Difference Between Fibrin and Fibrinogen

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Key Difference - Fibrin vs Fibrinogen

When a blood vessel is injured or cut, the excessive loss of blood should be prevented before it leads to a shock or death. This is done by converting the specific circulating elements in the blood system into insoluble gel-like substances at the injured site. This is known as blood clotting or blood coagulation. Blood coagulation is accomplished by making a blood clot. A blood clot consists of a plug of platelets and a network of insoluble fibrin molecules. Fibrin together with platelets forms a plug over the damaged blood vessel to prevent further blood loss. Fibrin is formed from fibrinogen. The key difference between fibrin and fibrinogen is that **fibrin is an insoluble plasma protein** while **fibrinogen is a soluble plasma protein.**

What is Fibrin?

Hemostasis is a natural process that occurs to prevent excessive bleeding following an injury. It is the process of natural blood clotting which acts as the first stage of wound healing. Vasoconstriction, temporary stopping of cut by a platelet plug and blood coagulation are the three steps in hemostasis. Blood coagulation is mainly done by the formation of a fibrin clot. Fibrin is an insoluble, fibrous and non-globular protein which is involved in the clotting of blood. It is the underlying fabric polymer of a blood clot. Fibrin formation occurs in response to an injury in any part of the vascular system or the circulatory system. When there is an injury, a protease enzyme called thrombin acts on fibrinogen and causes it to polymerize into fibrin, which is an insoluble gel-like protein. Then, fibrin together with platelets creates a blood clot on the wound site to prevent continued bleeding.

The formation of fibrin is totally dependent on thrombin generated from prothrombin. The fibrinopeptides, which are in the central region of the fibrinogen, are cleaved by thrombin to convert soluble fibrinogen to insoluble fibrin polymer. There are two pathways which trigger fibrin formation. They are extrinsic pathway and intrinsic pathway.

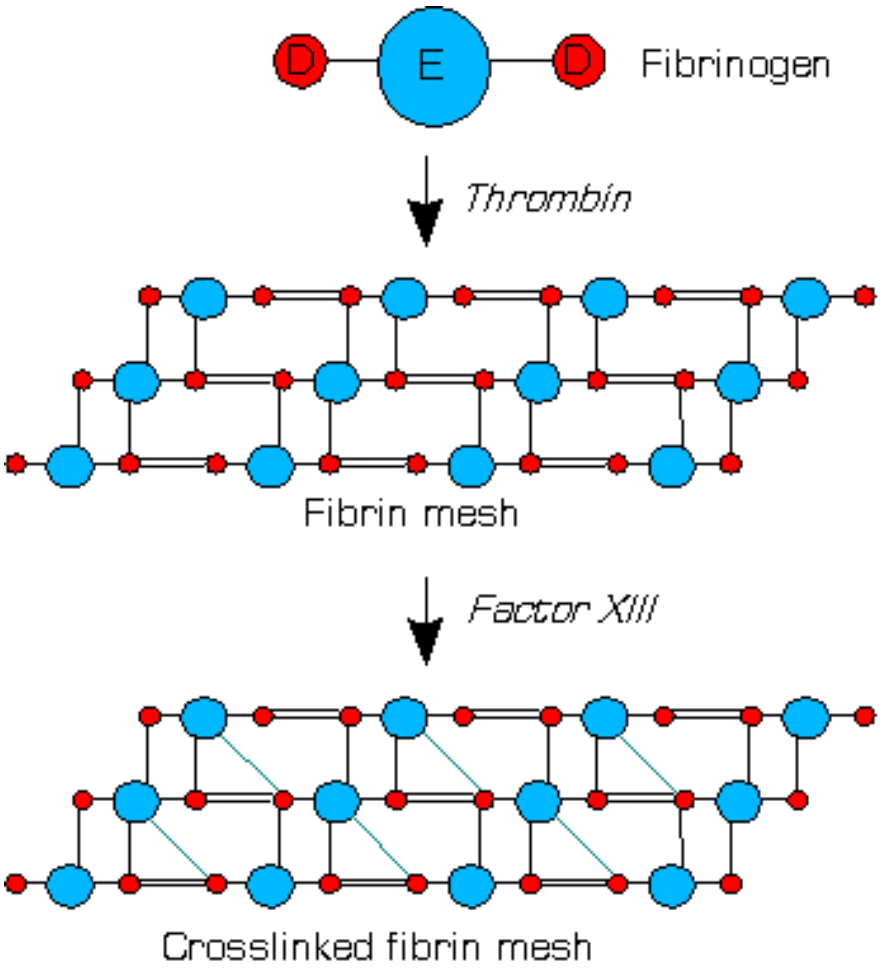

Figure 01: Fibrin mesh

What is Fibrinogen?

Fibrinogen is a soluble plasma protein important for blood coagulation. It is a large, complex and fibrous glycoprotein with three pairs of polypeptide chains joined together by 29 disulfide bond. When there is an injury in the vascular system, fibrinogen converts into fibrin which is the insoluble form of fibrinogen. This conversion is catalyzed by the enzyme called thrombin. Thrombin is generated from prothrombin.

Fibrinogen production is an essential process. It is the only pathway which produces the fibrin precursor. Dysfunction or diseases of the liver can lead to the production of inactive fibrin precursors or abnormal fibrinogen with reduced activity. This is known as dysfibrinogenaemia.

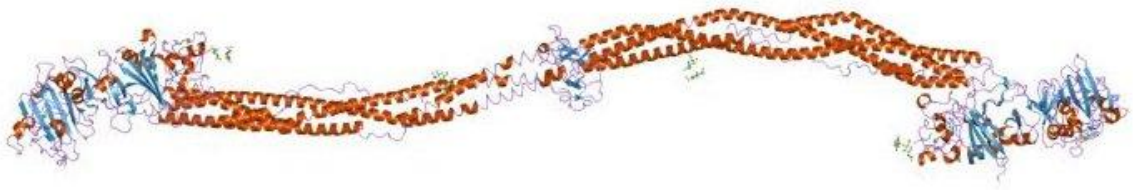

Figure 02: Fibrinogen

What are the similarities between Fibrin and Fibrinogen?

- Fibrin and fibrinogen are plasma proteins.
- Both proteins are produced by the liver.
- Both proteins are involved in blood coagulation.
- Both are fibrous proteins.

What is the difference Between Fibrin and Fibrinogen?

Fibrin vs Fibrinogen	
Fibrin is an insoluble, whitish, albuminous and fibrous protein which plays a major role in blood clotting.	Fibrinogen is a soluble plasma protein which polymerizes into fibrin by protease thrombin.
Solubility	
Fibrin is insoluble.	Fibrinogen is soluble.
Formation	
Fibrin if formed from fibrinogen.	Fibrinogen is synthesized from three separate mRNAs.

Summary - Fibrin vs Fibrinogen

Blood clotting is an important process to prevent excessive bleeding in an injury. Fibrin and fibrinogen are two plasma proteins that participate in blood clotting. Fibrin is an insoluble thread-like protein which is a major component of a blood

clot. The major difference between fibrin and fibrinogen is that fibrin is an insoluble protein while fibrinogen is a soluble protein. Fibrin is formed from fibrinogen which is a soluble protein in plasma. Fibrinogen is converted to fibrin when an injury in the vascular system occurs. This conversion is catalyzed by the clotting enzyme known as thrombin. Thrombin converts fibrinogen into insoluble fibrin which is suitable to make a network for the platelets to trap and create a plug of platelets. Both fibrin and fibrinogen are produced in the liver and are released into plasma.

References:

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