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Short Communication

A Brief Note on Bacterial Toxins

George Sourvinos*

Department of Biotechnology, University of Crete, Heraklion, Greece

DESCRIPTION

Toxins produced by microorganisms such as bacteria, fungus, protozoa, dinoflagellates, and viruses are known as microbial toxins. Many microbial toxins promote infection and disease by causing direct damage to host tissues and causing the immune system to malfunction [1].

Bacterial toxins are classified as exotoxins or endotoxins. Exotoxins are produced and actively released, whereas endotoxins remain in the bacteria. Exotoxins are also bacteria-specific; for example, diphtheria toxin is only produced by *Corynebacterium diphtheriae* bacteria and is essential for the diphtheria disease. Endotoxins are lipopolysaccharide or lipooligosaccharide molecules found in outer plasma membrane of Gram-negative bacteria. Exotoxins are proteins with enzymatic activity that interfere with host cells. *Botulinum* toxins, Clostridial toxins, Tetanus toxin, *Staphylococcal* toxins, Cholera toxins are some of the bacterial toxins examples.

Botulinum toxins

Botulinum neurotoxins (BoNTs) are protein neurotoxins made by the *Clostridium* bacteria [2]. BoNTs are presently being examined extensively for their potential to help with chronic inflammatory disorders including acne and multiple sclerosis, as well as for cosmetic purposes. The *botulinum* toxin, which is produced mostly by *Clostridium botulinum*, is the world's most toxic chemical.

Clostridial toxins

Clostridium species can be found in a variety of sites around the world, including soil, water, dust, and even human digestive tracts. Some of these species produce toxins that are harmful to humans, such as *botulinum* toxin and tetanus toxin. Most *clostridium* species that do produce toxins have binary toxins, with the first unit causing the poison to enter the cell and the second unit causing cellular deformation. *Clostridial* toxins are aid to help with gastrointestinal disorders, and they have a variety of ways for invading or entering the host cell. Pore-forming bacterial toxins are abundant, also have a unique technique of entering or invading the cell of their hosts [3].

Tetanus toxins

In many vertebrates (including humans) and invertebrates, *Clostridium tetani* produces tetanus toxin (TeNT protein), which causes tetanus. Tetanus is a paralytic disease that affects neonates and non-immunized persons worldwide. Tetanus toxin is produced by *Clostridium tetani*, a spore-forming bacteria found in soil. Tetanus is present in manure, soil, and dust and enters the body of organisms through wounds or skin breaks. Tetanus causes spastic paralysis by interfering with the transfer of glycine and γ-aminobutyric acid from inhibitory interneurons in the spinal cord. When tetanus toxin enters the body, it is taken up by cholinergic nerve endings that move axonally into the brain and spinal cord, causing disruption of the motor function. Tetanus is a harmful toxin with a wide range of symptoms that can be prevented by vaccination/immunization.

Staphylococcus toxins

Immune evasion proteins from *Staphylococcus aureus* have a significant conservation of protein structures and a range of activities that are all directed at the two key elements of host immunity, complement and neutrophils. The bacterium can survive immune response mechanisms with the help of these released virulence factors. Toxins produced by *S.aureus* strains include enterotoxins, which induce food poisoning, exfoliative toxins, which cause scalded skin condition, and Toxic-Shock Syndrome Toxin (TSST), which causes toxic shock syndrome. These are classified as super-antigens.

Cholera toxins

Cholera is a potentially fatal infection caused by toxigenic *Vibrio cholerae*, which is spread through the fecal-oral route via food or water contaminated with the *Vibrio cholerae*. The intestines are the target of *V.cholerae*, which secretes *cholera* toxin [4]. It is an exotoxin and powerful enterotoxin that acts as an Adenosine diphosphate (ADP)-ribosyltransferase that targets G-proteins. As a result, intracellular cAMP levels increases, forcing intestinal cells to discharge large amounts of water and electrolytes into the lumen.

Correspondence to: George Sourvinos, Department of Biotechnology, University of Crete, Heraklion, Greece, E-mail: sourvino@med.uoc.gr

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CONCLUSION

The majority of the food poisoning outbreaks are caused by both gram positive and gram negative bacteria. Exotoxins from bacteria can be enterotoxic, cytotoxic, hemolytic, or neurotoxic. Bacterial enterotoxins are responsible for a variety of gastrointestinal symptoms, including diarrhoea. Bacterial enterotoxins are responsible for production of various types of gastrointestinal manifestations like diarrhoea. Some bacterial toxins are very potent and are relatively easy to produce and are classifies as bio-threat agents. Ex: *Botulinum* neurotoxins. Bioassay methods, immunological assays, molecular techniques and cell cultures are used to detect the bacterial toxins.

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