

Difference Between Hemostasis and Coagulation

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Key Difference - Hemostasis vs Coagulation

Vascular system or [circulatory system](#) is a [closed system](#) which permits blood, nutrients, gasses, hormones and other essential substances to circulate within the body via a network of blood vessels. Unless an injury or trauma occurs, blood never leaves or leaks from the network of blood vessels. When there is damage to the vascular system, it is repaired immediately to prevent blood loss. Hemostasis is a natural process which is activated to stop bleeding from the injury site. It occurs via three ways. [Blood clotting or blood coagulation](#) is the final step of hemostasis. The hole of the vascular system is blocked by a [blood clot](#) formed by [platelets](#) and coagulating factors. The key difference between hemostasis and coagulation is that **hemostasis is the overall process which stops bleeding due to a trauma while coagulation is the last step of hemostasis which forms a blood clot to block the hole in vascular tissue.**

What is Hemostasis?

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. There are several mechanisms involved in hemostasis. They are vasoconstriction, tissue swelling, platelet aggregation and blood coagulation. As a result of vascular, platelet and plasma factors, the bleeding is arrested in the injured blood vessel by hemostasis process. The hemostatic system maintains blood in a liquid state under physiological conditions and also creates blood clots or [fibrin](#) clots when there is a vessel injury.

Platelets serve as an important factor in hemostasis. They are essential for the formation of blood clots and activation of coagulation proteins. Disorders of hemostasis lead to excessive bleeding following an injury. Platelet disorders are critical among them. Platelet production can be decreased or platelet destruction can be increased when there is a platelet disorder; platelets functions can also be impaired. These factors affect the hemostasis and lead to abnormalities in hemostasis.

What is Coagulation?

Blood coagulation is an important process. When a blood vessel is injured or cut, excessive loss of blood should be prevented before it leads to shock or death. It 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. Due to this process, continuous blood loss from injured blood vessels, tissues and organs is stopped, and possible complications are prevented as soon as possible. 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.

Blood coagulation is mainly done by the formation of a fibrin clot. Fibrin is an insoluble, fibrous and non-globular protein involved in the clotting of blood. It is the underlying fabric polymer of a blood clot. Fibrin formation occurs as a 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 continuous bleeding.

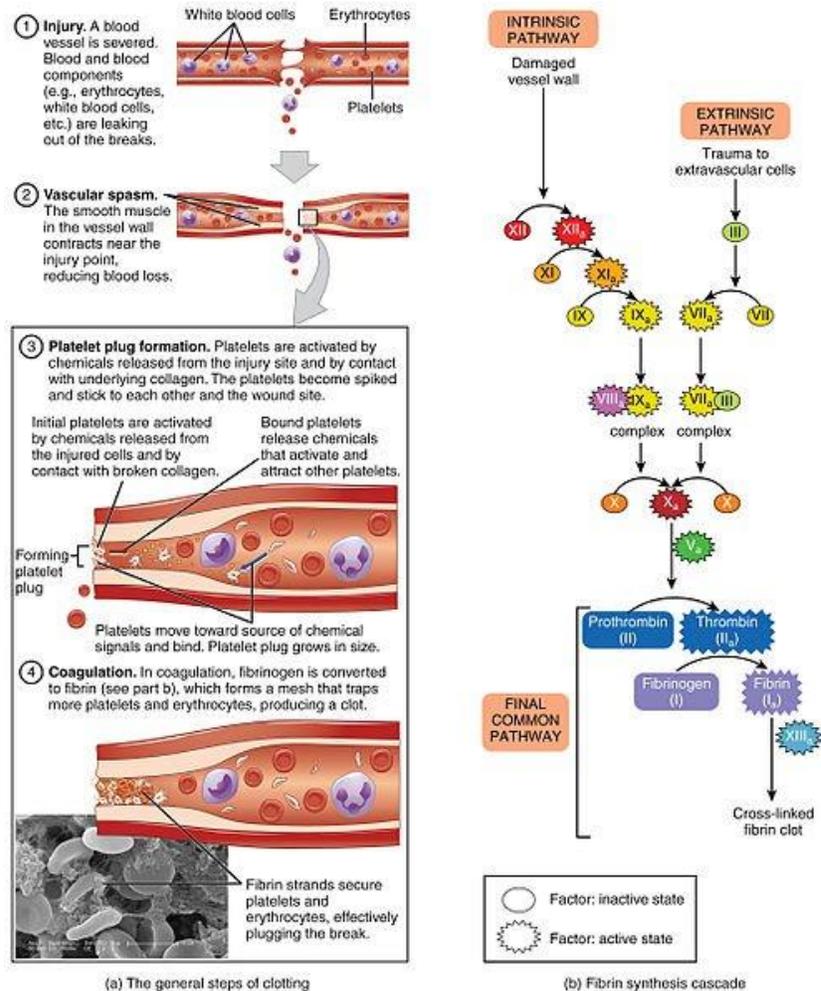


Figure 02: Blood coagulation

The formation of fibrin is totally dependent on thrombin generated from prothrombin. The fibrinopeptide, found in the central region of the fibrinogen, are cleaved by thrombin to convert soluble fibrinogen to insoluble fibrin polymer. There are two pathways in fibrin formation: [extrinsic pathway](#) and [intrinsic pathway](#). Deficiencies in these two pathways can lead to impaired blood clotting which ultimately results in [hemorrhage](#). Hence, both intrinsic and extrinsic pathways of blood clotting are important for hemostasis.

What is the difference between Hemostasis and Coagulation?

| Hemostasis vs Coagulation | |
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| Hemostasis is the overall process of arresting bleeding following a vascular injury. | Coagulation is the final step of hemostasis in which a stable blood clot is formed by platelets and insoluble fibrin network. |
| Process | |
| The ultimate result of the hemostasis is the stoppage of bleeding. | Soluble plasma fibrinogen polymerizes into insoluble fibrin during the coagulation and forms a plug to block the hole made by the injury. |
| Types | |
| Hemostasis can be categorized into two types named primary hemostasis and secondary hemostasis. | Coagulation can be categorized into intrinsic pathway of blood clotting and extrinsic pathway of blood clotting. |
| Disorders | |
| Hemostasis can show abnormalities due to platelet disorders. | Coagulation can be impaired by disorders of the liver and inactive or abnormal fibrinogen production. |

Summary - Hemostasis vs Coagulation

Hemostasis is the physiological process that stops bleeding at the site of an injury while maintaining normal blood flow elsewhere in the circulation. It occurs via several steps. Blood coagulation is the final result of hemostasis. This is the main difference between hemostasis and coagulation. Blood clotting is an important process to prevent excessive bleeding upon an injury. Fibrin and fibrinogen are two plasma proteins participate in blood clotting together with platelets.

Image Courtesy:

1. "1909 Blood Clotting" By OpenStax College - Anatomy & Physiology, Connexions Web site. Jun 19, 2013. [\(CC BY 3.0\)](#) via [Commons Wikimedia](#)

References:

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