

# Difference Between Endotoxin and Enterotoxin

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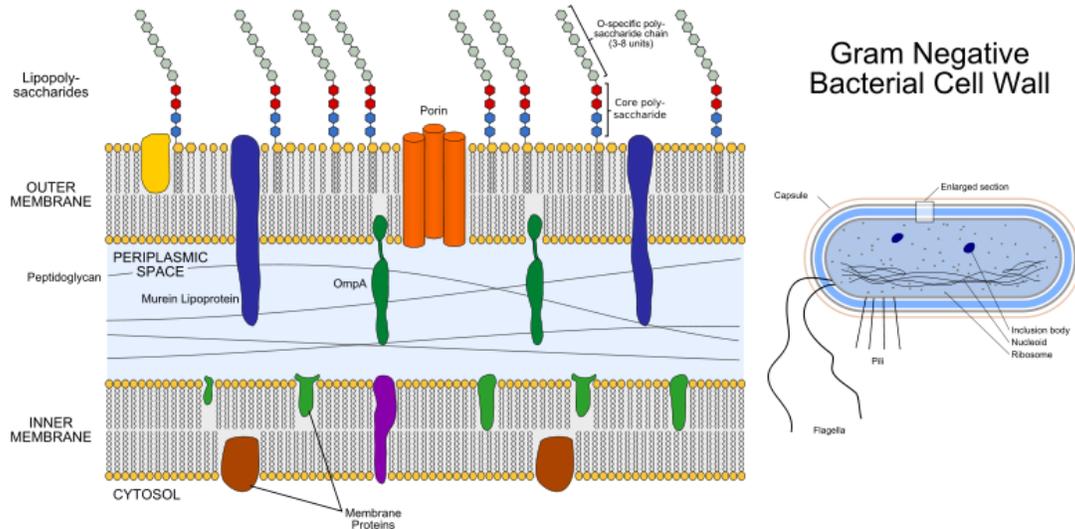
## Key Difference – Endotoxin vs Enterotoxin

A toxin is a poisonous substance that is produced by a living cell or organism. Toxins are produced by different types of organisms such as bacteria, fungi, plants, and animals. Bacteria are well-known microorganisms which produce toxins that cause severe diseases such as tetanus, cholera, and diphtheria. Bacteria produce two types of toxins named endotoxins and exotoxins. Endotoxins are located within the bacterial cells. They serve as part of the bacterial cell wall and are made up of lipids. Endotoxins are released outside when the bacterial cell is lysed. Exotoxins are poisonous proteins produced by bacteria. They are produced and released outside the bacterial cells. Enterotoxin is a type of exotoxin which is released to the intestine of organisms. These enterotoxins are produced by certain bacterial species and cause food poisoning and several intestine diseases. The key difference between endotoxin and enterotoxin is that **endotoxin is a poisonous substance produced within the bacterial cell** while **enterotoxin is a poisonous substance which is produced in or released into intestines by bacterial cells**.

## What is an Endotoxin?

Endotoxin is a poisonous substance present inside a bacterial cell that is released when the bacterial cell disintegrates. They are lipopolysaccharides which are located in the outer membrane of gram-negative bacteria. The outer membrane is unique to gram-negative bacteria. Hence, endotoxins are always associated with gram-negative bacteria. Some gram-negative bacterial species such as *Escherichia coli*, Salmonella, *Shigella*, *Pseudomonas*, *Neisseria*, *Haemophilus influenzae*, *Bordetella pertussis* and *Vibrio cholera* are well-known endotoxin producers.

Endotoxin has three components in its structure: lipid A, O antigen (O polysaccharide) and polysaccharide. Toxicity is mainly associated with the lipid A component and antigenic nature is associated with O antigen. Endotoxins do not act enzymatically. They are also not normally soluble. However, endotoxins are heat stable and cannot be destroyed by boiling. Certain powerful oxidizing chemicals such as superoxide, peroxide, and hypochlorite can be applied to destroy endotoxins.



**Figure 01: Endotoxins or Lipopolysaccharides in Gram-negative Bacteria**

Endotoxins are not released to the outside till the cell is subjected to autolysis, external lysis or phagocytic digestion. They remain as a component of the outer membrane of the bacterial cell.

## What is an Enterotoxin?

An enterotoxin is a protein exotoxin released by a microorganism that targets intestines. Enterotoxins are produced in or released into intestines. Certain bacterial species are capable of producing enterotoxins. Enterotoxins belong to the category of exotoxin. They are proteins and can act as enzymes. Enterotoxins are pore-forming toxins. Hence, they create pores in the epithelial cells of the intestine wall. When the enterotoxins increase the permeability to chloride ions in the intestinal mucosal cells, it causes secretory diarrhea. *Staphylococcus aureus* and *E. coli* are two bacterial species which can create such conditions by enterotoxins.

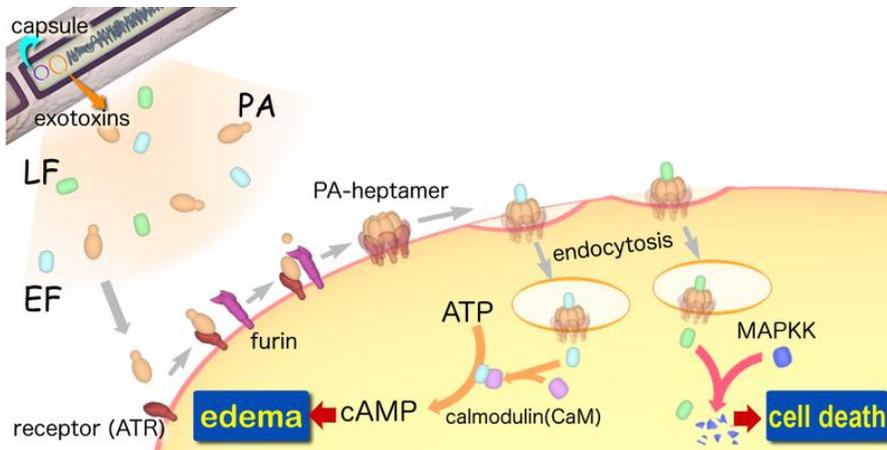


Figure 02: Action of Anthrax Exotoxins

In general, enterotoxins are produced by gram-positive bacteria. However, certain gram-negative bacteria can also produce enterotoxins. For example, *Vibrio cholera* is a well-known enterotoxin producer and is a gram-negative bacterium.

## What are the similarities between Endotoxin and Enterotoxin?

- Endotoxins and enterotoxins are produced by pathogenic bacteria.
- Endotoxins and enterotoxins are poisonous substances.

## What is the difference between Endotoxin and Enterotoxin?

Endotoxin vs Enterotoxin	
Endotoxin is a bacterial toxin which is a part of bacterial cell made up of lipopolysaccharides.	Enterotoxin is a protein exotoxin released by a microorganism that targets the intestines.
Bacterial Groups	
Endotoxins are produced by gram-negative bacteria.	Enterotoxins are produced by both gram-negative and positive bacteria.
Composition	

Endotoxin is a lipopolysaccharide.	Enterotoxin is a soluble protein.
<b>Action as an Enzyme</b>	
Endotoxin cannot work as an enzyme.	Enterotoxin is able to work as a soluble enzyme.
<b>Activity</b>	
Endotoxins are less potent and less specific in their action.	Enterotoxins are highly potent and specific in their action.
<b>Location</b>	
Endotoxins are a part of the outer membrane of the bacterial cell. Hence, remain within the outer membrane until the cell disintegrates.	Enterotoxins are produced in or released into the intestine. Hence, they remain in the bacterial cell surrounding.
<b>Antigenicity</b>	
Endotoxins have poor antigenicity.	Enterotoxins have high antigenicity.
<b>Solubility</b>	
Endotoxins are normally not soluble.	Enterotoxins are soluble.
<b>Conversion to Toxoid</b>	
Endotoxins cannot be converted to toxoids.	Enterotoxins can be converted to toxoids.
<b>Heat Sensitivity</b>	
Endotoxin is a heat stable substance. Hence, endotoxins cannot be destroyed by boiling.	Enterotoxin is a heat liable protein. Hence, they can be destroyed by boiling.
<b>Molecular Weight</b>	
Endotoxin is a high molecular weight	Enterotoxin is a low molecular weight

lipopolysaccharide.

protein.

## Summary – Endotoxins vs Enterotoxin

Endotoxins and enterotoxins are two types of poisonous substances produced by bacteria. Endotoxins are lipopolysaccharides and are components of the outer membrane of gram-negative bacteria. They are liberated when the bacterial cell disintegrates. Enterotoxins are a type of exotoxins that act on the intestine wall and cause diseases in the gastrointestinal tract. Endotoxins are lipids while enterotoxins are soluble proteins. This is the main difference between endotoxin and enterotoxin.

### References:

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