Molecular structure reveals how botulinum toxin attaches to nerve cells

13 December 2006

May lead to new therapeutics

Botulism is a life-threatening disease caused by exposure to botulinum neurotoxins, which are among the most potent toxins known. These neurotoxins are produced by Clostridium botulinum, a bacterium found in soil and food. In the body, the toxins bind to and enter neurons, interfering with nerve transmission and disrupting the communication between the nerve and muscle fibers throughout the body. Poisoning with botulinum toxins leads to an often-fatal paralysis, which is one reason they are considered among the highest biodefense research priorities by the U.S. government.

As part of its overall biodefense program, the National Institute of Allergy and Infectious Diseases (NIAID), one of the National Institutes of Health (NIH), has established the Regional Centers of Excellence for Biodefense and Emerging Infectious Diseases (RCEs) to support basic and applied research on biodefense-related agents, including botulinum neurotoxins. Now a group of researchers funded in part through two of these RCEs has provided a rare atomic glimpse of the initial step one of these toxins takes to gain entry into human neurons.

In an advanced online publication of the journal Nature, the scientists show structurally how botulinum neurotoxin B (one of seven toxins the bacterium produces) recognizes receptors on the surface of human neurons. The structure reveals how these toxins work at the molecular level and provides a promising new target for designing drugs to block the action of botulinum neurotoxins.

Source: NIH/National Institute of Allergy and Infectious Diseases

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