CENTERS FOR DISEASE CONTROL
1991 International EIS Course

AN OUTBREAK OF A NEUROLOGIC SYNDROME AMONG FACTORY WORKERS IN TAIWAN

Objectives

After completing this case study, the participant should be able to:

1. List the sequential steps taken when investigating an outbreak.
2. Explain the rationale for implementing control measures prior to confirmation of an etiologic agent.
3. Discuss possible obstacles to the application of control measures and possible means to overcome such obstacles.
4. Discuss strategies for rapidly informing the public about public health threats.

PART I

In early October 1986, a physician at the National Taiwan University Hospital was contacted concerning a possible outbreak of a neurologic illness among workers employed at a printing factory in Chang Hwa City, located 150 miles from Taipei, Republic of China. Seven of the plant's 40 workers had reportedly become ill between September 28 and 30 with one or more of the following signs and symptoms: ptosis, diplopia, difficulty swallowing, slurred speech, proximal muscle weakness, and dyspnea.

QUESTION 1: What additional information would you like to obtain during this telephone conversation?

QUESTION 2: What is the differential diagnosis?

AN OUTBREAK OF A NEUROLOGIC SYNDROME AMONG FACTORY WORKERS IN TAIWAN
PART II

Based on the cranial nerve findings of the patients and an initial environmental inspection of the work site which was unrevealing, the physician suspected that the neurologic symptoms were not due to an occupational exposure. Rapid repetitive stimulation electromyography tests performed on two of the patients revealed an incremental response consistent with a diagnosis of botulism intoxication.

On October 14, the investigating physician contacted the Bureau of Disease Control to report this outbreak of neurologic symptoms compatible with acute botulism intoxication. A team from the Department of Health departed immediately to investigate this outbreak.

QUESTION 3a: List the usual sequence of steps in an outbreak investigation.

QUESTION 3b: How might this sequence be altered when botulism is suspected?

The physician who had initially evaluated the seven cases provided the following summary information:

TABLE 1
Characteristics of 7 Cases of Botulism
Chang-Hwa City, September 28-30, 1986

Case	Onset	Ptosis	Diplopia	Dysphagia	Dysphonia	Weakness	Dyspnea	Hospitalized?
1	9/28	Y	Y	Y	Y	Y	Y	Y(died)
2	9/28	Y	Y	Y	Y	Y	Y	Y
3	9/29	Y	Y	Y	N	N	N	N
4	9/29	Y	N	Y	Y	Y	N	N
5	9/29	Y	Y	Y	Y	N	N	Y
6	9/29	Y	Y	Y	Y	Y	Y	Y
7	9/30	Y	Y	N	N	Y	N	N

QUESTION 4: Using the available data, formulate a case definition to be used in this outbreak.

When the team visited the factory, they learned that one of the seven patients was the cook who ran the factory cafeteria and had no direct occupational exposure to the factory. She was the most seriously ill of the seven and was unable to be interviewed since she was on a respirator. On the basis of this discovery and a clinical picture compatible with botulism, investigators thought that the most likely source was an improperly preserved food. The investigators developed a questionnaire which focused on meals eaten in the cafeteria on the 26th and 27th of September. These dates were chosen since all cases became ill between the 28th and 30th of September and the incubation period for botulism is between 12 and 36 hours. The data are summarized in Table 2 on the following page.

TABLE 2
Breakfast Location on 26 or 27 September Among Ill and Non-ill Factory Workers

	Ill	Not Ill	Total	Percent Ill
Breakfast in cafeteria	7	7	14	50.0%
Breakfast not in cafeteria	0	25	25	0.0%
Total	7	32	39	

QUESTION 5a: Based on the data in Table 2, what calculations might you perform to quantify and evaluate a possible association? Perform those calculations.

QUESTION 5b: Interpret your results.

Nine food items were served at the breakfasts on September 26 and 27. These items included several commercially preserved canned foods and home-made preserved ginger. When the persons who had eaten breakfast on one of the two days were questioned about specific foods consumed, none of the food items was found to be significantly associated with subsequent illness. Some of the preserved ginger served at the two breakfasts was still available for testing. Although no left-overs or partially empty cans of the eight other items remained from the implicated breakfasts, unopened cans of most of these items were found in the cafeteria's kitchen.

QUESTION 6a: Discuss some of the possible reasons why no specific food from the breakfast could be implicated.

QUESTION 6b: How would you proceed with your investigation to determine the vehicle of transmission?

AN OUTBREAK OF A NEUROLOGIC SYNDROME AMONG FACTORY WORKERS IN TAIWAN
PART III

Initial testing of the acidity and salinity of the single home-made product, preserved ginger, showed that it was an unlikely vehicle for transmission of botulism. The preserved ginger and remaining cans of items served at the implicated breakfasts were then sent to the laboratory for bacteriologic and biologic testing. Serum specimens were also obtained from some of the surviving patients, though the specimens were gathered 2-3 weeks after onset of illness.

At the end of the third week in October, an unopened jar of preserved peanuts produced by factory X was positive for type A botulinal toxin. Serum specimens for all tested patients were negative. Some public health officials though a product recall should be initiated at this point.

QUESTION 7: In light of the absence of botulinal toxin in collected serum and the identification of toxin only in an unopened jar of peanuts, is a product recall appropriate? Discuss the arguments for and against a product recall from the point of view of the health department.

AN OUTBREAK OF A NEUROLOGIC SYNDROME AMONG FACTORY WORKERS IN TAIWAN
PART IV

The Department of Health recommended a product recall to protect the public from the potentially lethal effects of the preserved peanuts while further investigations of the factory and the product were undertaken. Until this time the public and medical community at large had been unaware of the problem. The proposal for a product recall met with resistance for the following reasons:

1. Some opponents felt that there was not sufficient proof to implicate this product as the cause of the outbreak.
2. There were no additional cases reported suggesting that the outbreak was over, therefore, why alarm anyone.
3. It would potentially have adverse economic effects upon the canning industry.

QUESTION 8a: How would you respond to each of the above points offered by opponents of the recall?

QUESTION 8b: In considering a product recall, who should be informed of the product recall and why?

QUESTION 8c: What information would you include in the recall message for each target group?

QUESTION 8d: What methods would you use to reach each target group?

AN OUTBREAK OF A NEUROLOGIC SYNDROME AMONG FACTORY WORKERS IN TAIWAN
PART V

A product recall was implemented. Information concerning the recall was frequently broadcast by radio and television over several days and people were advised to return any Factory X peanuts to the nearest government health facility.

Two more cases of botulism occurred in Chang Hwa County in late November. A 68 year-old woman and her 6 year-old grandson developed symptoms of botulism within 24 hours of eating peanuts that had been produced by Factory X on 10 September, the same day as the can implicated in the printing factory outbreak. The woman died at home on November 29, and the grandson was hospitalized with severe respiratory depression on November 30. A serum specimen collected shortly after admission was positive for type A botulinal toxin. The boy was placed on mechanical ventilation and treated with antitoxin provided by the Department of Health. He required prolonged assisted ventilation, but recovered completely.

QUESTION 9: What are the possible reasons for additional cases despite the aggressive recall program?

AN OUTBREAK OF A NEUROLOGIC SYNDROME AMONG FACTORY WORKERS IN TAIWAN
PART VI

An investigation of the factory revealed that it was not licensed to produce canned foods. The company was a small, family-run business with fewer than 15 full-time employees. It had been processing preserved foods in bulk quantity for more than 20 years but it had been canning for only about 6 years. The factory owner supervised all food processing and relied only on his memory for ingredients and steps in processing. There were no production records available to compare batches of peanuts produced on September 10 with other batches prepared on other days. There were no sales or distribution records to assist in the recall of the product. The only food processing equipment in the factory was several large cauldrons and a labeling machine. The factory didn't have pressurization equipment required by law for thermal processing of low-acid foods such as peanuts.

Laboratory analysis of samples of product recalled as of 26 November revealed that 9 of 12 jars of peanuts produced on September 10 were positive for toxin, compared to none of 32 jars from batches produced on other days.

QUESTION 10: How can a recurrence of this problem in the canning industry be prevented? Are these proposals practical in this setting?

Reference
Chou JH, Hwang PH, Malison MD. An outbreak of type A foodborne botulism un Taiwan due to commercially preserved peanuts. Internat J Epidemiol 1988;17:899-902.