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Toxic Mechanism and Its Application of *Botulinus neurotoxin*

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Botulinum neurotoxins, which are known as the most potent protein toxin, are produced by a strict anaerobic bacterium, *Clostridium botulinum* and classified into 7 types (A to G) according to their serologic responses. All of the botulinum toxins act on peripheral neuromuscular junction and cause systemic flaccid paralysis, 'botulism', when intoxicated. Although the main route of intoxication is known as eating of poisonous foods, deep wounded injury also can cause botulism and infants are very susceptible when they ingest foods contaminated with durable endospore.

Clostridium botulinum produces the toxic component as a complex form which is composed of 3 different proteins, hemagglutinins, which shows hemagglutinic activity, nontoxic-nonhemagglutinin, and the toxin protein itself. The toxin protein is 150 kDa in molecular weight and could be separated into two chains as the other typical microbial toxins are. N-terminal light chain (~50 kDa) and C-terminal heavy chain (~100 kDa) are linked by a disulfide bond.). The catalytic domain, a zinc-endopeptidase, is confined to the light chain. The binding domain comprising the C-terminal half of the heavy chain is required for neuronal cell targeting through binding to specific receptors on presynaptic membrane, while the translocation domain located in its N-terminal half is involved in intracellular membrane translocation.

In early 1990s, the secret how botulinum toxins block the release of neurotransmitter in pre-synaptic nerve terminal was known. After entering into the cytoplasm of neuronal cells, the light chain cleaves some proteins which are involved in neurotransmitter release. Type A and E botulinum toxins cleave SNAP-25 protein, type B, D, F, G protein cleave VAMP, and type C cleaves syntaxin.

Lately, type A botulinum toxin is used in the treatment of spastic muscular conditions such as torticollis, cervical dystonia, strabismus, hemifacial spasm, spasticity in cervical palsy in children, but also in the treatment of hiperhidrosis and even some pains. It is also used for cosmetic purposes to reduce wrinkles.