

National Enteric Disease Surveillance: Botulism Surveillance Overview

Surveillance System Overview: National Botulism Surveillance System

Botulism is a rare but serious paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum* and sometimes by strains of *Clostridium butyricum* and *Clostridium baratii*. Botulism can be treated with an antitoxin that blocks the action of toxin circulating in the blood.

Antitoxin for children one year of age and older and for adults is available through the Centers for Disease Control and Prevention (CDC), the Alaska Division of Public Health (ADPH), and the California Department of Public Health (CDPH); antitoxin for infants is available from CDPH.



Colored transmission electron micrograph of the Gram-positive anaerobic bacteria *Clostridium botulinum*

Antitoxin can be released through state public health officials for suspected botulism cases and is most effective when administered early in a patient's illness. State public health officials can reach the CDC clinical emergency botulism service for consultation and antitoxin 24/7 at 770-488-7100. Physicians should contact their state health department as soon as they suspect that a patient may have botulism.

For surveillance purposes, CDC categorizes human botulism cases into four transmission categories: foodborne, wound, infant, and other. Foodborne botulism is caused by the consumption of foods containing pre-formed botulinum toxin. Wound botulism is caused by toxin produced in a wound infected with *Clostridium botulinum*. Infant botulism by definition occurs in persons less than one year of age and is caused by consumption of spores of *C. botulinum*, which then grow and release toxins in the intestines. Cases are classified as "other" if the patient is not an infant, has no history of ingesting a suspect food, and has no wounds. Consistent with the Council of State and Territorial Epidemiologists (CSTE) position statements, the "other" category includes botulism in which the route of transmission is unknown. The "other" category also includes iatrogenic botulism, which is caused by an accidental overdose of botulinum toxin (i.e., therapeutic injection), and adult intestinal colonization botulism, which is very rare but occurs through a mechanism similar to infant botulism.

Since 1973, CDC, in partnership with CSTE, has maintained the National Botulism Surveillance System for intensive surveillance for cases of botulism in the United States. The National Botulism Surveillance System collects reports of all laboratory-confirmed botulism cases in the United States and is continuously monitored for early detection of outbreaks. Demographic (e.g., age, sex, race and ethnicity), clinical (e.g., transmission category, case-patient outcome), laboratory (e.g., laboratory testing method, toxin type), and epidemiologic (e.g., vehicle) data are reported by all 50 states and the District of Columbia. To be confirmed, cases must meet the CSTE case definition (http://www.cdc.gov/osels/ph_surveillance/nndss/casedef/botulism_current.htm) of botulism. Because CDC, ADPH, and CDPH are the only sources of botulism antitoxin for cases in the United States, all or

almost all recognized cases of botulism are recorded. However, some cases may not be recognized either because of misdiagnosis (2) or because mildly affected persons may not seek medical care (3).

Other sources of national-level botulism surveillance data

Several other systems at CDC conduct surveillance for botulism. The National Notifiable Diseases Surveillance System (NNDSS) collects and compiles reports of nationally notifiable infectious diseases, including botulism (4). NNDSS collects data from states on both laboratory-confirmed and probable cases of botulism. NNDSS data is collected from states through several mechanisms, including the National Electronic Diseases Surveillance System (NEDSS) which is being developed to integrate both epidemiologic and laboratory information; currently laboratory information is not available from NNDSS. The Foodborne Disease Outbreak Surveillance System (FDOSS) collects reports of enteric disease outbreaks due to foodborne, waterborne, person-to-person, and animal contact transmission from state and territorial public health agencies (5). Additionally, CDC maintains a record of all antitoxin releases for cases in categories other than infant botulism.

Overview of Taxonomy

Clostridia spp. are spore-forming, anaerobic, gram-positive bacilli that are commonly found in soil and marine sediments. Under certain conditions spores may germinate into bacilli that can produce toxin. These conditions most often occur with improperly home-canned foods; minimally heated chilled food that have not been adequately refrigerated; and contaminated wounds. *Clostridium botulinum* produces seven serologically distinct botulinum toxin types (A–G). Of these, human botulism is caused primarily by toxin types A, B, or E, and rarely by F. Several related clostridial species can produce botulinum toxins as well; toxin type E can be produced by *C. butyricum* and type F can be produced by *C. baratii*.

References

1. Shapiro, RL, C Hatheway, DL Swerdlow. Botulism in the United States: a clinical and epidemiologic review. *Ann Intern Med.* 1998; 129: 221-228.
2. St. Louis, ME, S Peck, D Bowering, et al. Botulism from chopped garlic: delayed recognition of a major outbreak. *Ann Intern Med.* 1988; 108: 363-368.
3. Angulo, FJ, J Getz, JP Taylor, et. al. A large outbreak of botulism: the hazardous baked potato. *JID.* 1998; 178: 172-177.
4. 2012 case definitions: nationally notifiable conditions infectious and non-infectious case: http://wwwn.cdc.gov/nndss/document/2012_Case%20Definitions.pdf.
5. National outbreak reporting system (NORS): <https://www.cdc.gov/outbreaknet/nors/>

Suggested Readings

Arnon SS, Barzilay EJ. Clostridial Infections: Botulism and infant botulism. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, eds. *The Red Book: 2009 report of the Committee on Infectious Diseases.* Elk Grove Village: American Academy of Pediatrics; 2009:259--62.

Arnon SS, Schechter R, Maslanka SE, Jewell NP, Hatheway CL. Human botulism immune globulin for the treatment of infant botulism. *N Engl J Med* 2006;354:462-471

CDC. Botulism caused by consumption of commercially produced potato soups stored improperly – Ohio and Georgia, 2011. *MMWR* 2011;60(26):890.

CDC. Investigational heptavalent botulinum antitoxin (HBAT) to replace licensed antitoxin AB and investigational botulinum antitoxin E. *MMWR* 2010;59(10):299.

Fagan RP, McLaughlin JB, Castrodale LJ et al. Endemic foodborne botulism among Alaska Native persons – Alaska, 1947–2007. *Clin Infect Dis* 2011;52(5):261-2.

Koepke R, Sobel J, Arnon S. Global occurrence of infant botulism, 1976-2006. *Pediatrics*. 2008;122:e72-e82.

Shapiro RL, Hatheway C, Becher J, Swerdlow DL. Botulism surveillance and emergency response: a public health strategy for a global challenge. *JAMA* 1997;278:433--5.

Shapiro RL, Hatheway C, Swerdlow DL. Botulism in the United States: a clinical and epidemiologic review. *Ann Intern Med* 1998;129:221--8.

Sobel J, Tucker N, McLaughlin J, Maslanka S. Foodborne botulism in the United States, 1999--2000. *Emerg Infect Dis* 2004;10:1606--12.

Yu, PA, Maslanka SE, St Louis ME, Swerdlow DL . Botulism In: Abrutyn E, Brachman PS. editors. *Bacterial infections in humans*. New York. Springer, 2009:159-176.

Yuan J, Inami G, Mohle-Boetani J, Vugia DJ. Recurrent wound botulism among injection drug users in California. *Clin Infect Dis* 2011;52(7):862—6

Reference Citation

Centers for Disease Control and Prevention (CDC). National Botulism Surveillance System Overview. Atlanta, Georgia: US Department of Health and Human Services, CDC, 2012.