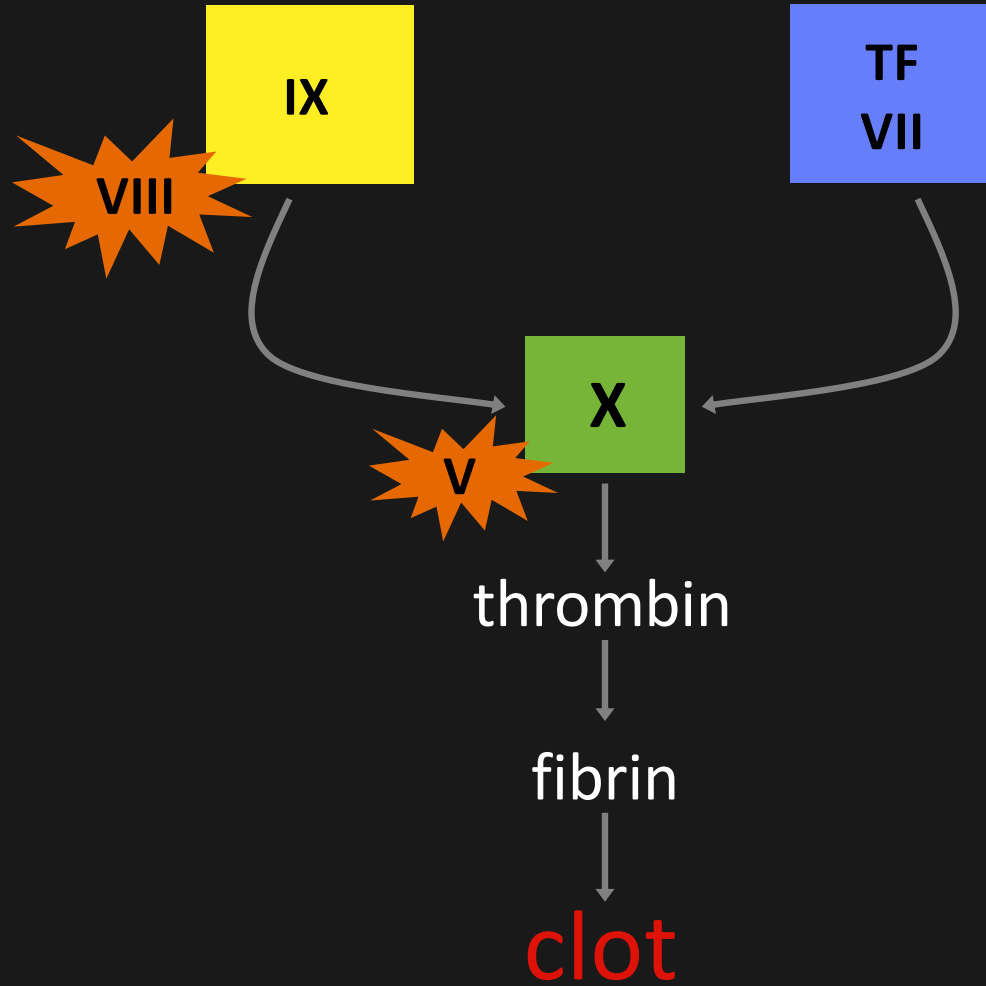
## Extrinsic





Intrinsic

Extrinsic



tissue factor



fibrin



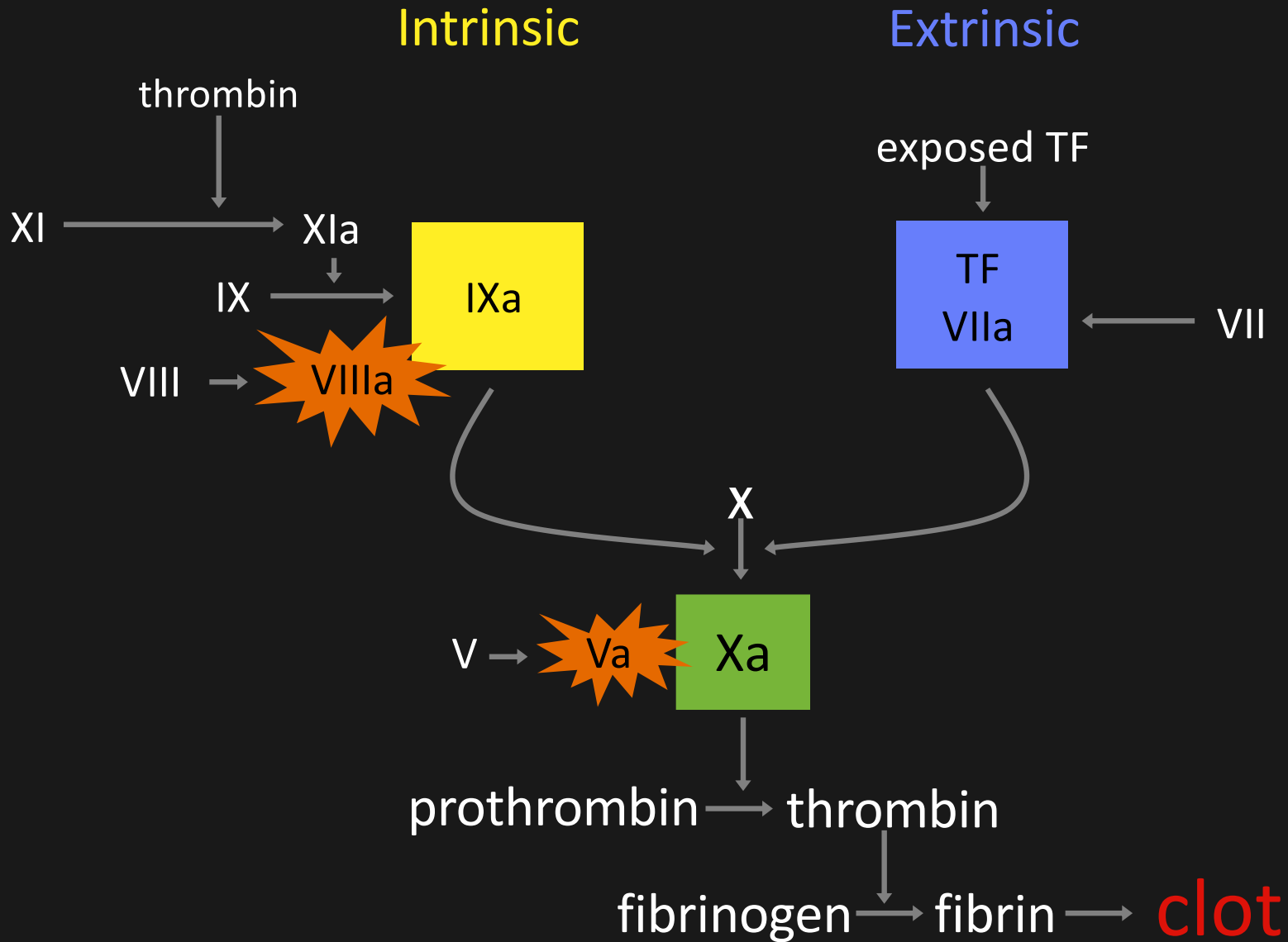
clot



busy  
distracting  
sinful

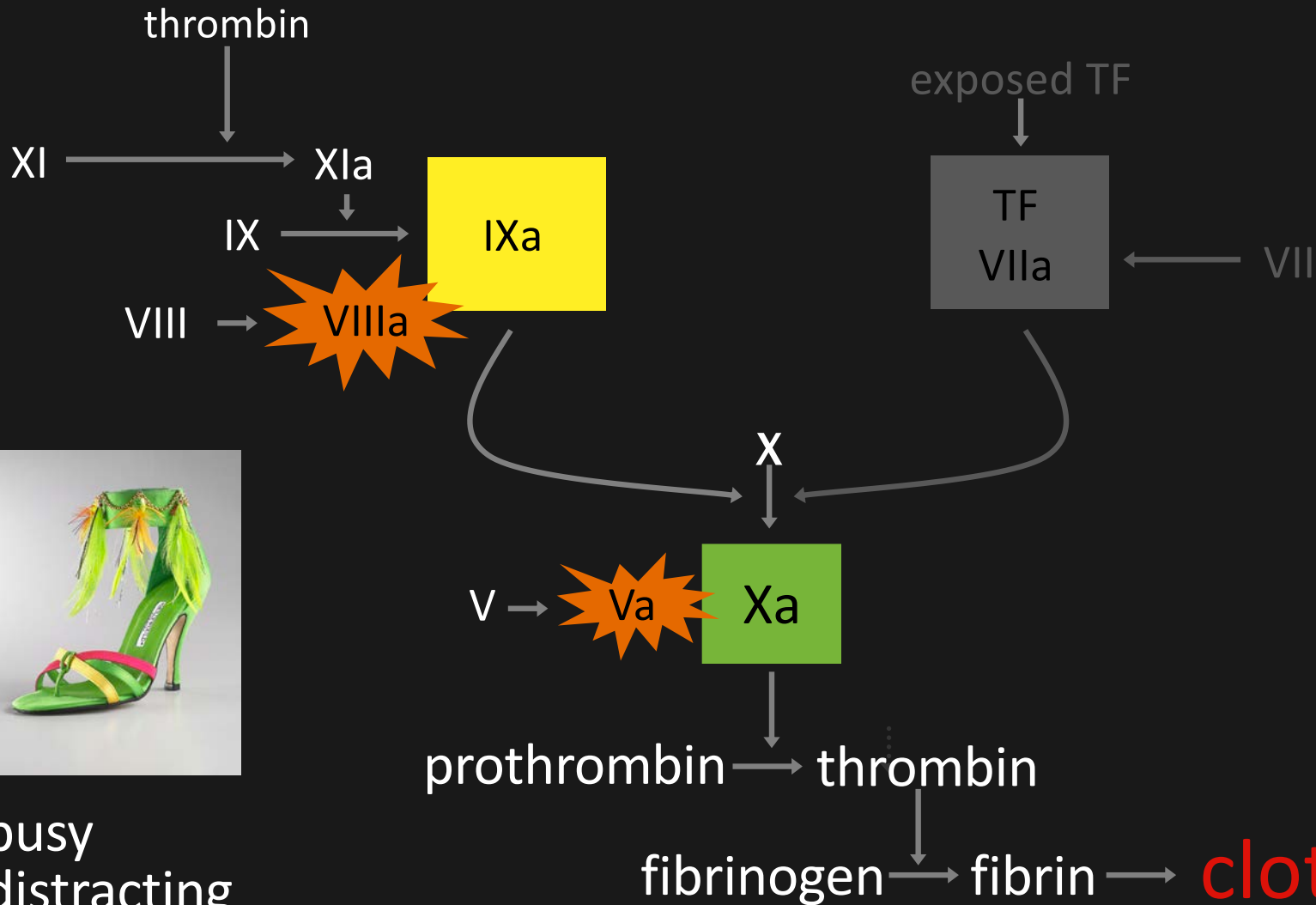


simple  
riveting  
sexy



# SINtrinsic

# Extrinsic

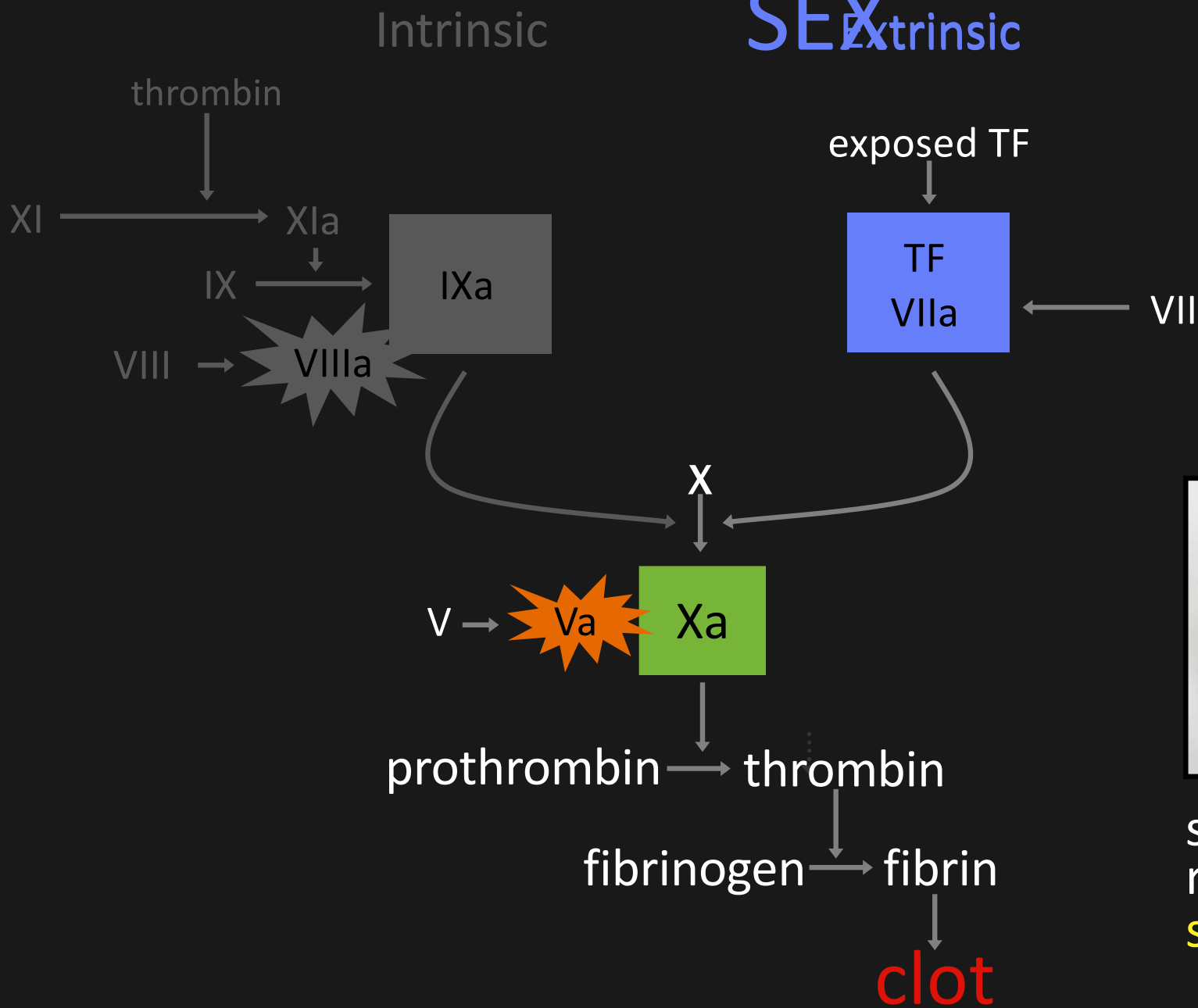


busy  
distracting  
sinful

clot



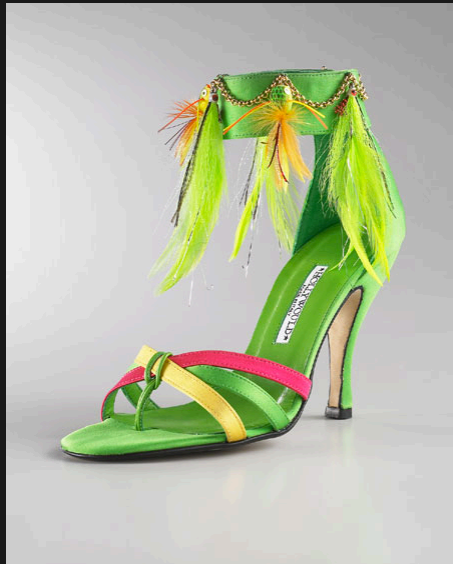
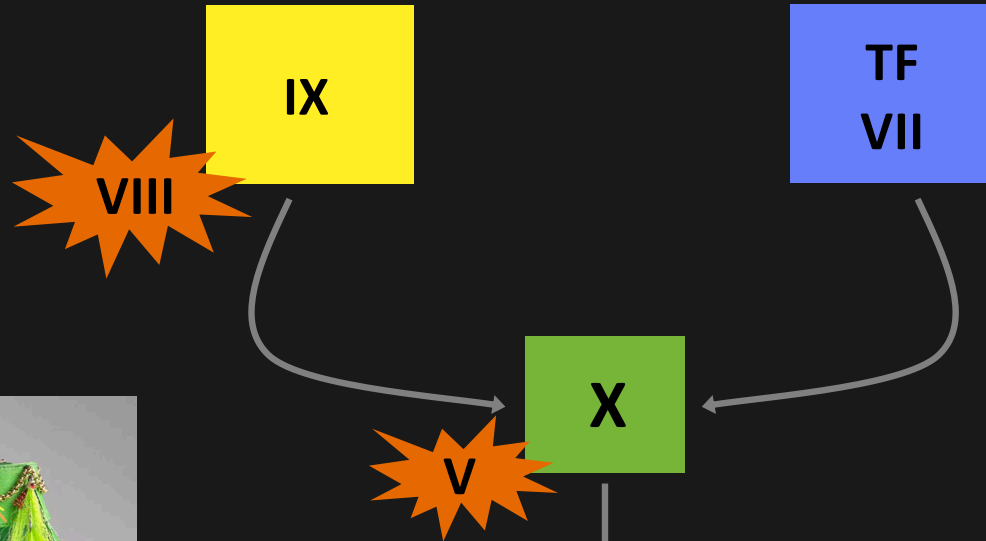
# SEX~~trinsic~~



simple riveting  
sexy

**SIN**<sub>trinsic</sub>

**SEX**<sub>trinsic</sub>



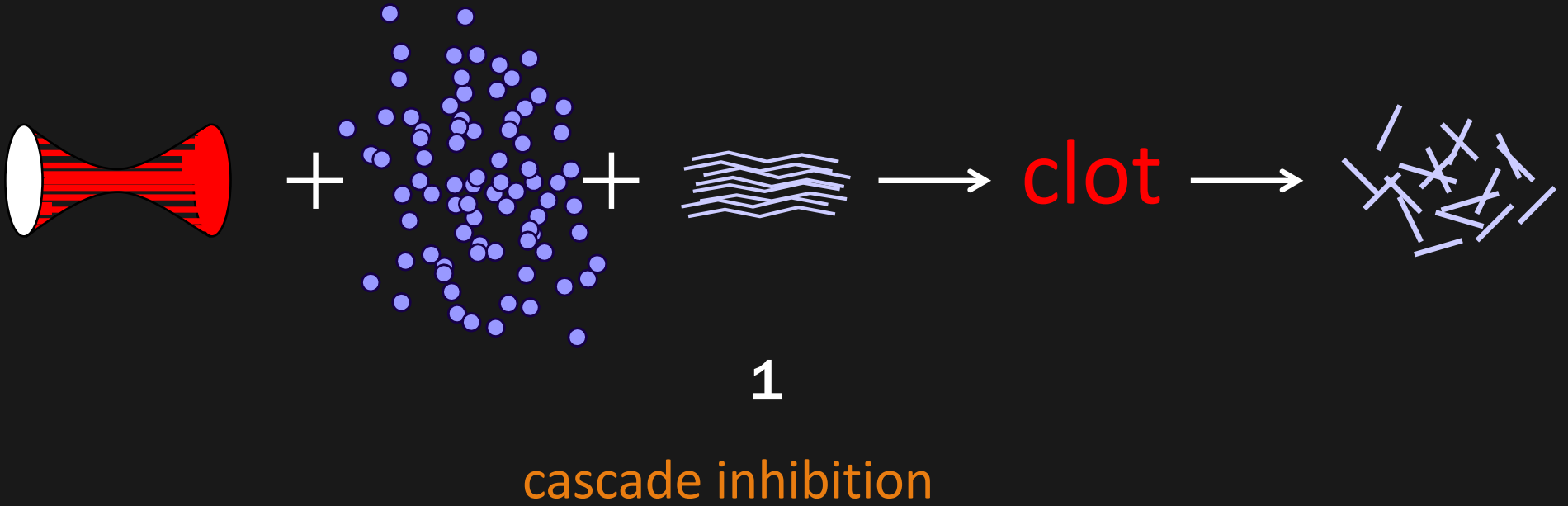
thrombin

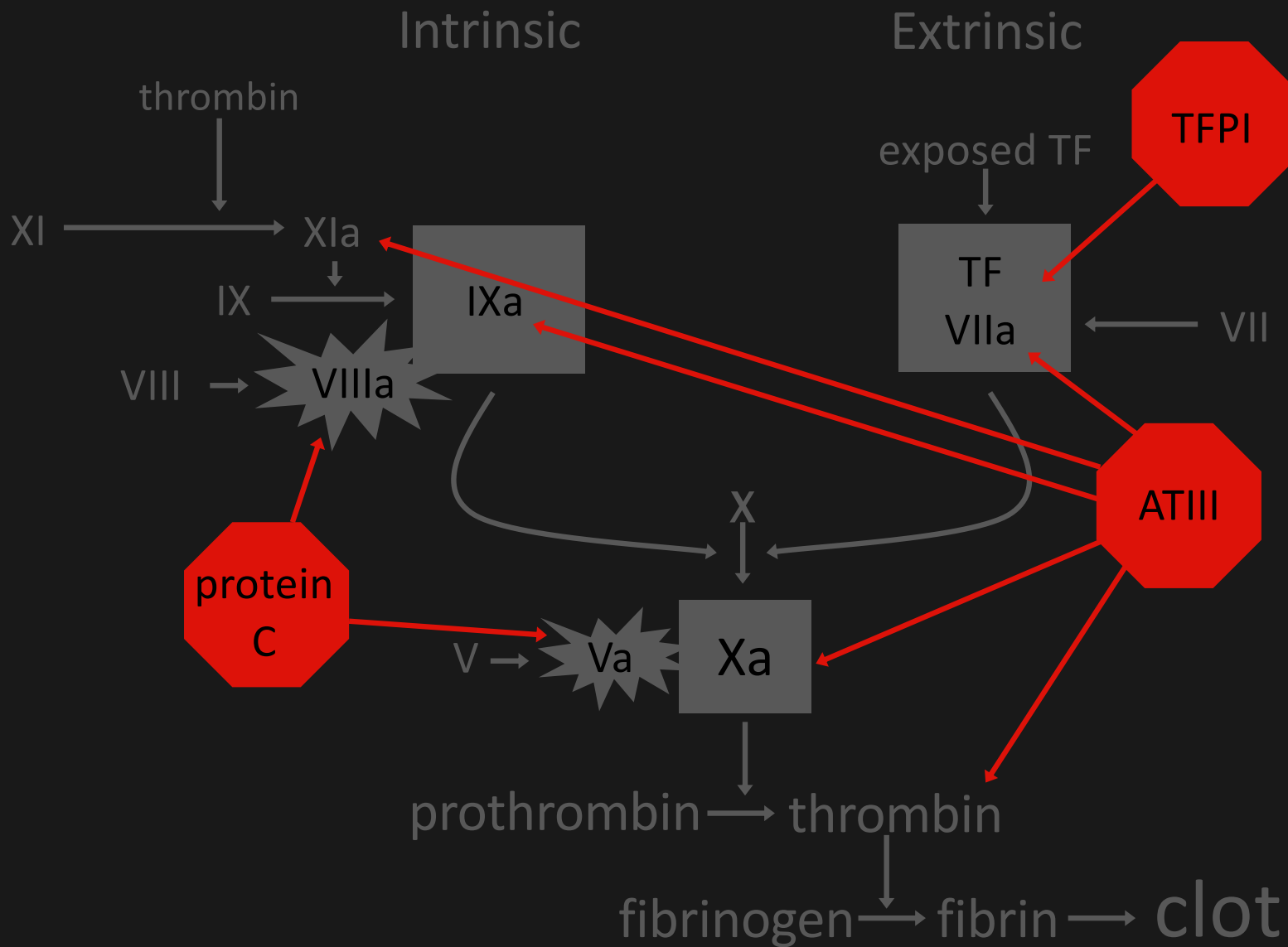
fibrin

**clot**

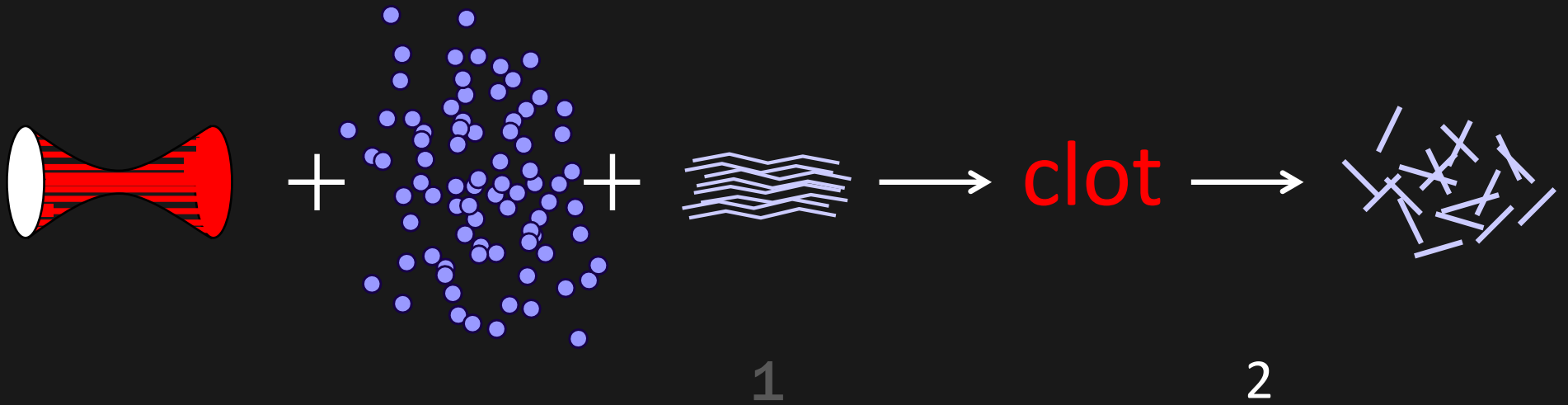


# Anti-Clotting





# Anti-Clotting

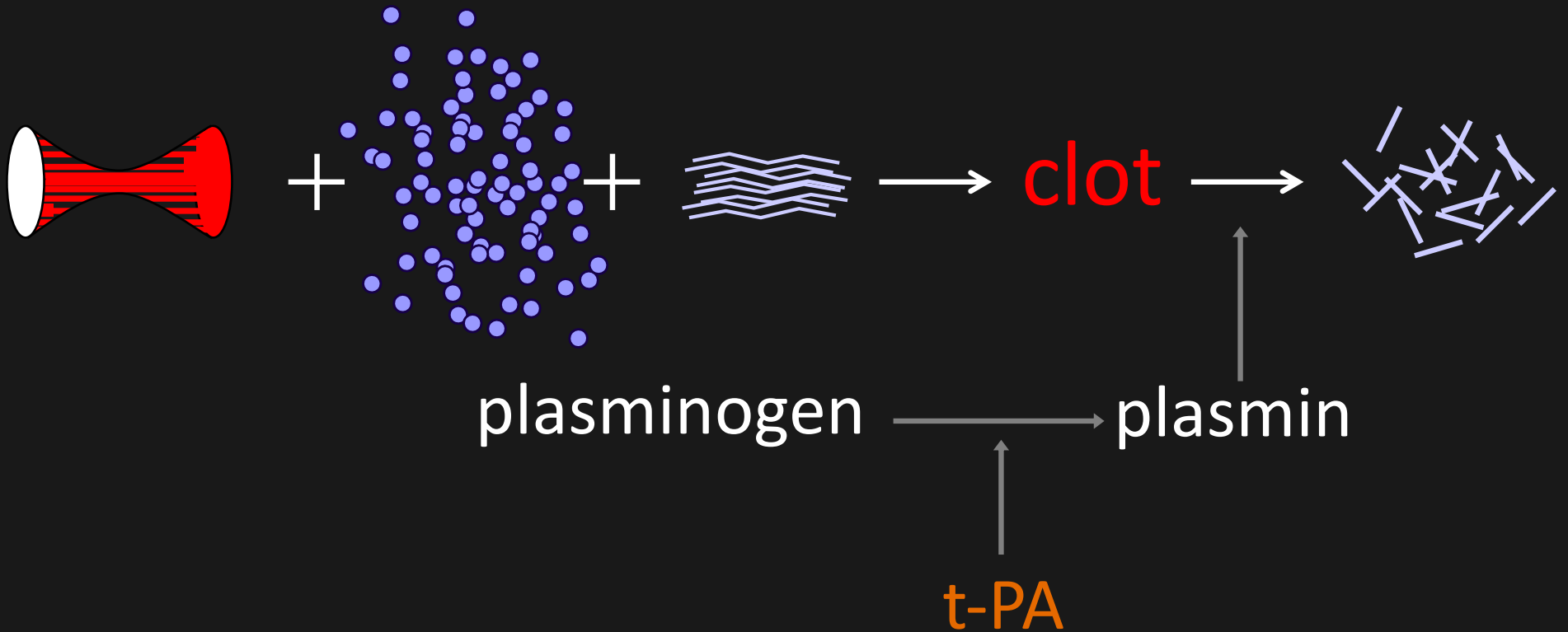


cascade inhibition

- TFPI
- ATIII
- Proteins C, S

clot lysis

# Anti-Clotting



# Hemostasis Outline

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- The big picture
- Laboratory tests

# Platelet Lab Tests

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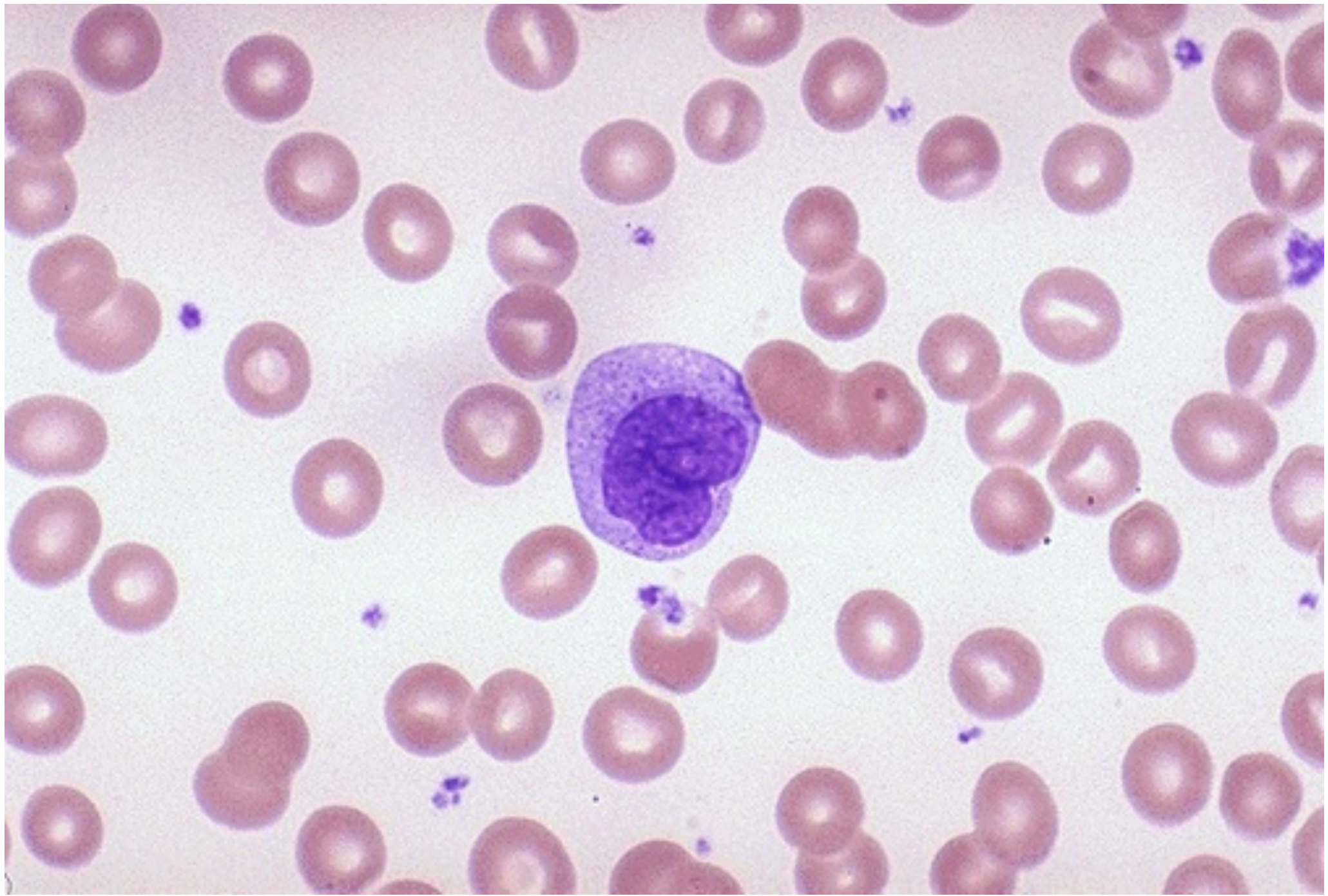
## Count

- Done by particle counter
- 150 – 450 x 10<sup>9</sup>/L

## Morphology

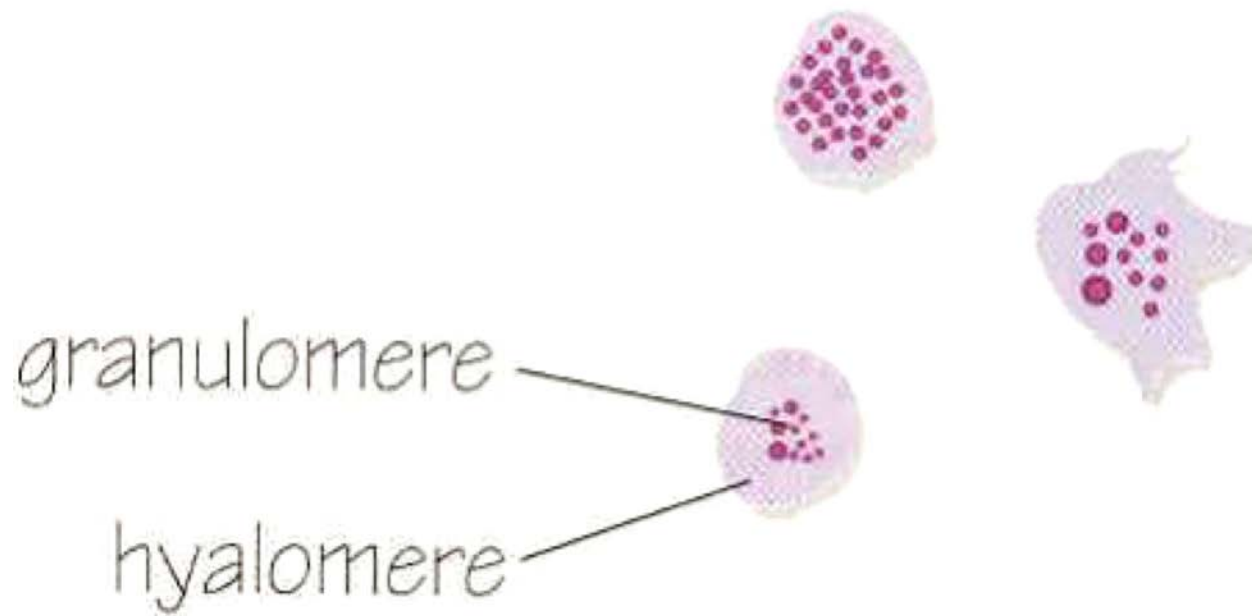
- Size
- Granulation





Platelets

# Normal Platelets



# Bleeding Time

---

## Why?

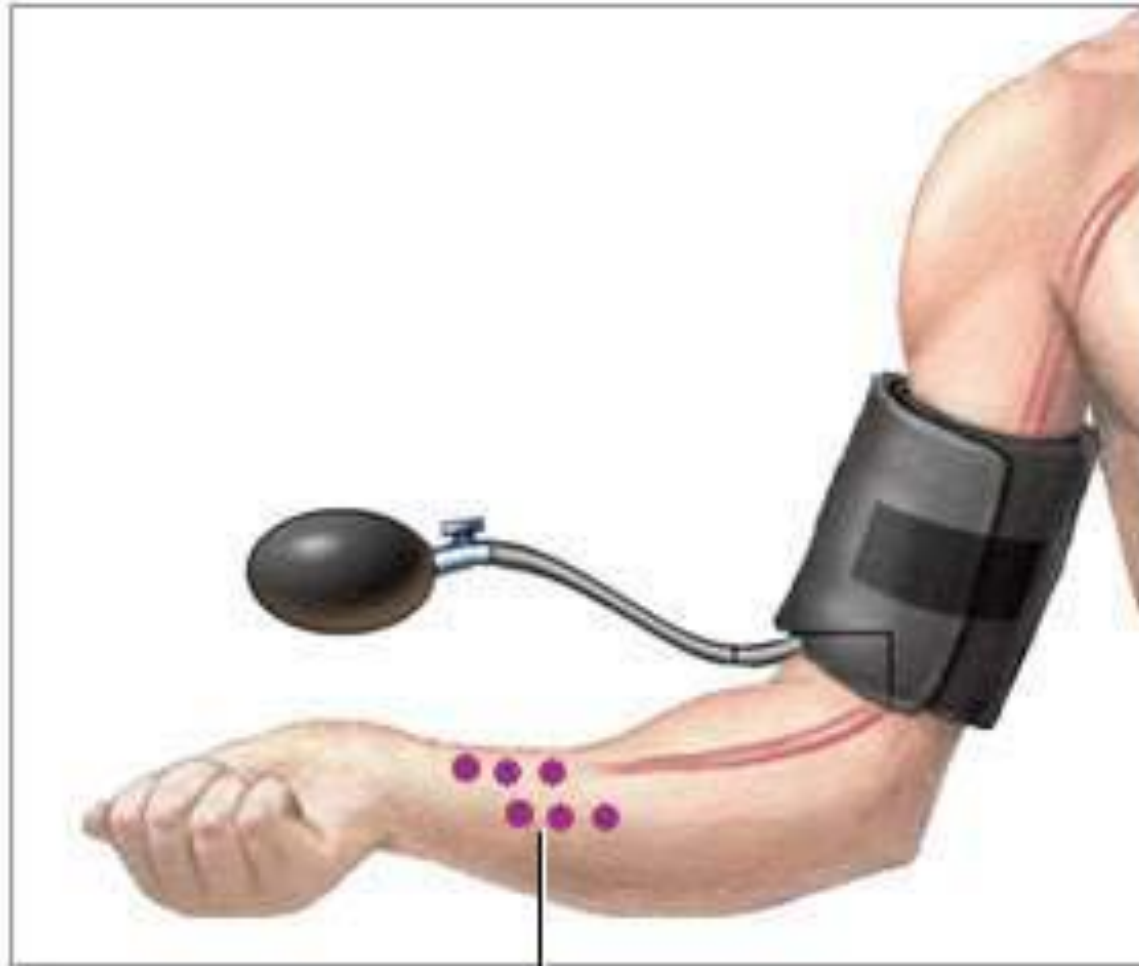
- Evaluate platelet response to vascular injury
- Some platelet disorders have a long bleeding time

## How?

- Inflate blood pressure cuff
- Make incision
- Time how long it takes to stop bleeding

## Careful!

- Lots of things affect the test!
- Some consider the test unreliable.



Two incisions are made  
and the time for clotting  
to occur is recorded

# Coagulation Lab Tests

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- Draw blood into citrate tube
- Spin tube, decant plasma
- Add reagents to plasma
- Watch for formation of fibrin

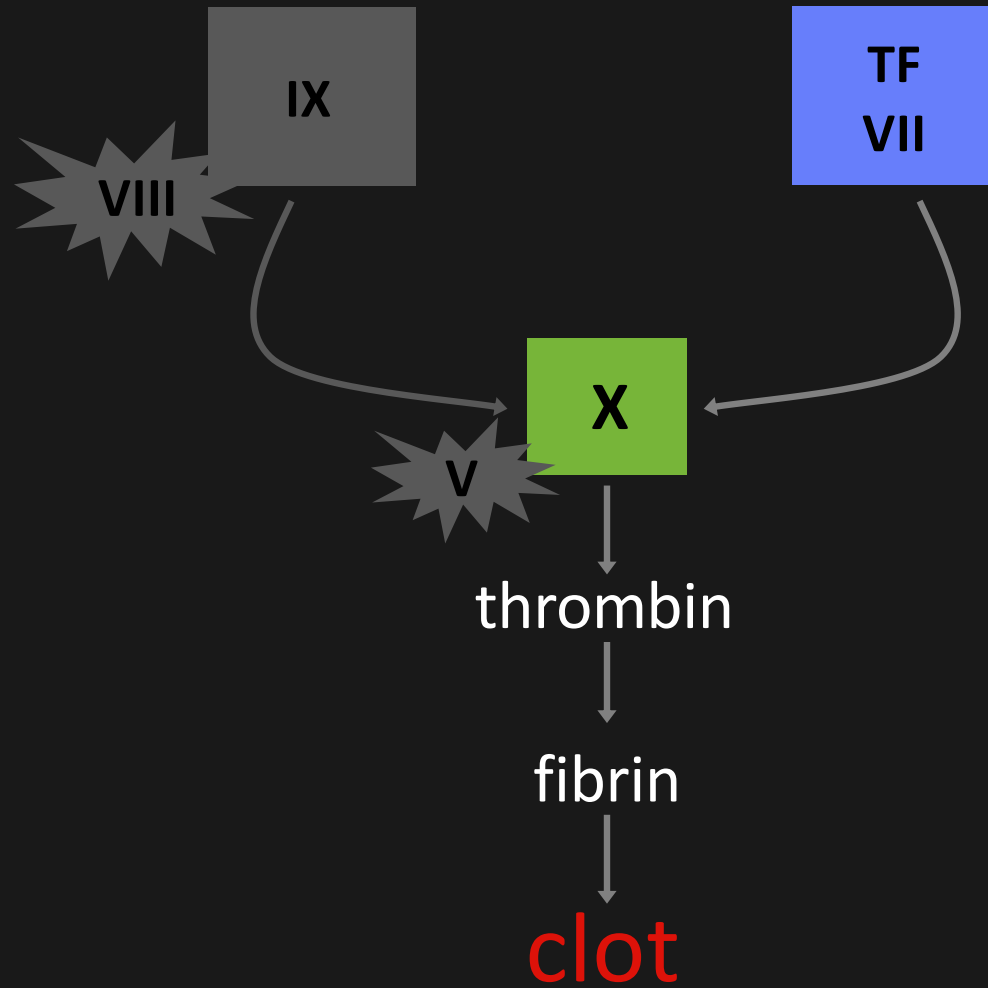
# Prothrombin Time

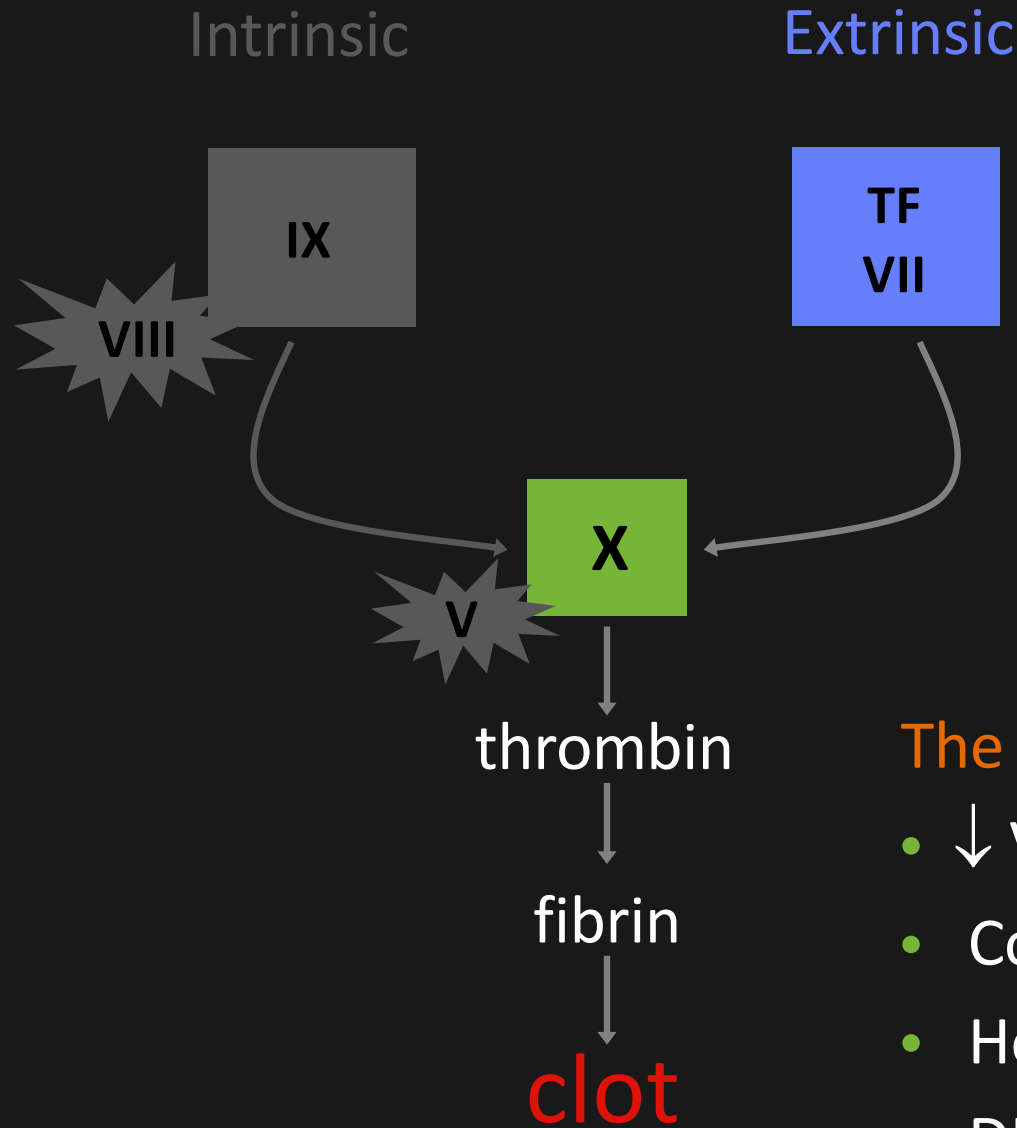
---

- Plasma + thromboplastin
- Measures extrinsic pathway

Intrinsic

SEX<sub>trinsic</sub>





The PT is increased in:

- ↓ VII, X, V, II, I
- Coumadin
- Heparin
- DIC



# When should you order a PT?

---

- Never!
- Order an INR instead.

What is an INR?

Just a corrected PT.

# When should you order an INR?

---

- To assess liver function
- To monitor Coumadin therapy
- To diagnose DIC\*
- To assess pre-op status

\* Disseminated intravascular coagulation

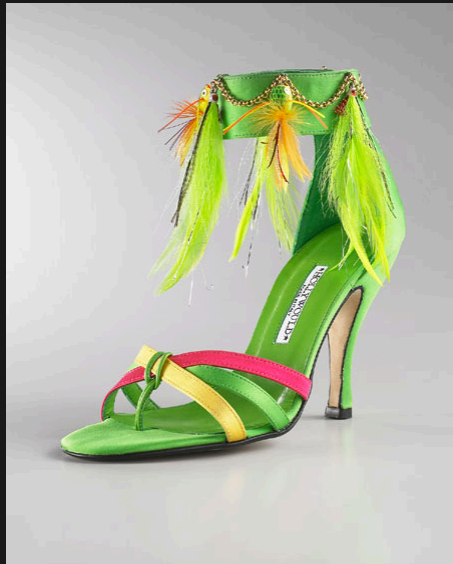
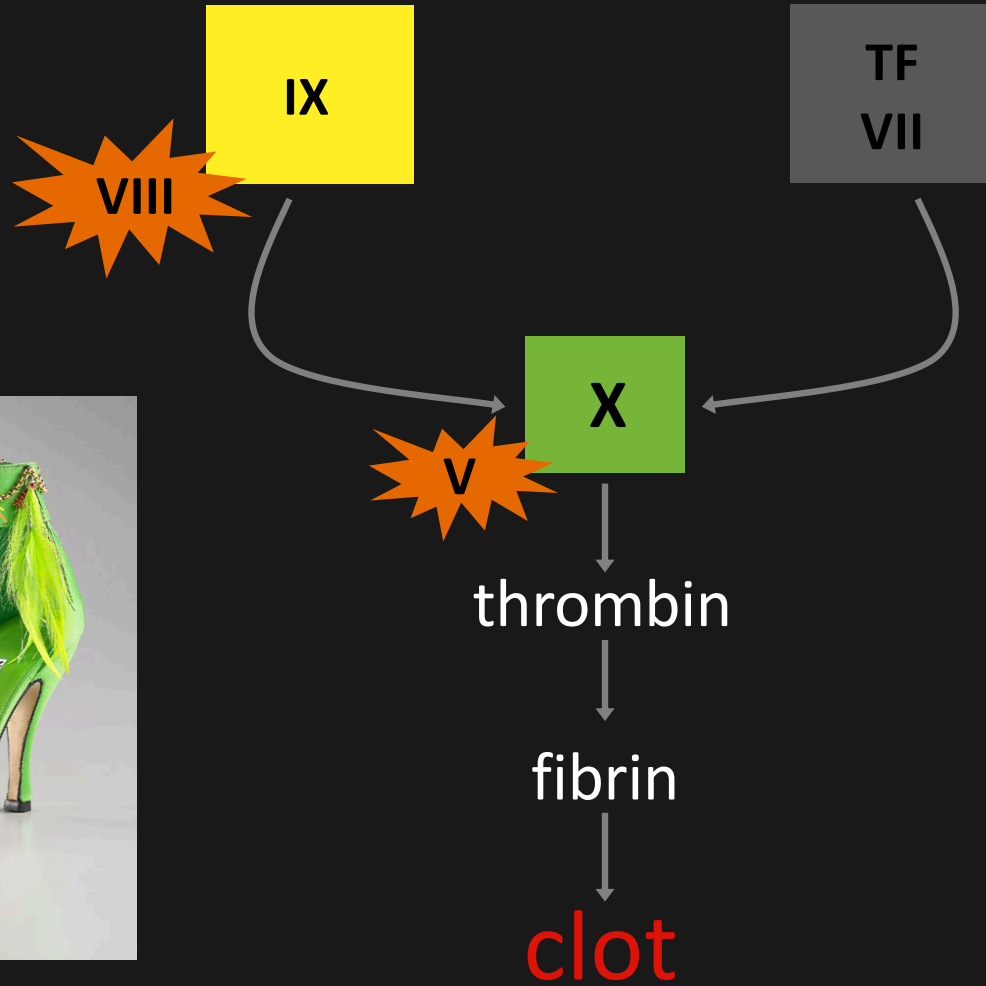
# Partial Thromboplastin Time

---

- Plasma + phospholipid
- Measures intrinsic pathway
- APTT = same thing

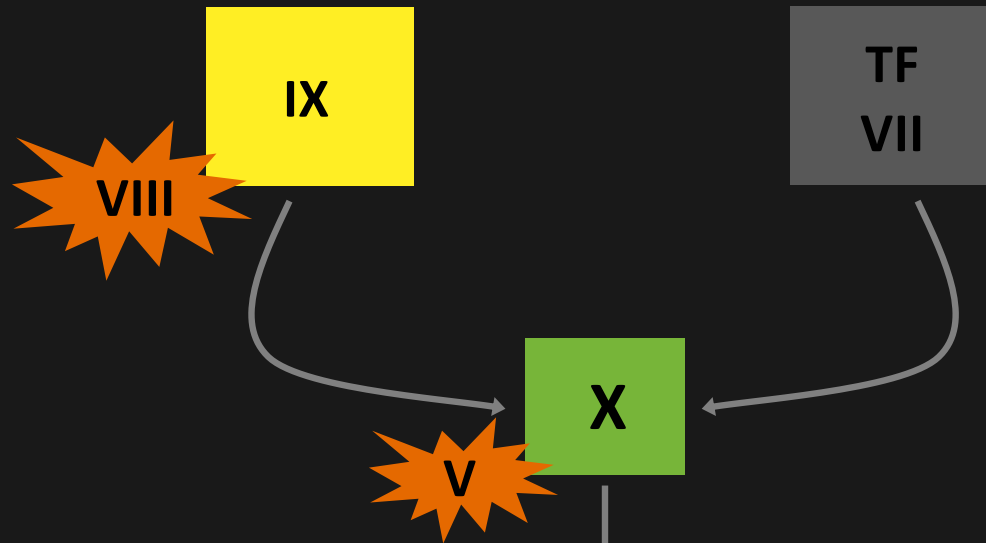
**SIN**<sub>trinsic</sub>

Extrinsic



Intrinsic

Extrinsic



The PTT is increased in:

- hemophilia A
- hemophilia B
- DIC
- heparin

thrombin

fibrin

clot

# When should you order a PTT?

---

- To investigate a history of abnormal bleeding
- To monitor heparin therapy
- To diagnose DIC
- To assess pre-op status

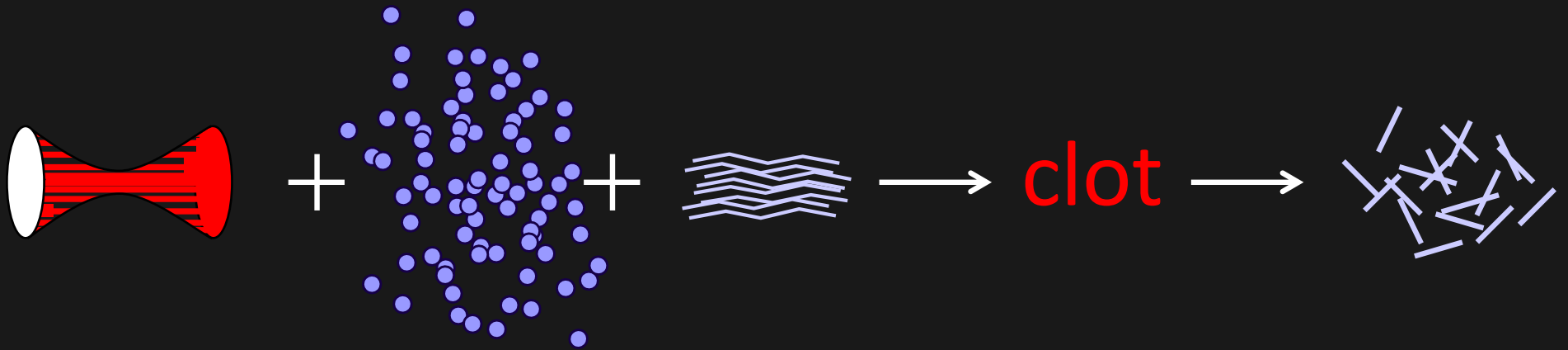
# Fibrin Degradation Product Assay

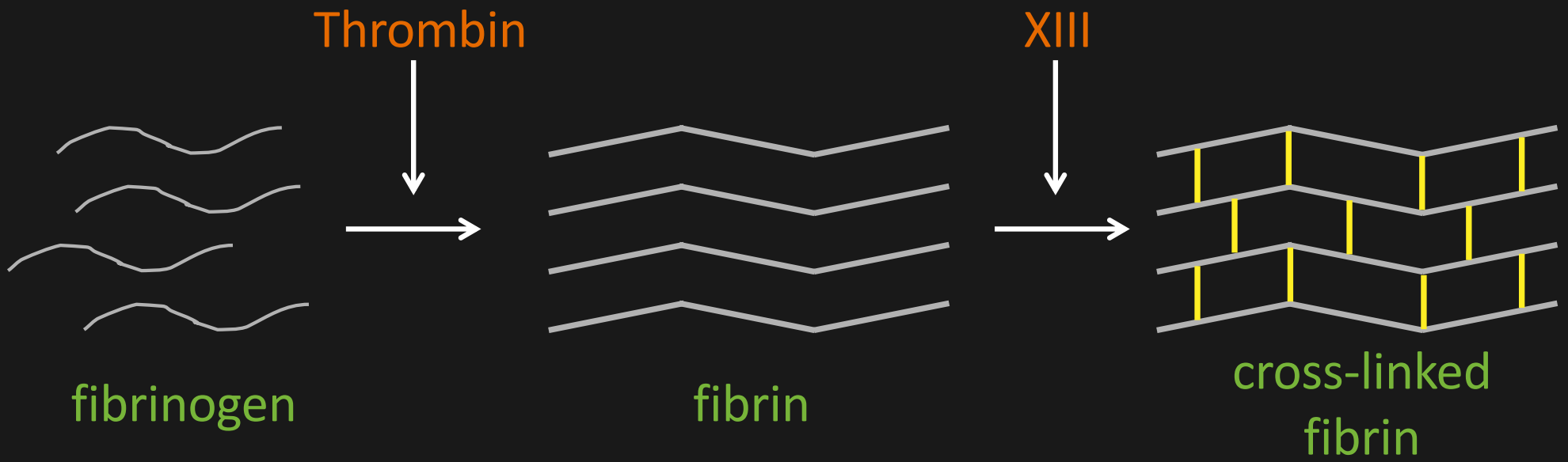
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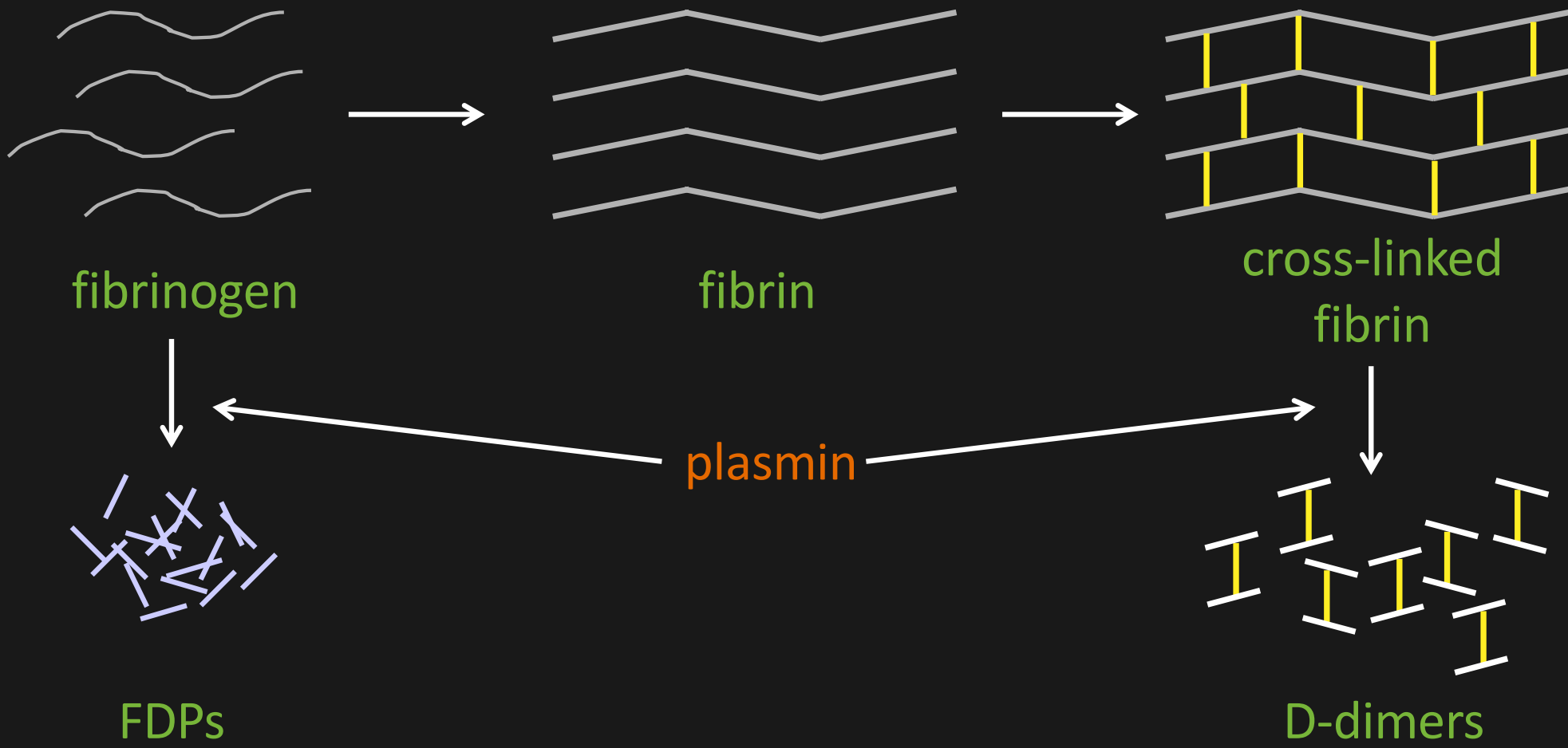
- Measures FDPs (including D-dimers)
- VERY sensitive!



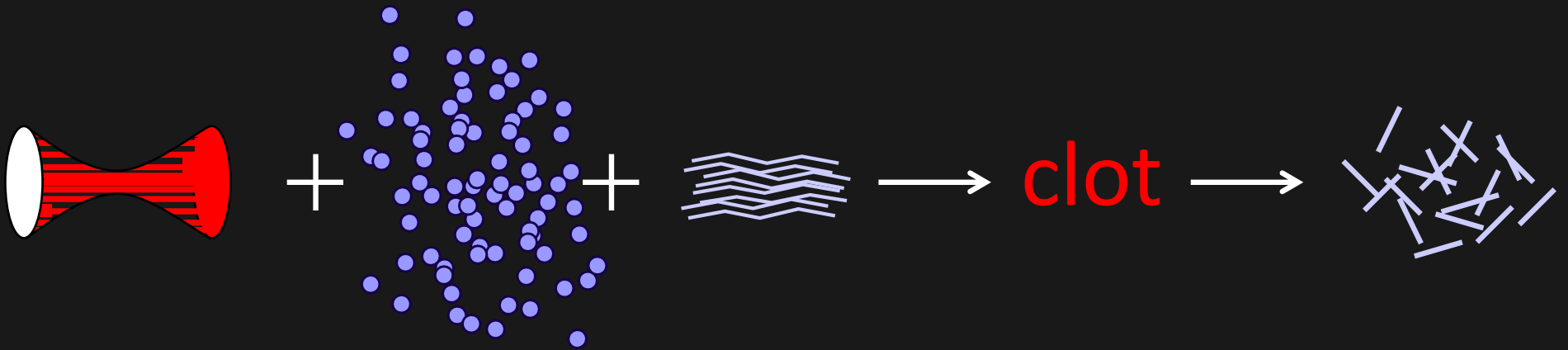
# Anti-Clotting







# Anti-Clotting



FDPs are increased when there is:

- A nasty thrombus
- Minor clotting

# When should you order an FDP assay?

---

- Not to **rule in** a clot...
- but to **rule out** a clot.