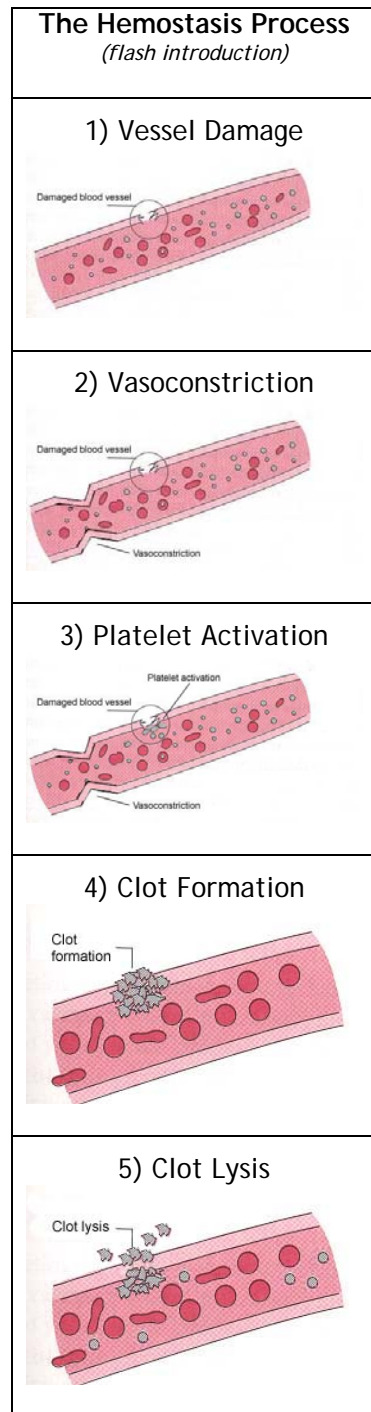


The Hemostasis Lab



Welcome to *The Hemostasis Lab* course for [Company Name] Field Service Engineers (FSEs). After completing this training, you will be able to:

- Identify the interaction of blood vessels, platelets, coagulation factors, and fibrinolysis in the hemostasis process.
- Identify inherited and acquired diseases associated with hemostasis.
- Understand which tests are performed in the hemostasis lab and why.
- Understand how [Company Name] Hemostasis analyzers work, their features and benefits.
- Identify [Company Name] and competitor analyzers

What is Hemostasis?

Hemostasis is the process of maintaining blood in its fluid state, as well as stopping bleeding in cases of trauma or disease. Normal hemostasis involves a balance between the following coagulation processes:

- The formation of blood clots to stop bleeding from injured vessels.
- [Natural anticoagulant](#) and [fibrinolytic](#) systems to prevent clot formation beyond the site of injury.

In the majority of patients, these processes work together to form a clot to stop bleeding, and to prevent unwanted clot formation so that blood flows freely through arteries, veins, and capillaries.

What Happens if Something Goes Wrong?

Problems arise in hemostasis if blood is lost from the vessels by bleeding or when a clot obstructs a blood vessel. An abnormality may be minor, such as a bruise, or it may be life threatening, such as a hemorrhage, thrombus, or embolus.

- Defects in clot formation or overactive fibrinolysis can lead to bleeding disorders.
- Defects in the anticoagulant systems or defective fibrinolysis lead to [hypercoagulation](#).

These defects can be hereditary or acquired. A growing menu of laboratory tests can be used to provide a specific diagnosis in affected patients.

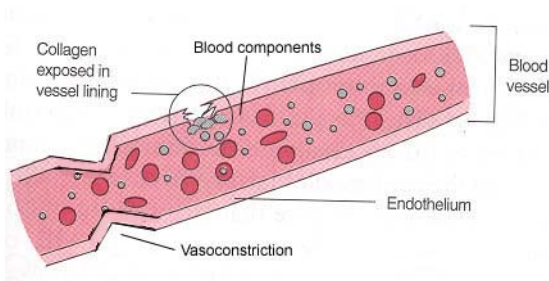
The Hemostasis Process

During normal hemostasis, if a blood vessel is injured, the following interdependent systems are called to action:

- [Vascular](#) system
- [Platelets](#)
- Blood [coagulation factors](#)
- [Fibrinolysis](#)

The Role of the Vascular System

When a blood vessel is damaged, the following vascular reactions can occur:



- **Vasoconstriction**—blood vessels narrow to reduce blood flow to a damaged area.
- **Collagen exposure**—The collagen layer is part of the sub-endothelium of blood vessels. [Platelets](#) and clotting factors activate when they come in contact with exposed [collagen](#), of damaged blood vessels.

Q. Which hemostasis systems are affected by the exposure to the collagen layer?

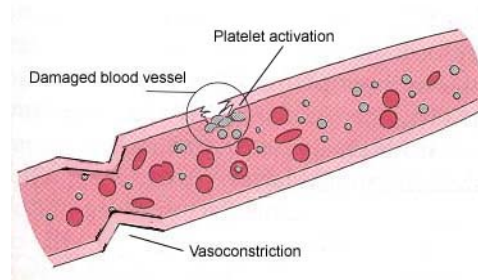
Click [here](#) for the answer.

A. Vascular system, platelets, and plasma clotting factors

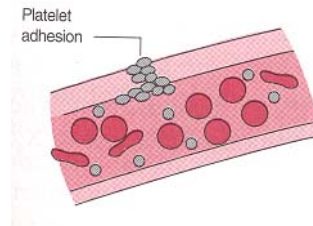
The Role of Platelets

When a blood vessel is damaged, [platelets](#) undergo the following changes:

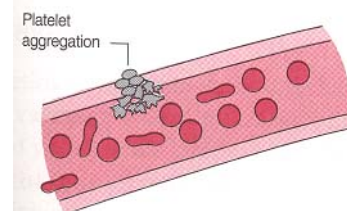
1. Platelets come in contact with exposed [collagen](#) in the wall of damaged cells to initiate platelet [adhesion](#) at the site of injury.



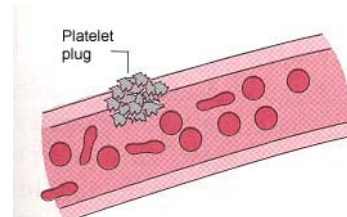
2. Platelet adhesion activates platelets, which change shape, release ADP, and begin to stick together.



3. Activated platelets initiate platelet [aggregation](#) in the damaged area, and release [platelet factor 3](#) and Ca^+ .



4. Platelet aggregation causes the formation of a platelet plug to stop bleeding in the damaged area.



Learn more about...Platelet Aggregation

Although platelets are not complete cells, they are quite active chemically. Over 40 substances are secreted from platelets during the “release” reaction that accompanies aggregation, including adenosine diphosphate (ADP). Within one minute, [fibrin](#) strands begin to appear, trapping [RBCs](#), and [WBCs](#) into the clot to make it stronger.

The Role of Coagulation Factors

When a blood vessel is damaged, coagulation factors interact to form a stable [fibrin](#) clot to stop bleeding. Coagulation factors are:

- **Made up of plasma proteins**, except for calcium (Factor IV), which is a mineral, and thromboplastin, which is a lipoprotein released from tissue.
- **Produced in the liver**, except for Factor VIII (hemolytic factor), which is produced in multiple organs.
- **Circulated in plasma in an inactive form** as [enzyme](#) precursors, or as catalysts for other enzymatic reactions.

What's the deal with these factor names?

[Coagulation factors](#) are named according to a system of Roman numerals that relate to their order of discovery—not to their order used in a reaction.

- Coagulation factor numerals also have synonyms. For example, factor I is more commonly known as fibrinogen, and factor III is more commonly known as thromboplastin.
- Coagulation factors initially circulate in the plasma in an inactive form. Upon activation, factor numerals are designated by the subscript "a" (e.g., XII_a).

Keeping coagulation factor numbers and names straight is no easy task! For example, number VI is no longer used, and two factors are named but have no numbers! Click a coagulation factor [below](#) to view its synonym. Factors marked * are more commonly referred to by their synonyms, rather than their Roman numerals.

<Click a 3-D button to reveal the factor name.>			
Factor I* Fibrinogen	Factor II* Prothrombin	Factor III* Thromboplastin or tissue factor	Factor IV* Calcium
Factor V Prothrombin accelerator	Factor VII Proconvertin	Factor VIII:C Antihemophilic factor	Factor IX Christmas factor
Factor X Stuart-Prower factor (PTC)	Factor XI Plasma thromboplastin antecedent (PTA)	Factor XII Hageman factor (contact factor)	Factor XIII Fibrin-stabilizing factor
No number assigned High Molecular Weight Kininogen (HMWK) or Fitzgerald factor	No number assigned Prekallikrein (PK) or Fletcher factor		

...end of sample...