Wound Botulism

Ai-Ling Lin, DO
Internal Medicine PGY4
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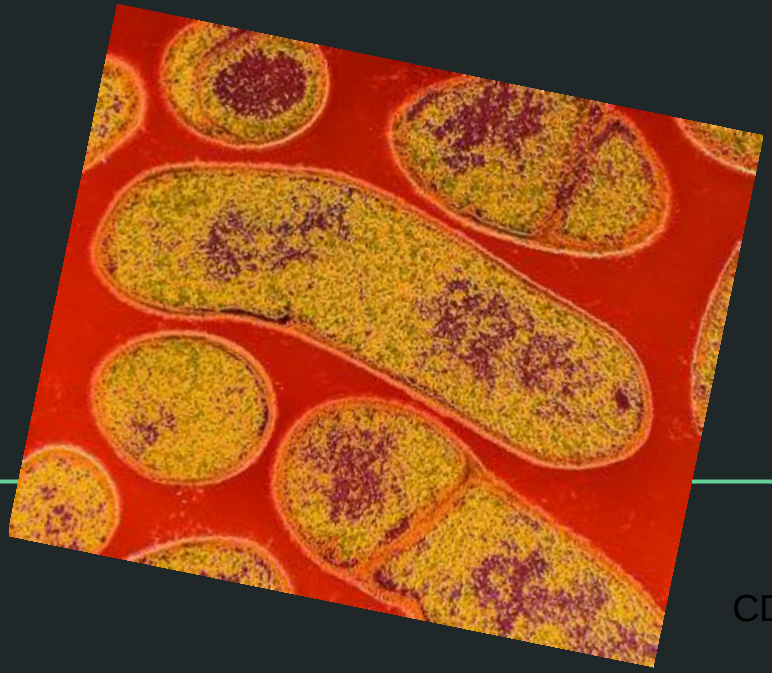


CDC

Objectives

Overview of Botulism

Types of Botulism

Heroin in Alaskan media

Heroin and wound botulism

History

First noted with a case series in 1820s

hundreds of patients with "sausage poisoning" in a southern German town

1895 in Belgium

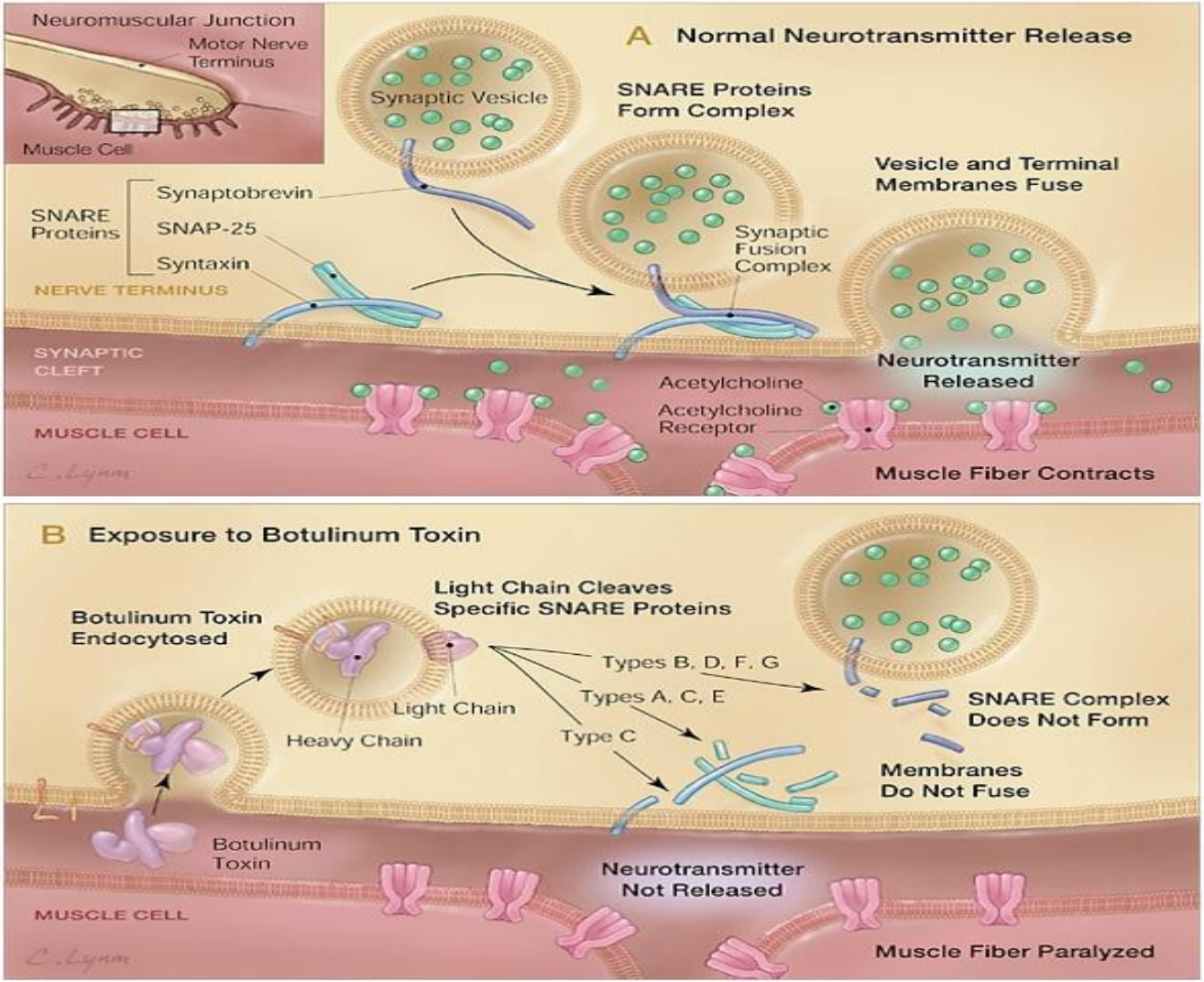
the association was demonstrated between a neuromuscular paralysis and ham infected by a spore-forming bacillus that was isolated from the ham.

Botulus = Latin word for “sausage”

Botulism - *Clostridium botulinum*

A gram positive anaerobic spore-forming bacilli

Neurotoxin enters the bloodstream and paralyzes muscles by **irreversibly** blocking the release of acetylcholine at peripheral neuromuscular junctions. Affects both autonomic and voluntary motor activities.



Arnon et al., 2001

Botulism

easily isolated from the surfaces of vegetables, fruits, seafood, and **exist in soil** and marine sediment worldwide

Heat resistant spores surviving 100C, can be destroyed if >120C for 5minutes

Germinate in anaerobic environment

pH>4.6

ideal temp 25-37C (some strain grow in 4C)

Symptoms

Cranial nerve palsies followed by symmetric descending paralysis.

Neurologic: diplopia, eye dilation, dysphagia, dry mouth

GI: nausea or vomiting

Muscular: weakness, paralysis, fatigue, dyspnea

Types of Botulism

Foodborne botulism – Ingestion of food contaminated by **preformed botulinum toxin** (dx: blood assay. Sometimes can find in emesis and stool assay too)

Infant botulism – The **ingestion of clostridial spores** that then colonize the host's gastrointestinal (GI) tract and release toxin produced in vivo (dx: stool toxin)

Wound botulism – Infection of a **wound** by *Clostridium botulinum* with subsequent in vivo production of neurotoxin

Types of Botulism

Inhalational botulism – The form that would occur if aerosolized toxin was released in an act of bioterrorism

Iatrogenic botulism – Iatrogenic cases of botulism from patients receiving botox for cosmetic indications. Rare reports.

Treatment

Call State Health Department for the antitoxin (Heptavalent botulinum antitoxin which contains antibodies for 7 toxin types A-G)

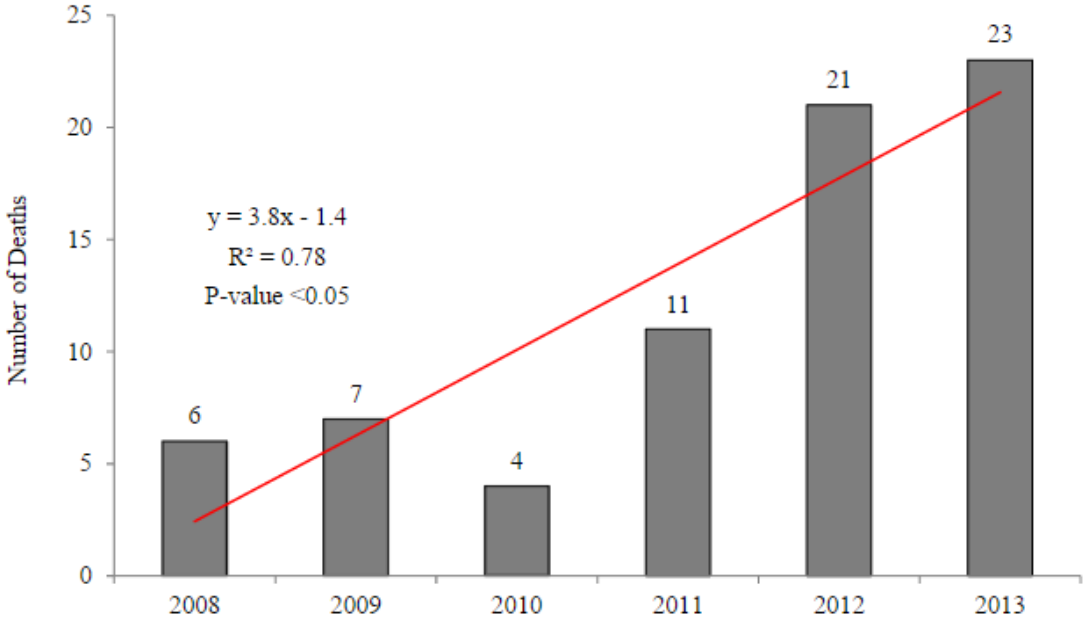
- Antitoxin side effects include serum sickness and anaphylaxis
- Patient often continue to progress with neurologic and muscular deterioration after receiving antitoxin

Monitor airway and evaluate for possible intubation. Respiratory failure is the primary cause of death.

Complete resolution of toxin effects usually takes 1-2 months.

Heroin in Alaska

Figure 4. Number of Heroin-Associated Deaths*, by Year — Alaska, 2008–2013 (N=72)



*Represents deaths where heroin was either the underlying and contributory cause of death.

Alaska DHSS

Table. Alaska Drug Overdose Deaths, by Drug Category — Alaska, 2009–2015

Category	Number of Deaths Per Year (Age-Adjusted Rate of Overdose Deaths per 100,000 Pop. Per Year)†						
	2009	2010	2011	2012	2013	2014	2015‡
Prescription Drugs	104 (14.4)	60 (8.5)	58 (7.8)	76 (10.5)	69 (9.1)	71 (10.0)	83 (11.0)
Opioid Pain Relievers	80 (11.2)	52 (7.3)	48 (6.4)	53 (7.3)	51 (6.7)	51 (7.2)	65 (8.5)
Illicit Drugs	36 (5.1)	21 (2.8)	40 (5.2)	55 (7.1)	51 (7.0)	55 (7.4)	59 (7.8)
Heroin	7 (1.0)	NR†	11 (1.4)	21 (2.7)	26 (3.5)	26 (3.5)	36 (4.7)
Unspecified Drugs	7 (9.0)	NR†	16 (2.2)	24 (3.5)	15 (2.0)	20 (2.5)	19 (2.5)
Total Overdose Deaths§	131 (17.9)	76 (10.5)	104 (13.9)	125 (17.0)	106 (14.2)	123 (16.7)	121 (16.0)

http://www.epi.alaska.gov/bulletins/docs/b2016_06.pdf

In the news

May 2014 Kodiak: “In a January bust that was their biggest yet, Kodiak police seized 76 grams of black tar heroin and 28 grams of Afghan brown heroin, plus other drugs” http://www.seattletimes.com/nation-world/heroin-invades-rural-alaska/

May 2015 Bethel: “Heroin Hits Home: A Bethel Woman’s Struggle to Get Clean” http://www.alaskapublic.org/2015/05/26/heroin-hits-home-a-bethel-womans-struggle-to-get-clean/

Aug 2016 Quinhagak: Heroin/fentanyl overdose - https://www.adn.com/alaska-news/rural-alaska/2016/09/18/after-a-young-womans-heroin-death-an-alaska-village-looks-inward/

October 2016 : Bethel drug bust “ drug paraphernalia, 47.7 grams of heroin, 10.33 ounces of crack cocaine and $64,000 in cash.” https://www.adn.com/alaska-news/crime-courts/2016/10/21/troopers-arrest-7-seize-cocaine-and-heroin-in-bethel-drug-bust/

Alaska Heroin Rush. Drugs Inc. on National Geographic Channel. On Nov 13th at 3am.

Heroin

highly addictive drug processed from morphine, a naturally occurring substance extracted from the seed pod of certain varieties of poppy plants.

“cut” with sugars, starch, powdered milk [White China from Asia/Afghanastan] OR coffee grounds, dirt [Black Tar from Mexico].

https://www.deamuseum.org/ccp/opium/production-distribution.html

Wound Botulism and “Black Tar Heroin”

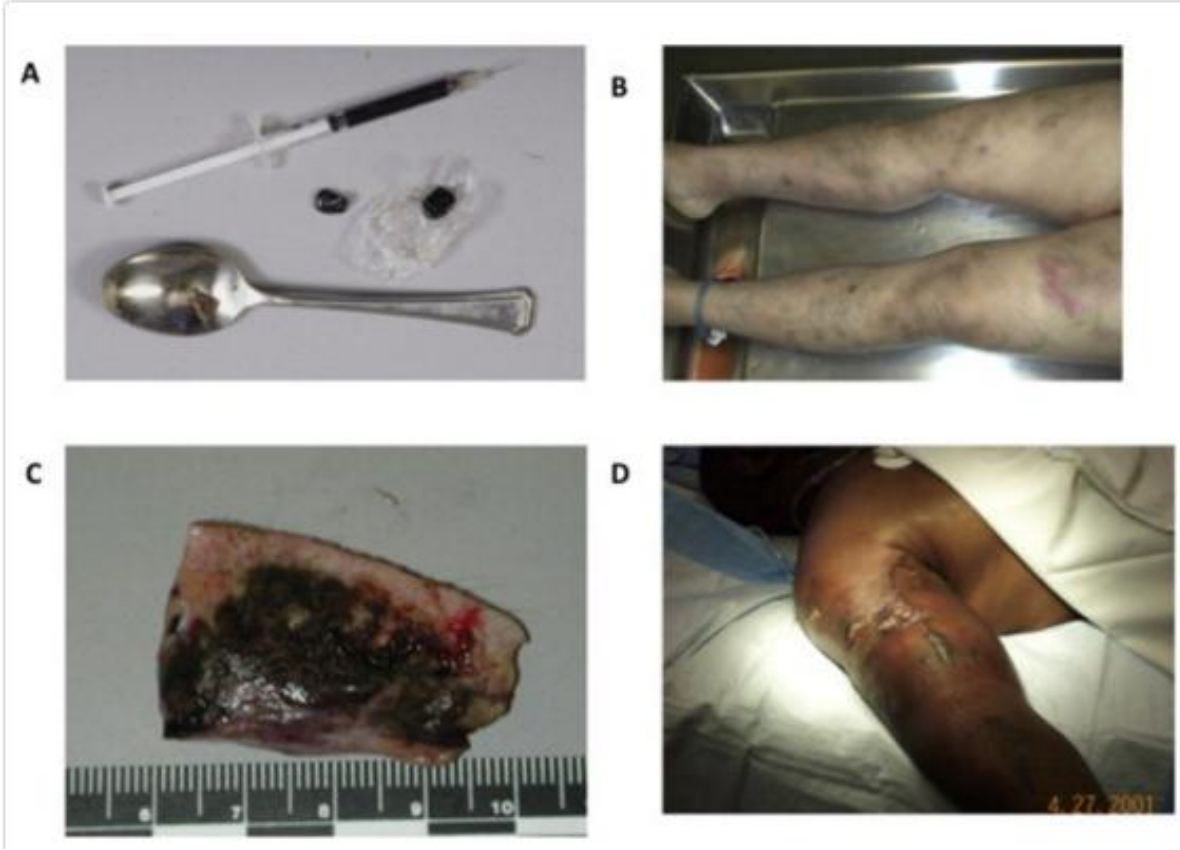
Longer incubation period, up to 10 days (where as food botulism incubation 12-36hrs), fever, leukocytosis

Black tar heroin (tarry consistency, dark-colored), toxin type A or B. inject subcutaneously (“skin popping”) or intramuscularly (“muscling”) -> necrotic myositis, which sets up an ideal environment for bacterial growth.

Toxin can’t be detected once bind to cell receptors.

Culture the wound for toxin and bacteria

Antibiotics recommended for wound botulism -> (PenG or Metronidazole UpToDate recommendations)



Anaerobe, 2014

Black Tar Heroin: a viscous substance that is gummy and non-water-soluble, requiring additional handling and heating to prepare in an injectable solution.

Cheap heroin. Improper acetylation with acetic acid with lack of fancy lab equipments. Veins from injection often become sclerotic due to additives leading to skin popping.

“cut” with a variety of brown organic materials, which increase its weight for sale.

i.e. shoe polish, wood pulp, coffegrounds, and dirt – are believed to be a major source of contamination with Clostridial spores

Black Tar Heroin

Preparation for injection:

- Dissolve in saliva, lemon juice
- heated to boiling temperature
    - This process likely destroys most bacteria other than Clostridial spores, which have been shown to survive such conditions

From Mexico/Latin America

Wound Botulism and Black Tar Heroin

First noted in 1950s due to contaminated surgical wound, then now more associated with black tar heroin skin popping

across England and Scotland for 2000-2009. Overall, 295 infections were reported: 1.45 per 1,000 IVDU in England and 4.01 per 1,000 IVDU in Scotland

In California from 1993-2007 had 17 recurrent cases (14 patients with 1 recurrence, 3 patients with 2 recurrence.)

Most Common Symptoms: a visible wound, speech difficulty, double vision, respiratory difficulty, and trouble swallowing.

Yuan, 2011. Palmteer 2013

Conclusion

Early recognition of botulism with a thorough patient history

Early access and administration to antitoxin (only works before toxin is endocytosed) - reduce ICU stay

Supportive Care

Can recur if they continue skin popping

Resources

Abavare, Laura and Abavare, Charles. “Wound botulism resulting from heroin abuse: can you recognize it?” *Journal of emergency nursing.* 2012, Vol.38(3), p.301-303

Hull-Jilly, Deborah. Et al. “Health Impacts of Heroin Use in Alaska.” *Epidemiology Bulletins.* July 14, 2015. http://dhss.alaska.gov/dph/Epi/injury/Pages/sa/heroin/default.aspx

Heroin. National Institute on Drug Abuse. Last updated 2014. https://www.drugabuse.gov/publications/research-reports/heroin/what-heroin

Palmateer, et al. “Infections with spore-forming bacteria in person who inject drugs, 2000-2009.” Emerg Infect Dis. 2013 Jan;19(1):29-34. doi: 10.3201/eid1901.120044.

SCHROETER, M., ALPERS, K., VAN TREECK, U., FRANK, C., ROSENKOETTER, N. and SCHAUMANN, R. (2009) ‘Outbreak of wound botulism in injecting drug users’, *Epidemiology and Infection*, 137(11), pp. 1602–1608. doi: 10.1017/S0950268809002544.

Tucker, R. and Frazee, B. “View from the front lines: An emergency medicine perspective on clostridial infections in injection drug users.” UCSF and Highland Hospital, Oakland, CA. *Anaerobe*. Volume 30, December 2014, Pages 108–115.

Yuan. et al., “Recurrent Wound Botulism Among Injection Drug Users in California“ Clin Infect Dis. (2011)doi: 10.1093/cid/cir005First published online: February 11, 2011