Blood Clotting Notes
I. Hemostasis

1. **Hemostasis** - the stoppage of bleeding; 3 step process

A. **Blood vessel spasm**
   
   1. cutting or breaking of blood vessels simulates smooth muscle contraction (vasospasm)
   2. may last only a few minutes; effect can last up to 30 minutes
   3. serotonin - a hormone that can further contract smooth muscle
B. **Platelet plug formation**

1. platelets in plasm **adhere** to broken vessel and **to each other**

2. will help with **small breaks** only (see fig. 10.6 pg.337)
C. **Blood coagulation**

1. **Coagulation**—most effective hemostatic mechanism (*forms blood clot*)

2. Coagulation depends on **clotting** factors that **promote** and/or **inhibit** clotting

3. Sequence has **many steps** beginning when **platelets** encounter a **broken vessel** (a **cut**).
a. damaged tissue releases *thromboplastin* which produces *prothrombin activator* (ca$^{+2}$ ions must be present)

b. *prothrombin*- alpha globulin that turns to *thrombin* in the presence of ca$^{+2}$ ions

PROTHROMBIN $\rightarrow$ THROMBIN

c. formation of *fibrin*; thrombin catalyzes *fibrinogen* into thread-like fragments
FIBRINOGEN $\rightarrow$ FIBRIN

d. fibrin threads stick to exposed surfaces of damaged blood vessels; entraps RBC’s and Platelets (blood clot)
e. prothrombin activator in blood is directly proportional to the amount of tissue damage; tissue damage continues to stimulate production
f. clotting ceases where blood is moving quickly (prevents clots in blood stream)
Hemostasis

Serotonin Released by platelets

Platelet Plug forms

Vascular Spasm—narrows blood vessels

Coagulation

Anchored platelets release chemicals that attract more platelets.

PF3 and TF trigger the clotting cascade

See next slide
Coagulation

Prothrombin Activator → Prothrombin → Thrombin → Ca\(^{+2}\)

Fibrinogen (Soluble) → Thrombin → Ca\(^{+2}\) binds

Fibrin (Insoluble) → Fibrin adheres to platelets → Traps RBC

Clot Formation Complete

Clotting Time = 3-6 minutes
1. Injury to lining of blood vessel exposes connective tissue; platelets adhere

2. Platelet plug forms

3. Fibrin clot with trapped cells

Collagen fibers

Platelet releases chemicals that make nearby platelets sticky

Clotting factors from:
- Platelets
- Damaged cells
- Plasma (factors include calcium, vitamin K)

Prothrombin → Thrombin

Fibrinogen → Fibrin

Fibrin
Blood clot formation

- Clotting factor
- Platelet
- Fibrin

Red blood cell
Phlebitis: inflammation of the wall of a vein
(1) Injured tissue + Platelets $\rightarrow$ Thromboplastin is formed (from blood plasma)

(2) Prothrombin $\xrightarrow{\text{Thromboplastin} \text{ Ca}^{++}}$ Thrombin
   (Soluble protein)  (An active enzyme)
   (plasma)

(3) Fibrinogen $\xrightarrow{\text{Thrombin}}$ Fibrin
   (Soluble protein) (Insoluble protein)
   (from plasma) which forms a mesh of fibres

(4) Fibrin + Red blood corpuscles $\rightarrow$ Blood clot
   (A thick mass of fibres) (RBCs entangled in fibrin)