Toxin Protein

Toxins are tiny molecules, peptides, or proteins that can cause disease when they come into touch with or are absorbed by human tissues and interact with biological macromolecules such as enzymes or cellular receptors. Bacteria are the most common sources of protein toxins. Bacterial protein toxins are unique and strong cytotoxic agents linked to specific carrier ligands for cellular targeting. Bacterial protein toxins are classified into endotoxins and exotoxins.

Endotoxins are also known as cell-associated toxins since they are non-protein lipopolysaccharides that are connected with the cell wall of Gram-negative bacteria. The majority of endotoxins are found in the cell envelope. Endotoxin is defined as the lipopolysaccharide (LPS) or lipooligosaccharide (LOS) found in the outer membrane of Gram-negative bacteria. Although soluble endotoxins are not structural components of cells, they can be released by developing bacteria or cells that are lysed due to successful host defense mechanisms or the activities of some antibiotics. Bacterial endotoxins include enterotoxins, neurotoxins, cytotoxins, lysins, and gangrene-producing toxins. Endotoxins typically act in the presence or vicinity of bacterial growth.

Exotoxins are proteins secreted by bacteria that act at a location other than the site of secretion. However, some bacterial exotoxins act at the site of pathogen colonization and may play a role in invasion. Exotoxins are usually proteins, minimally polypeptides, that act enzymatically or through direct action with host cells and stimulate a variety of host responses. Most exotoxins act at tissue sites remote from the original bacterial invasion or growth point. The exotoxins are unstable by nature. They lose their poisonous qualities but retain their antigenic properties with time.

Along with the carrier bacteria, microbial toxins capable of disrupting or hyperstimulating numerous critical activities and pathways of eukaryotic cells have emerged. These toxins must benefit the bacterium in some way, either during the host-parasite relationship or in some environmental niche encountered by the bacterium. Certain bacterial toxins act on the target cell surface, causing irreversible damage to the cell membrane or disrupting normal cellular signal transduction. Other poisons demonstrate enzymatic action after entering the cytoplasm of the susceptible cell via endocytosis. Other bacterial toxins work by inhibiting or activating a normal host cell function. Although harmful to the susceptible host during infection, certain bacterial toxins have been used as probes of eukaryotic cellular pathways and for medical uses. Thus, research on a microbial toxin produced by an established, developing, or reemerging pathogen is likely to offer unique knowledge about the toxin's role in disease and the disrupted host cell features. Table 1 lists the common bacterial toxin proteins

Toxin	Source	Toxin	Source
Aerolysin	*Aeromonas hydrophila*	Dermonecrotic toxin	*Bacillus anthracis*
Exotoxin A	*Pseudomonas aeruginosa*	Pertussis toxin	*Bacillus anthracis*
Lethal factor	*Bacillus anthracis*	C2 toxin	*Clostridium botulinum*
Listeriolysin O	*Listeria monocytogenes*	C3 toxin	*Clostridium botulinum*
α-toxin	*Staphyloccocus aureus*	toxin A	*Clostridium difficile*
Pneumolysin	*Streptococcus pneumoniae*	toxin B	*Clostridium difficile*
Streptolysin O	*Streptococcus pyogenes*	Perfringolysin O	*Clostridium perfringens*
Diphtheria toxin	*Corynebacterium diphtheriae*	Cholera toxin	*Vibrio cholerae*
Shiga toxins	*Escherichia coli*	Enterotoxins	*Staphylococcus aureus*

Hemolysin	*Escherichia coli*	Exfoliative toxins	*Staphylococcus aureus*
CNF-1	*Escherichia coli*	Toxic-shock toxin	*Staphylococcus aureus*
Heat-labile toxin (LT)	*Escherichia coli*	Alpha toxin	*Staphylococcus aureus*
Heat-stable toxin (ST)	*Escherichia coli*	Neurotoxins A-G	*Clostridium botulinum*
Cytolethal distending toxin	*Escherichia coli*	Tetanus toxin	*Clostridium tetani*
East	*Escherichia coli*	Anthrax EF	*Bacillus anthracis*

Table1. Common bacterial toxin proteins

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Phone: (858)-909-0079) **Bioclone Inc**. Fax: (858)-909-0057