

BIO 2402  
Human Anatomy & Physiology

Hi everyone! I hope you all are feeling confident in your studies of the endocrine system and are ready to tackle the last chapter that will be on your first lecture exam! We will be covering the first chapter of cardiovascular system that focuses on the blood. I will include practice questions for both the endocrine system (as a review) as well as the cardiovascular system. Please let me know if you have any questions!

Remember that the Tutoring Center offers free individual and group tutoring for this class. Our Group Tutoring sessions will be every Wednesday from 6:00-7:00 PM CST. You can reserve a spot at <https://baylor.edu/tutoring>.

**KEY WORDS:** Intrinsic & Extrinsic Pathway, Cell Differentiation, Plasma Proteins, Relative Abundance

- Composition of Blood: Plasma and Formed Elements

*Whole Blood* = Plasma + Formed Elements

*Hematocrit* = Formed Elements

*Plasma* = 93% water, 7% **Plasma Proteins**

1. **Albumin:** smallest most abundant
2. **Globulin:** second most abundant
  1. Alpha- transports bilirubin
  2. Beta- transports metals
  3. Gamma- aka immunoglobulins or antibodies, immunization
3. **Fibrinogen:** secreted from the liver, least abundant

- **Red Blood Cells:** Most abundant formed element in the blood

- **White Blood Cells:** Have two subclasses

- *Granulocytes or Polymorphonuclear leukocytes:* neutrophils, eosinophils, and basophil
- *Agranulocytes or Mononuclear leukocytes:* lymphocytes and monocytes

- For each blood cell please ensure that you know the following: **function, origin, formation, and destruction.** Dr. Taylor likes to ask questions about the different function of the blood cells, so it is imperative that you know the difference between each type.

**Relative Abundance:** within the whole blood each separate element as a specific concentration, or abundance relative to the concentration of the other elements.

From most to least, relative abundance is:

1. RBCs
2. Thrombocytes
3. Neutrophils
4. Lymphocytes
5. Monocytes

6. Eosinophils

7. Basophils

### Hemostasis: the stoppage of bleeding.

**Occurs in three major stages:** Vascular Spasm, Platelet Plug Formation, and Blood Clotting

**Vascular Spasm:** The quickest stage in hemostasis, occurs when the smooth muscle tissue in a damaged blood vessel vasoconstricts, consequently reducing blood flow and blood pressure in that area of the blood vessel.

**Platelet Plug Formation:** Begins with platelets congregating at the site of damage. A platelet plug, a tightly packed group of platelets which seal a hole in a blood vessel wall, requires two steps to activate.

1. Platelet Adhesion: platelets stick to foreign particles (collagen fiber for example)
2. Platelet Aggregation: platelets begin sticking to one another. Platelet aggregation is an example of a positive feedback cycle; as platelets congregate together they release ADP which attracts more platelets, which in turn release more ADP.

**Blood Clotting:** also known as **coagulation**

Make sure that you can trace each step of this diagram and can differentiate between **intrinsic and extrinsic factors**

**Intrinsic Pathway:** This pathway is initiated by chemicals that come from within the blood.

1. Begins with Platelet Factor 3 being released from platelets after exposure to exposed collagen fibers
2. Two additional clotting factors plus Platelet factor and calcium ions work together to activate Factor X into Promthrombinase

**Extrinsic Pathway:** This pathway is initiated by chemicals that come from outside of the blood.

1. Begins with Tissue Factor(TF/Thromboplastin/Tissue Factor 3) being released from blood vessel walls.
2. Calcium ions plus Thromboplastin activate a second clotting factor which activates Factor X into Promthrombinase

After Prothrombinase, you will need to be able to remember which coagulants activate one another. The chart below shows how Prothrombin and Fibrinogen are activated into the final blood clot.

Practice Problems:

1. Which pathway is more fast acting, **intrinsic or extrinsic?**
2. Prothrombinase is to \_\_\_\_\_ as \_\_\_\_\_ is to Fibrinogen

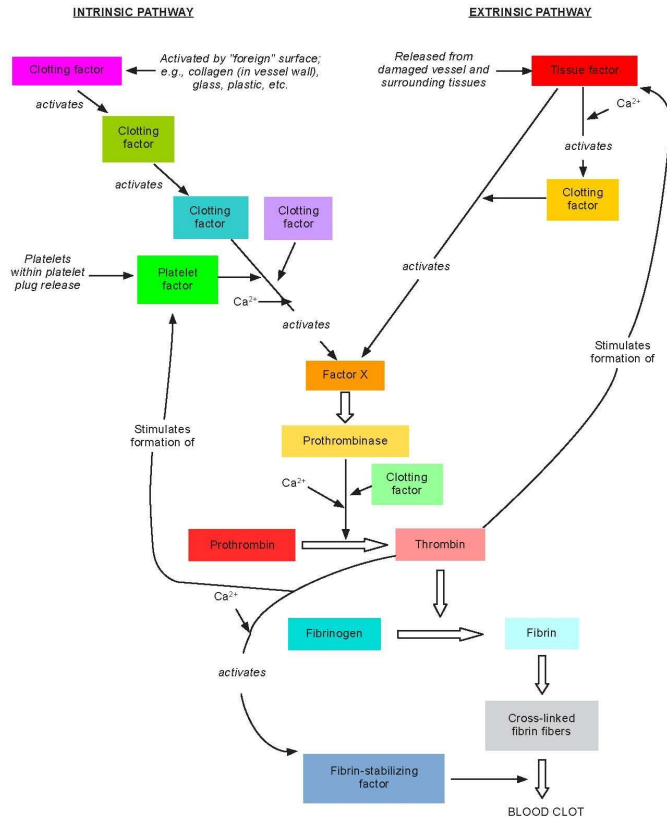


Figure 3-6. Steps in coagulation

\*all images come from *Human Anatomy & Physiology*, by Mark Taylor\*  
 Answer: 1) Extrinsic. 2) Prothrombin, Thrombin

**Cell differentiation:**

- Also known as the development of blood's formed elements
- All cell differentiation begins with a hemocytoblast, also known as a hemopoietic stem cell, which comes from red bone marrow.
- It is important to note that once a hemocytoblast differentiates into a myeloid stem cell or lymphoid stem cell that that particular cell is considered committed, and cannot be reversed in its development.
- Make sure that you can trace each RBC and WBC back to a hemocytoblast.

**EX: Hemocytoblast —> Myeloid stem cell —> Megakaryoblast —> Megakaryocyte —> Thrombocytes/Platelets**

The image below shows the pathway of each blood cell as they differentiate, please use this to learn each pathway as well as to test your knowledge later on.

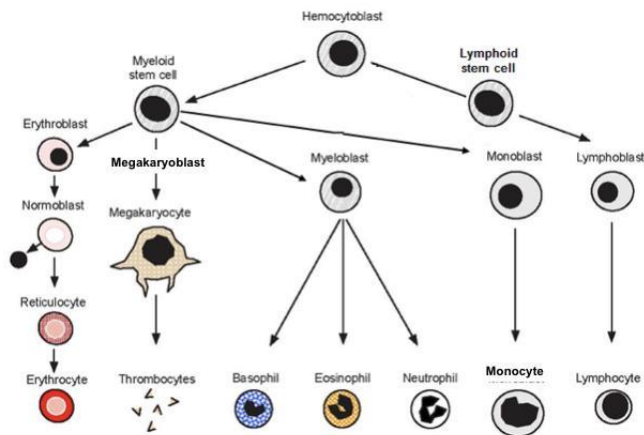


Figure 3-4. Development of blood's formed elements

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Practice Questions:

1. During which stage does an immature erythrocyte lose its nucleus?
2. What is another name for thrombocytes?

Answers: 1) normoblast 2) platelets