

Difference Between Alpha and Beta Hemolysis

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Key Difference - Alpha vs Beta Hemolysis

[Red blood cells](#) are the most common type of blood cells in our blood. They are produced by the [bone marrow](#). They are important in carrying oxygen from the lungs to the heart and to the entire body. Red blood cells contain [hemoglobin](#) molecules. Hemoglobin is an iron-containing metalloprotein, and it is the main molecule of oxygen transportation. Hemoglobin molecules are located inside the red blood cells. The destruction of the red blood cells causes the release of hemoglobin from the red blood cells to the [blood plasma](#). This process is known as hemolysis. Several specific types of [bacteria](#) produce an [enzyme](#) called hemolysin that catalyzes the breakdown of red blood cells. Hemolysis is in three types; alpha hemolysis, beta hemolysis, and gamma hemolysis. **In alpha hemolysis, red blood cells are partially broken down while in beta hemolysis, red blood cells are completely broken down by the bacterial enzymes.** This is the **key difference** between alpha hemolysis and beta hemolysis.

What is Alpha Hemolysis?

Alpha hemolysis is also known as incomplete hemolysis, is the process of partial destruction of red blood cells. This process is catalyzed by the bacterial hemolytic enzyme called alpha-hemolysin. Several bacterial species are responsible for alpha hemolysis, and they are *S. pneumoniae*, *Streptococcus mitis*, *S. mutans*, and *S. salivarius*.



Figure 01: Alpha Hemolysis

When these bacteria are grown in blood agar medium, around their colonies greenish colour develops due to the incomplete destruction of red blood cells. The greenish colour is due to the presence of biliverdin, and this compound is a by-product of hemoglobin breakdown.

What is Beta Hemolysis?

Beta hemolysis also known as complete hemolysis, is the process of complete destruction of red blood cells. The [cell membranes](#) of the red blood cells destroyed by the bacterial hemolytic enzymes. Therefore, the hemoglobin molecules release into the blood plasma. Beta hemolysis occurs due to the bacterial enzyme called beta-hemolysin.



Figure 02: Beta Hemolysis

The bacteria that secrete this enzyme are known as beta hemolytic bacteria, and the common species are *S. pyogenes* and *S. agalactiae*. When these bacteria are grown in blood agar medium, they release beta-hemolysin into the medium. Beta hemolysins break down the red blood cells completely. Hence, clear zones are produced around the bacterial colonies. Beta hemolysis is identified by the clear zones produced around the bacterial colonies.

What are the Similarities Between Alpha and Beta Hemolysis?

- Alpha and Beta hemolysis are two types of hemolysis.
- In both processes, bacterial enzymes are involved.
- Red blood cells are affected by both processes.

What is the Difference Between Alpha and Beta Hemolysis?

Alpha vs Beta Hemolysis	
Alpha Hemolysis is the process of incomplete destruction of red blood	Beta Hemolysis is the process of complete destruction of red blood cells

cells in the blood.	in the blood.
Red Blood Cells	
In alpha hemolysis, red blood cells break down completely.	In beta hemolysis, red blood cells break down partially.
Indication of Blood in Agar Medium	
Alpha Hemolysis indicates the production of clear zones around the bacterial colonies on blood agar plates.	Beta Hemolysis indicates greenish colour around the bacterial growth in blood agar plates.
Enzyme Involved	
Alpha Hemolysis is catalyzed by the enzyme alpha-hemolysin.	Beta Hemolysis is catalyzed by the beta-hemolysin.
Bacteria Involved	
Alpha Hemolysis bacteria are <i>pneumoniae</i> , <i>Streptococcus mitis</i> , <i>S. mutans</i> , and <i>S. salivarius</i> .	Beta Hemolytic bacteria are <i>pyogenes</i> and <i>S. agalactiae</i> .
Synonyms	
Alpha Hemolysis is also known as green hemolysis, incomplete hemolysis or partial hemolysis.	Beta Hemolysis is also known as complete hemolysis.

Summary - Alpha vs Beta Hemolysis

Hemolysis is the breakdown of red blood cells by the bacterial enzymes. When the cell membranes of the red blood cells are disrupted, hemoglobin molecules leak into the blood plasma. The enzymes that are involved in hemolysis are known as a hemolysin. Many bacteria are able to produce hemolysin enzymes. There are three types of hemolytic reactions; alpha hemolysis, beta hemolysis and gamma hemolysis. In alpha hemolysis, incomplete break down of red blood cells occurs. Hence greenish colour zones are produced around the bacterial colonies grown on the blood agar plates. In beta hemolysis, complete destruction of red blood cells occurs. Hence, clear zones are produced around the bacterial colonies in the blood agar plates. This is the difference between alpha hemolysis and beta

hemolysis. Hemolytic anemia is the disease condition that occurs due to the excessive destruction of red blood cells in the blood.

Reference:

1. "Blood Agar, Hemolysis, and Hemolytic Reactions." World of Microbiology and Immunology, Encyclopedia.com. [Available here](#)
2. "Hemolytic Anemia: Causes, Symptoms, and Diagnosis." Healthline, Healthline Media. [Available here](#)

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2. 'Beta hemolysis on blood agar' By HansN. - Own work, [\(CC BY-SA 3.0\)](#) via [Commons Wikimedia](#)

How to Cite this Article?

APA: Difference Between Alpha and Beta Hemolysis. (2018 January 26). Retrieved (date), from <http://differencebetween.com/difference-between-alpha-and-vs-beta-hemolysis/>

MLA: "Difference Between Alpha and Beta Hemolysis". Difference Between.Com. 26 January 2018. Web.

Chicago: "Difference Between Alpha and Beta Hemolysis". Difference Between.Com. <http://differencebetween.com/difference-between-alpha-and-vs-beta-hemolysis/> accessed (accessed [date]).



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