

Let us start with the module

blood clotting processes,

extrinsic and intrinsic mechanism.

In this module we are going to discuss

blood and blood clotting mechanisms.

At the end of this module,

students will learn about blood and

blood clotting and they will understand

the mechanism of blood clotting.

Blood clotting is nothing else but

a process where blood loses its

fluidity and becomes a jelly like mass,

few minutes after it is shed out.

This is achieved with the help

of various clotting factors.

The important clotting factors

which help in blood clotting are

Factor 1. Fibrinogen, Factor

2. Prothrombin, Factor 3. Thromboplastin,

Factor 4. Calcium, Factor

5. Labile factor, Factor 6. has not been

assigned, Factor 7. Stable

Factor, Factor 8. Anti hemophilic

Factor, Factor 9. Christmas factor,

Factor 10. Stuart - Prower factor,

Factor 11. Plasma thromboplastin

antecedent, Factor 12.

Hageman factor and Factor 13

fibrin - stabilizing factor.

Now blood clotting occurs in three stages.

First stage is formation

of prothrombin activator.

Second stage is conversion of

prothrombin into thrombin and third

stage is conversion of fibrinogen

into fibrin.

Now let us start with the first stage

that is formation of prothrombin activator.

Prothrombin activator is

required to convert prothrombin.

Into thrombin. This prothrombin activator

is formed through two pathways.

Intrinsic pathway and extrinsic pathway.

Let us have a look at the intrinsic pathway.

Whenever there is an injury,

the blood vessel is ruptured.

The endothelium is damaged and

the collagen is exposed.

Factor XII will come in contact

with this collagen and factor XII

will get converted into activated

factor XII in the presence of Kallikrein

and high molecular weight kinogen.

Now,

as you can see in the image to the right,

the activated factor XII will convert

factor XI into activated

factor XI in the presence of

high molecular weight kinogen.

Activated factor XI will now activate

factor IX in the presence of Factor IV.

Activated factor IX will activate factor

X in the presence of Factor VIII and calcium.

When platelet comes in contact with collagen of damaged blood vessels, it gets activated and releases phospholipids.

Activated factor X will react with this phospholipid and factor V to form prothrombin activator in the presence of calcium ions.

Factor V, also activated by positive feedback effect of thrombin.

Let us now have a look at the extrinsic pathway.

So, because of an injury, the tissue is damaged and this damaged tissue will release factor III.

Thromboplastin has phospholipids and glycoproteins, both of which are proteolytic enzymes.

The proteolytic enzymes convert factor X into activated factor X in the presence of factor VII.

Activated factor X reacts with

factor V and phospholipid

component of tissue thromboplastin

to form prothrombin activator

in the presence of calcium ions.

So this is an image which is showing both

the intrinsic as well as extrinsic pathways.

Now,

once the prothrombin activator is formed

in the presence of calcium factor IV,

it will convert prothrombin into

thrombin and the formed thrombin

will initiate the formation of more

thrombin molecules.

The initially formed thrombin

also activates Factor V.

Factor V accelerates formation

of both extrinsic as well as

intrinsic prothrombin activator.

Prothrombin activator will convert

prothrombin into thrombin and

this is the positive feedback effect.

The third stage is conversion

of fibrinogen into fibrin.

Thrombin will now convert inactive

fibrinogen into activated fibrin and

Fibrin through polymerization forms

loosely arranged strands of fibrin.

These loose strands modified into dense

and tight fibrin threads by factor

XIII in the presence of calcium ions.

All of the tight fibrin threads

are aggregated and they form

a meshwork of stable clot.

So this is how the clotting process occurs.

And these are the references which

have been used for this module.

Thank you.