

Problem-based case scenario

You are a public health officer on a heavily populated Pacific island. You receive a call on October 10 from an occupational physician who describes an outbreak of unusual illness that began during the last week of September among workers at a printing factory. She tells you that a number of workers became ill within a 2 to 3 day period. Their symptoms included double vision, drooping eyelids, muscle weakness, and progressive respiratory weakness. Two workers have been hospitalised and have required mechanical ventilation to assist in breathing.

1. What would you do first?

You are told that there are 4 male and 3 female cases, ranging in age from 18 to 66 years. All are Asian and are native to the island. You are told that two of the men operate printing presses, filling them with ink and using solvents for occasional cleaning. One additional male worker is a typesetter, who is also exposed to solvents. The fourth affected male employee is a maintenance worker, who repairs the presses and uses solvents to clean the machines on a daily basis. The three ill female workers are proof-reader, an office worker, and the cafeteria cook. None of the women are exposed to chemicals in the plant. The cook was the first to become ill and was one of the hospitalised cases. You are told that there are 40 employees in total. The plant manager gives you a personnel list that includes names, age, sex, job title, work area, job duties, and job duration for each worker.

2. What are your initial hypotheses about the cause of the illness?
3. What information do you want next, and whom do you call?

Your first calls are to the physicians who are treating the two hospitalised workers. They tell you that the presumptive diagnosis in both cases is botulism. Laboratory confirmation is pending, but, meanwhile, both patients are being treated for botulism.

You refresh your memory about botulism (see Table 2), since this type of poisoning is rare on your island.

4. How would you define your *cases*?

5. What information would you want to collect next and how would you obtain it?

For this outbreak, you define a case of botulism as anyone with two or more of the symptoms on the list in the box, *Seminal Facts on Botulism*. All 7 workers who were initially identified by the plant's occupational physician as recently ill met this definition.

Results of the questionnaire were obtained for 39 of the 40 workers at the plant. Six ill employees ate at the factory cafeteria on September 26 and 27, compared to 7 of 32 non-stricken workers who ate at the factory cafeteria on both days. You also learn that the factory cook died from respiratory complications 3 weeks after hospital admissions.

6. How would you use the information from the questionnaire? How would you proceed to find out whether the disease was related to eating at the cafeteria?

Meanwhile, additional information was obtained:

Following announcements to the medical community and through mass media, 14 additional suspect cases of botulism were reported. Only two of these cases met the case definition of the study. One was a 68 year old woman in the community (not a plant worker) who died at home within 24 hours of becoming ill. The second was her 6 year-old grandson, who was hospitalised and required mechanical ventilation.

Serum specimens from 7 cases and stool samples from 2 cases, all from the plant, were negative for botulism toxin. These were collected 3 weeks after exposure. Laboratory examination of preserved foods remaining in the factory cafeteria showed that 1 of 4 unopened jars of unsalted peanuts produced by Company B on September 10 was positive for type A botulism toxin.

7. How can you explain the occurrence of botulism in the community?
8. How do you interpret the results of the serum and stool tests?
9. What steps do you take to protect the health of the public?

Epilogue

Investigation of Company B by the Department of Health revealed that it was a small family-owned business that was not licensed to can products. They did not have the proper steam equipment to process low acid canned foods. The owner reported that some of the glass jars filled with peanuts were noted to have developed bubbles, or other signs of spoilage, and were then discarded. Company B was closed by the Department of Health.

A product recall was issued for all jars of peanuts produced by Company B on September 10. 104 jars were obtained. Laboratory testing showed that 34 of the 104 jars tested positive for type A botulinum toxin, compared to 0 to 32 jars randomly selected from other batches produced by Company B.

Despite the recall, the 68 year old woman and her grandson who became ill had purchased Company B peanuts of the September 10 batch at a local grocery store. After they became ill, testing of the peanuts from the partially eaten jar was positive for type A botulinum toxin.

Physician awareness of the dangers of botulism on the island improved as a result of this outbreak. Within four months of this outbreak, two additional outbreaks of botulism as a result of home-preserved meats were reported to the Department of Health.

The Department of Health issued new regulations requiring that all canneries register with Department of Health and show "proof of good manufacturing practices." The number of inspectors and the quality of their training, however, were considered to be insufficient to ensure adequate enforcement.

Appendices

Table 2

Seminal Facts about Botulism, Type A

Characteristic symptoms: (develop 12 to 36 hours after exposure)	<ul style="list-style-type: none"> • drooping eyelids (ptosis) • difficulty swallowing (dysphagia) • double vision (diplopia) • difficulty speaking (dysarthria) • muscle weakness, including respiratory muscles
Cause:	<ul style="list-style-type: none"> • neurotoxin produced by the bacterium <i>Clostridia botulism</i>
Diagnosis:	<ul style="list-style-type: none"> • characteristic symptoms and physical exam findings • laboratory confirmation • epidemiologic linkage
Laboratory confirmation:	<ul style="list-style-type: none"> • <i>serum and stool levels of toxin:</i> 60% to 65% are positive if collected within 3 days of ingestion but only 15% to 20% are positive if collected 4 or more days after ingestion • <i>stool culture of organism:</i> 75% are positive if collected within 3 days of ingestion but only 35% are positive if collected 4 or more days after ingestion
Treatment:	<ul style="list-style-type: none"> • supportive therapy, i.e. mechanical ventilation if needed • administration of anti-toxin
<p>References: 1) Bleck, T. <u>Clostridium Botulinum</u> in Mandell, G, Bennett, J, and Dolin, R (eds) <i>Principles and Practice of Infectious Diseases</i>, 4th edition, Churchill Livingstone, New York, 1995</p> <p>2) Woodruff B et al. <u>Clinical and Laboratory Comparison of Botulism from Toxin Types A, B, and E in the United States, 1975 - 1988.</u> <i>Jl. Inf. Dis.</i> 1992; 166: 1218-1286.</p>	