

BOTULISM ASSOCIATED WITH VACUUM-PACKED SMOKED WHITEFISH IN FINLAND, JUNE-JULY 2006

M Lindström¹, M Vuorela², K Hinderink¹, H Korkeala¹,
E Dahlsten¹, M Raahenmaa¹, M Kuusi¹

1. Department of Food and Environmental Hygiene, University of Helsinki, Helsinki
2. Central Hospital of Päijät-Häme, Lahti
3. Finnish Food Safety Authority (Evira), Helsinki
4. National Public Health Institute (KTL)

Published online 20 July 2006

Citation: Euro Surveill 2006;11(7):E060720.3.

Available from

<http://www.eurosurveillance.org/ew/2006/060720.asp#3>

On 29 June 2006, a 65 year old woman fell ill with vomiting and diarrhoea in southern Finland. The next day she developed muscular weakness of her upper and lower limbs, and was admitted to hospital. She developed difficulty in breathing and required mechanical ventilation in an intensive care unit for one week. The patient is now recovering, but still has some difficulties in swallowing, and is not yet able to walk. The patient did not receive botulinum antitoxin, since the symptoms had already begun to resolve upon diagnosis. The patient's husband also had diarrhoea on 29 June and later had some difficulties in swallowing, but no other neurological symptoms were observed. He was admitted to hospital for one night (1-2 July) because of diarrhoea.

Serum samples from the female patient taken on 30 June and 1 July were positive for botulinum neurotoxin by mouse bioassay, and the neutralisation test suggested that the patient's illness was caused by botulinum toxin type E. Gastric fluid and serum samples taken on 4 July did not yield neurotoxin or *Clostridium botulinum*. No specimens were available from the husband, as botulism was not diagnosed during his hospital stay, and he was not called back to hospital for specimens.

An interview with the husband revealed that the couple had eaten smoked vacuum-packed whitefish on 28 June. The wife had eaten most of the fish, and the husband ate only a small portion. The whitefish had been imported from Canada, but smoked and packed in Finland. There was no leftover fish for microbiological examination. Flush samples were taken from the fish's plastic packaging, but they were negative for *C. botulinum* by PCR [1] and culture.

The suspected fish product was recalled by the manufacturer, and production of the product was suspended. The national and local food control authorities inspected the production plant and the distribution centre. The entire manufacturing process and storage temperatures throughout the cold chain, including the retail outlet, were investigated. The inspections did not reveal any factors that could have created an increased risk of botulinum neurotoxin production.

Microbiological analysis of ten vacuum-packed fish made from the same raw fish batch that was used to make the product eaten by the patient, and from fish from earlier and later batches, were all negative for *C. botulinum*. The investigators have therefore hypothesised that there may have been storage temperature abuse at a later stage, such as in the retail outlet or the home. After inspection of the facility and microbiological examination of fish samples, production of the product has started again.

C. botulinum type E is naturally highly prevalent in aquatic environments and fish [2,3], leading to a high risk of contamination. The hot-smoking processes are usually too low to eliminate botulinum spores [4]. Growth and toxin production from spores in vacuum-packed smoked fish products with anaerobic atmosphere and limited preservative factors is likely during extended storage at temperatures above 3°C. Therefore the most important factors controlling *C. botulinum* growth and toxin production are efficient heat treatments, restricted shelf life and continuous storage below 3°C.

Human botulism is a very rare disease; the most recent case to be reported in Finland before the case mentioned here occurred in 1999 [5]. A similar outbreak that affected two people in Germany in 1997 is described in the literature [6]. However, it is of utmost importance that physicians remain aware of the disease as a possible diagnosis. Botulism should be considered whenever a patient develops neurological symptoms that include blurred vision, difficulties in swallowing or speech and symptoms of descending flaccid paralysis. This should be followed by appropriate epidemiological and laboratory analyses to confirm the diagnosis and to improve the epidemiological understanding of the disease [7].

References:

1. Lindström M, Keto R, Markkula A, Nevas M, Hielm S, Korkeala H. Multiplex PCR assay for detection and identification of *Clostridium botulinum* types A, B, E, and F in food and fecal material. *Appl Environ Microbiol* 2001; 67: 5694-5699.
2. Hielm S, Björkroth J, Hyytiä E, Korkeala H. Prevalence of *Clostridium botulinum* in Finnish trout farms: pulsed-field gel electrophoresis typing reveals extensive genetic diversity among type E isolates. *Appl Environ Microbiol* 1998; 64: 4161-4167.
3. Hyytiä E, Hielm S, Korkeala H. Prevalence of *Clostridium botulinum* type E in Finnish fish and fishery products. *Epidemiol Infect* 1998; 120: 245-250.
4. Lindström M, Nevas M, Hielm S, Lähteenmäki L, Peck MW, Korkeala H. Thermal inactivation of nonproteolytic *Clostridium botulinum* type E spores in model fish media and in vacuum-packaged hot-smoked fish products. *Appl Environ Microbiol* 2003; 6: 4029-4036.
5. Lindström M, Hielm S, Nevas M, Tuisku S, Korkeala H. Proteolytic *Clostridium botulinum* type B in the gastric content of a patient with type E botulism due to whitefish eggs. *Foodborne Pathog Dis* 2004; 1: 53-57.
6. Korkeala H, Stengel G, Hyytiä E, Vogelsang B, Bohl A, Wihlman H, et al. Type E botulism associated with vacuum-packaged hot-smoked whitefish. *Int J Food Microbiol*. 1998; 43: 1-5.
7. Lindström M, Korkeala H. Laboratory diagnostics of botulism. *Clin Microbiol Rev* 2006; 19: 298-314.