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BCH 471
Experiment (9)

COGULATION PROFILE

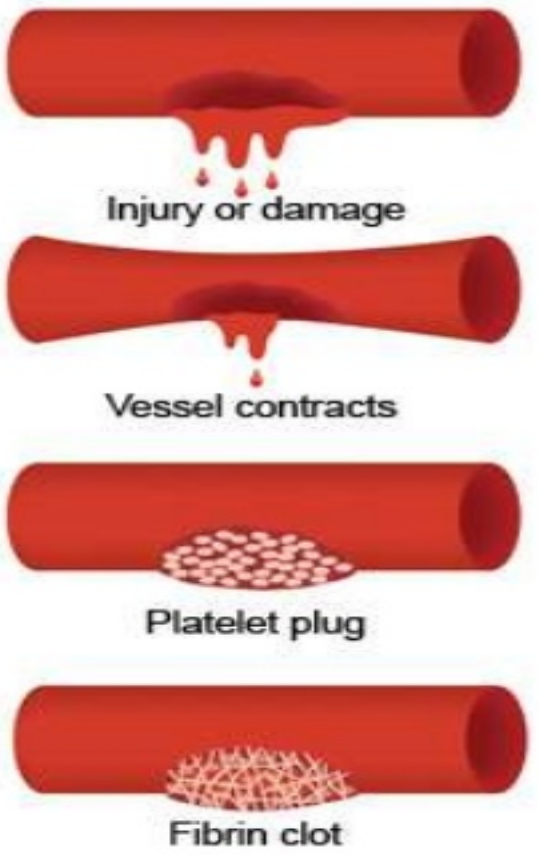
Clotting time, Bleeding time, and Prothrombin time

Coagulation

- **Coagulation** is a complex process by which blood forms clots.
- It is an important part of **haemostasis** (the cessation of blood loss from a damaged vessel).
- Disorders of coagulation can lead to an increased risk of bleeding (hemorrhage) or clotting (thrombosis).

Hemostasis is maintained in the body via three mechanisms:

- *Vascular spasm* - Damaged blood vessels constrict
- *Platelet plug formation* - Platelats adhere to damaged endothelium to form platelet plug (*primary hemostasis*)
- *Blood Coagulation* - Clots form upon the conversion of fibrinogen to Fibrin (*secondary hemostasis*).



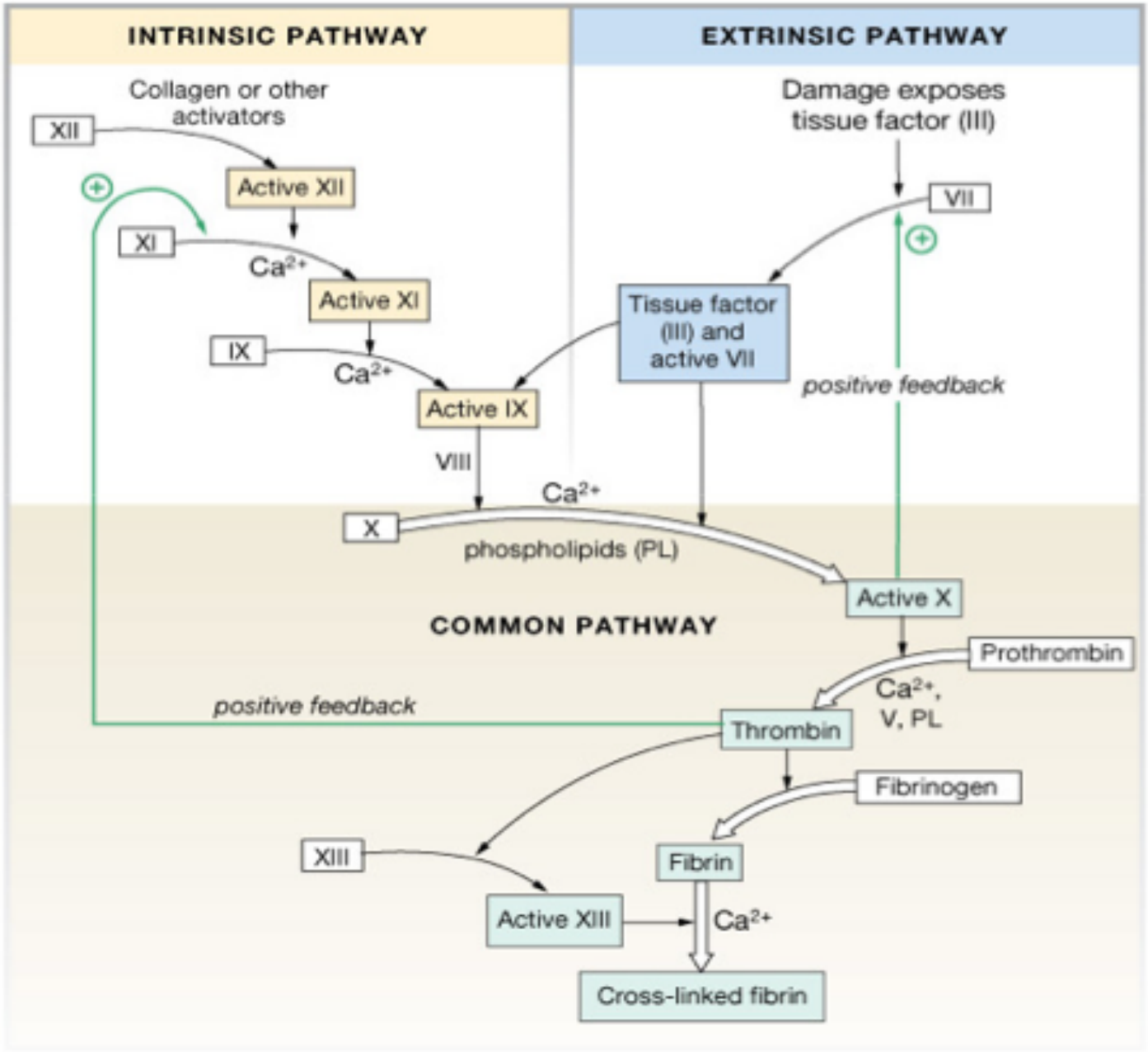
Clotting Cascade

- A cascade is a mechanism in which enzymes activate other enzymes sequentially usually leading to an amplification of an initial signal.

- Pathways
  - Extrinsic
  - Intrinsic

  } Initially independent, then they converge on common pathway leading to the formation of a fibrin clot

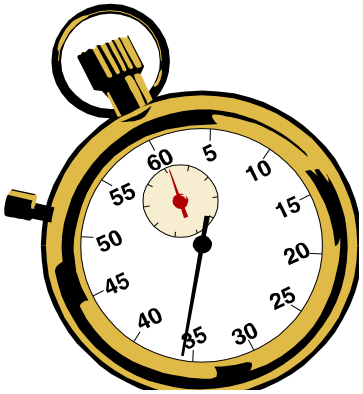
- Each of these pathways leads to the conversion of factor X (inactive) to factor Xa (active)


INTRINSIC PATHWAY
EXTRINSIC PATHWAY
Collagen or other activators
XII
Active XII
XI
Ca2+
Active XI
IX
Ca2+
Active IX
VIII
Damage exposes tissue factor (III)
VII
Tissue factor (III) and active VII
positive feedback
Ca2+
X
phospholipids (PL)
Active X
COMMON PATHWAY
Prothrombin
Ca2+, V, PL
positive feedback
Thrombin
Fibrinogen
XIII
Fibrin
Active XIII
Ca2+
Cross-linked fibrin

What triggers extrinsic and intrinsic pathways

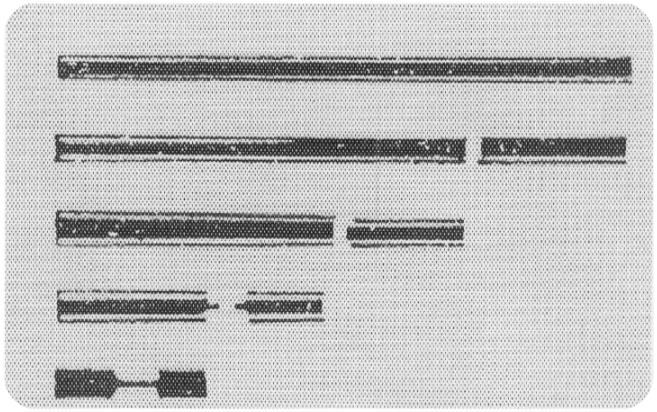
- Extrinsic—Damage to tissue outside the blood vessel. This pathway acts to clot blood that has escaped from the vessel.
- Intrinsic—Damage to blood vessel wall, triggered by elements that lie within the blood itself.

Clotting time

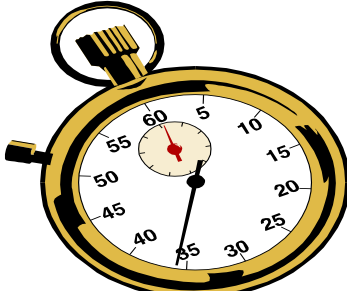


- Test for **intrinsic system**
- Simple test but takes time and rarely done now
- **Method:**
  - Venous blood is taken and placed on glass test tube at 37°C and it observed at time intervals until clotting occurs
- Normal blood takes 5-10min to clot
- Longer periods → Coagulation defects (e.g. Hemophilia)

Clotting time - capillary method

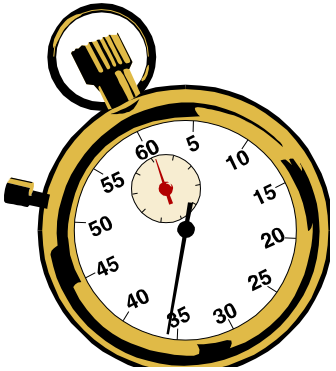


BLEEDING TIME



- Provides assessment of platelet count and function
- **Method:**
- It is determined by noting time at which blood coming out a small cut, no longer forms a spot on a piece of filter paper placed in contact with cut surface
- The normal range from 1-9 min

PROTHROMBIN TIME (PT)



- Measures effectiveness of the extrinsic pathway

- **Method:**
  - An excess of tissue factor and Ca2+ ions are added to diluted plasma containing citrate (anticoagulant) and then the time taken for the mixture to clot is measured
- **Normal value** → 10-15 secs

- High PT → low levels of thrombin
- Results from liver disease due to deficiency of prothrombin, fibrinogen, V, VII and X factors