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Editorials

Food-borne Clostridium botulinum intoxication from mass produced foodstuffs in Europe 2
by J Cowden

Rapid communications

Two outbreaks of botulism associated with consumption of green olive paste, France, September 2011 5
by JM Pingeon, C Vanbockstael, MR Popoff, LA King, B Deschamps, G Pradel, H Dupont, A Spanjaard, A Houdard, C Mazuet, B Belaizi, S Bourgeois, S Lemgueres, K Debbat, P Courant, R Quirin, P Malfait

Two cases of food-borne botulism in Finland caused by conserved olives, October 2011 8
by K Jalava, K Selby, A Pihlajasaari, E Kolho, E Dahlsten, N Forss, T Bäcklund, H Korkeala, T Honkanen-Buzalski, T Hulkko, Y Derman, A Järvinen, H Kotilainen, L Kultanen, P Ruutu, O Lyytikaïnen, M Lindström

An outbreak of food-borne botulism in Scotland, United Kingdom, November 2011 11
by LM Browning, H Prempeh, C Little, C Houston , K Grant, JM Cowden, on behalf of the United Kingdom Botulism Incident Management Team

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Food-borne *Clostridium botulinum* intoxication from mass produced foodstuffs in Europe

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The incidence of botulism in the European Union (EU) in recent years is well described elsewhere [1]. In brief, in the EU between 2006 and 2008, 477 confirmed cases were notified: an average of 119 cases per year, with a range of 104 to 132, and no discernable trend.

The surveillance of cases of botulism in the EU includes the three main forms of the disease but does not distinguish between them [2].

- Food-borne botulism is caused by the ingestion of toxin produced by organisms in an anaerobic environment. It usually results from inadequately sterilised domestically canned or bottled foods.
- Intestinal botulism is caused by the production in the gut of toxin by organisms which have been ingested and have proliferated. This form predominantly affects infants under a year old, often associated with the consumption of honey.
- Wound botulism is caused by the production of toxin by organisms introduced into wounds. This is often associated with dirty wounds, including those following injecting drug use.

Botulism is a severe disease that can be fatal in 5-10% of cases [3].

According to the European Centre for Disease Prevention and Control's (ECDC) Annual Epidemiological Report 2011, major causes of botulism in industrialised countries are contaminated and inadequately cooked foods, and ingestion by infants of spores in the environment [1].

Since 2009, *Eurosurveillance* has published only four reports of outbreaks of food-borne botulism in Europe [4,5,6,7] and only three resulted from consumption of widely distributed, commercially produced foods [4,5,6].

Despite only one of the four outbreaks being due to domestically prepared food [6], home-preserved food is generally acknowledged to be the major cause of botulism in those EU countries that have had most cases in recent years and outbreaks resulting from mass produced foods are rare.

Against this background, from September to November 2011, there were three outbreaks in three different countries in Europe. In the outbreaks which feature in this issue of *Eurosurveillance*, the vehicles of intoxication were demonstrated, on the basis of strong toxicological and descriptive epidemiological evidence, to have been widely distributed, commercially produced foods [8,9,10].

These three outbreaks present intriguing differences and similarities.

- In two outbreaks, the Finnish and the Scottish, cases were confined to single households. In France cases occurred in two household clusters.
- In the French and Finnish outbreaks the vehicles included olives: olive tapenades in the French outbreak, and almond-stuffed olives in the Finnish. In the Scottish outbreak, the vehicle was korma sauce.
- In all three outbreaks the vehicle of intoxication was marketed in glass jars with screw-top lids.
- In the French and the Scottish outbreaks the food was produced and distributed within the country of origin. In the Finnish outbreak, the food was distributed internationally from another country, Italy.
- In the Finnish and the Scottish outbreaks the food was produced in industrialised units. In the French outbreak the producer was described as an "artisanal producer" although the tapenade was commercially produced and widely distributed.
- In the French and the Scottish outbreaks the toxin was type A. In the Finnish outbreak it was type B.
- In two outbreaks, the Finnish and the French, defects potentially explaining the contamination were identified. In the Finnish outbreak, seals in other jars from the same batch were found to have defects, although none was found to be contaminated. In the French outbreak an improper

sterilisation process was identified. In the Scottish outbreak the food originated from a state-of-the-art food-production facility where intensive investigation has yet to find any shortcomings, and no post-production event has been identified which could explain the contamination.

The number of cases in all three outbreaks was surprisingly low if a production fault is assumed to have affected the production of at least a whole batch of jars.

This is particularly true of the Scottish outbreak where only one household was affected, and which could be explained by the contamination of a single jar from a batch of 1,836 jars. Likewise, the Finnish outbreak affected a single household, and could be explained by only one contaminated jar of stuffed olives, despite the batch being part of a lot of 900 imported into Finland, and the product having been exported to many countries in Europe and beyond.

Only in the French outbreak does the contamination of more than one jar need to be hypothesised to explain the cases – and even here, contamination of only two jars could explain the cases. The size of the batch in the French outbreak was approximately 60 pots.

These outbreaks demonstrate that even modern industrialised production and distribution methods can occasionally allow contamination by botulinum toxin and prompt some important questions.

- How could a fault in production, distribution, retail, or domestic handling result in the contamination of a single item or so small a proportion to cause only a very limited number of cases from a large batch of product?
- If it is not possible to identify exactly where or how the contamination occurred, how can it be avoided in future?
- As risk can never be completely eliminated, do we have to accept that small outbreaks of diseases, even as deadly at botulism, and caused by mass produced foods are inevitable?

The first two questions relate to primary prevention, i.e. food safety. Ensuring safe food is the responsibility of food producers, and those who regulate them and enforce those regulations. These activities are beyond the scope of this editorial.

If, however, the answer to the last question is “yes”, or even if it is “no” but it is accepted that the ideal is unachievable, then the role of secondary prevention is crucial. Secondary prevention in this context, i.e. the identification, investigation, and control of the outbreaks resulting from contaminated food, is the responsibility of local, national, and international public health and laboratory professionals.

In order for secondary prevention to be effective, the following actions must be carried out rapidly:

- identification of cases, which requires fit-for-purpose local and national clinical and laboratory surveillance;
- epidemiological investigation of the cases and their microbiological or toxicological confirmation, which requires an effective public health and clinical laboratory service;
- microbiological and toxicological investigation to confirm the vehicle, which requires a competent environmental laboratory service;
- dissemination of information about such cases, their occurrence, characteristics and exposures and the results of epidemiological and microbiological or toxicological investigations to others, which in case of the EU is facilitated through EU-wide coordinated alert systems, such as the Epidemic Intelligence Information System (EPIS) and Early Warning and Response System (EWRS);
- immediate control measures, which in these circumstances consist chiefly of the withdrawal of suspect foods, and the alerting of the public to the danger of any such foods which remain in their possession. This requires, not only systems such as the EU Rapid Alert System for Food and Feed (RASFF), but also efficient lines of communication outside the EU, for example with WHO and other national organisations such as the United States Centers for Disease Control and Prevention and, crucially, to the public.

All these systems appear to have worked well in the investigation and control of the three outbreaks reported in this issue. They can serve as a good example for politicians and policymakers who need to be aware of the necessity for the continuing development of such vital health protection activities, even in the current climate of constrained resources.

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Two outbreaks of botulism associated with consumption of green olive paste, France, September 2011

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Two family outbreaks of botulism (a total of nine cases) were identified in south-east and northern France in early September 2011. The source of infection was considered to be a ground green olive paste. Botulinum type A toxin was identified in seven cases and in the incriminated olive paste. Incorrect sterilisation techniques were observed at the artisanal producer's workshop. These episodes highlight the potential public health threat of *Clostridium botulinum* linked to inadequate sterilisation of food products.

Outbreak description

In early September 2011, local health authorities were notified by a hospital clinician of an outbreak of five suspected cases of botulism (Outbreak 1) among eight persons who attended a family dinner in the Vaucluse department in the south-east of France. The five, aged in their mid-50s to mid-80s, presented with classic symptoms of botulism (gastrointestinal symptoms followed by descending paralysis) 24 to 36 hours after the meal and were hospitalised the same or the following day after symptom onset. All five rapidly developed quadriplegia and required intubation and mechanical ventilation. A trivalent antitoxin was administered to all five. As of the end of November (latest information available), all five were still hospitalised.

A further suspected case, who had attended the same family dinner, was initially asymptomatic, but went on to develop mild symptoms of botulism (double vision, ptosis and difficulty in swallowing), seven days after the family meal. This person was hospitalised the day of symptom onset. The patient did not develop paralysis of the limbs or respiratory muscles and was discharged from hospital three days after admission.

A second outbreak of three suspected cases (Outbreak 2) was reported two days following notification of Outbreak 1, among six persons who attended another family dinner, in the Somme department in the north of France. The three suspected cases, all aged in their 20s, presented with classic symptoms of botulism one day after the dinner and were hospitalised that day. All three rapidly developed quadriplegia and required intubation and mechanical ventilation. A trivalent antitoxin was administered to all three. The duration of hospitalisation ranged from 34 to 58 days. Two asymptomatic persons who also attended the dinner were hospitalised for observation and were discharged after 48 hours.

Oubreak investigation

An investigation was undertaken the day Outbreak 1 was notified, to confirm the diagnosis, identify any additional cases and the vehicle of intoxication and to put in place appropriate control measures.

When the first outbreak was notified, the French Ministry of Health issued an urgent message about the outbreaks to all French hospitals and poison control centres. Hospital clinicians were reminded to report immediately all clinical suspicions of botulism to the local health authorities, using the mandatory notification system.

The local health authorities documented the food consumption of the suspected cases in the two to three days before symptom onset and particularly during the meal shared by each family in the two outbreaks, including type of food, brand and date and place of purchase.

Clinical samples

Serum, gastric juice and stool samples from the suspected cases and samples recovered from leftover foods from the two family meals were analysed by the National Reference Centre for Anaerobic Bacteria and Botulism at the Pasteur Institute in Paris. The presence of botulinum toxin type A was confirmed by the mouse lethality test and by seroprotection with specific antibodies [1]. The presence of *Clostridium botulinum* was investigated by real-time PCR amplification of the type A, B and E neurotoxin genes, and strain isolation and characterisation [1].

Type A botulinum toxin was identified in serum samples by the mouse lethality test from seven of the nine suspected cases and *C. botulinum* was isolated from stool and/or gastric juice from the same seven cases. As the other two persons had clinical symptoms compatible with botulism and an epidemiological link with a laboratory-confirmed case, they were also considered as cases.

Serum samples taken from three asymptomatic people who had participated in the family meals – one in Oubreak 1 and two in Oubreak 2 – were negative for botulinum toxin.

Food investigation

In Outbreak 1, the eight family members had shared a single common meal at the start of September (24 to 36 hours before symptom onset in the first five cases), during which all five consumed ground green olive paste (containing green olives, garlic, capers and olive oil). The two asymptomatic participants did not report having consumed the paste. The case who presented later with a milder form of the disease, reported not to have consumed the paste, but to have used the knife that had been used to serve it. A dried-tomato paste was also eaten by some (number unknown) of the family members who attended the meal.

In Outbreak 2, consumption of ground green olive paste and a dried-tomato paste during the single common meal in early September (one day before symptom onset) was reported for all three cases. The asymptomatic participants did not report consumption of these products, with the exception of one participant who ate only the tomato paste.

Leftovers of the two meals were sent for testing two days after each meal had taken place. The national reference centre identified botulinum toxin type A in the green olive paste from the meal in Outbreak 1, with toxin titres of 20,000 mouse lethal doses (MLD)/g. The dried-tomato paste, eaten by some of the family of Outbreak 1, was negative for botulinum toxin.

Type A botulinum toxin was also identified in the leftover olive paste (toxin titres of 2,000 MLD/g) and to a lesser extent in the tomato paste (2 MLD/g) from the meal in Outbreak 2.

C. botulinum type A was identified by real-time PCR from all four food samples and isolated from three food samples (green olive paste leftovers from both meals and the leftover dried-tomato paste from the meal in Outbreak 2).

Trace-back and environmental investigations

The trace-back investigation found that the two families in Outbreaks 1 and 2 had eaten ground green olive paste that had been produced on 20 May 2011. The tomato paste eaten by members of Outbreak 1 had been produced on 26 July 2011, while that eaten by members of Outbreak 2 dated from 20 May 2011.

The green olive pastes and tomato pastes had been purchased by the families in two grocery stores in two neighbouring districts of the Provence region in south-east France, in late July and August 2011. They were sold in small glass jars with screw-top lids as part of a collection of several pastes, which are typical of this region. The products came from a local artisanal producer: they were produced in small quantities (the size of the batch of olive paste produced on 20 May was approximately 60 pots) and distributed principally to grocery stores under three different brand names, in a limited geographical area in the south-east of the country. The products were also sold in small quantities on the Internet.

An environmental investigation carried out by the district food control authority identified that the sterilisation process was incorrect, which affected not only the production of the two types of paste, but all goods made by this producer. No in-house quality assurance controls had been performed and the producer had not declared the food production to the local health authorities responsible for inspecting food producers.

Public health measures

The green olive paste was recalled nationally, via a local and national press release, the day after the first outbreak was notified. Following trace-back investigation, inspection of the production procedures and microbiological results suggesting that other products prepared using the same sterilisation process could also be at risk, all products of the producer involved were recalled two days after the press release was issued.

European countries were informed of the occurrence of the cases and the incriminated product via the Early Warning and Response System (EWRS) and the Epidemic Intelligence Information System (EPIS) of the European Centre for Disease Control, the International Food Safety Authorities Network (INFOSAN) of the World Health Organization and the Food and Agriculture Organization of the United Nations and via an alert in the European Union's Rapid Alert System for Food and Feed (RASFF), the day after the press release was issued and during the following two days.

As of 6 December, no other case of botulism associated with this product has been identified in France or any other European Union Member State.

Discussion

Botulism is a rare disease in France and has been statutorily notifiable since 1986. Between 2007 and 2009, 47 cases were notified [2] and among the confirmed cases, botulinum type B toxin was identified in 33 and botulinum type A toxin in eight (three of the eight were infants). The last reported episode of botulism in France due to botulinum type A toxin was in Corsica in 2010 [3], in which five persons who attended the same meal developed severe botulism: one case died. This episode was linked to the consumption of home-preserved French beans in a salade niçoise.

Botulism due to type A toxin is characteristically associated with the consumption of vegetable products, especially home-canned vegetables, but some cases have been linked to commercially processed foods [4]. The probable food source in the outbreaks described here was a green olive paste produced by a local manufacturer using inadequate sterilisation techniques. Botulism food poisoning associated with incorrectly prepared olives has previously been documented [5,6]. Garlic, which was included in the preparation of the olive pastes involved in these outbreaks, has also been previously associated with botulism [7].

C. botulinum spores are present in the environment and can be present in foods that have not been subjected to a sufficiently high temperature during preparation [8,9]. If appropriate conditions exist within such foods, *C. botulinum* spores present can germinate, multiply and produce toxin. The environmental investigation carried out following the two outbreaks described in this report demonstrated that the sterilisation process used by the producer was incorrect. Our findings strongly suggest that the inadequate sterilisation process permitted spores of *C. botulinum* to survive the preparation process and consequently was the probable cause of the outbreaks.

These outbreaks highlight the potential public health threat of *C. botulinum* associated with inadequate sterilisation processes and underline the importance of monitoring practices of producers involved in small-scale food preparation.

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Two cases of food-borne botulism in Finland caused by conserved olives, October 2011

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In October 2011 in Finland, two persons fell ill with symptoms compatible with botulism after having eaten conserved olives stuffed with almonds. One of these two died. *Clostridium botulinum* type B and its neurotoxin were detected in the implicated olives by PCR and mouse bioassay, respectively. The olives were traced back to an Italian manufacturer and withdrawn from the market. The public and other European countries were informed through media and Europe-wide notifications.

We describe two cases of food-borne botulism linked to consumption of conserved olives, identified in Finland in October 2011.

Description of cases

In mid-October 2011, the National Institute for Health and Welfare (THL) in Finland was informed of a suspected case of food-borne botulism. This was an elderly person who had been admitted to the Helsinki University Central Hospital three days earlier due to acute onset of dizziness, blurred vision, dysphagia and dysarthria but not preceded by gastrointestinal symptoms. One day after hospital admission, the patient's condition deteriorated and food-borne botulism was suspected based on clinical symptoms a day later. The suspected case had no history of travel, and wound botulism was ruled out because of intact skin. During days 1 and 2 of hospitalisation, descending paralysis progressed rapidly to nearly total tetraparesis and respiratory muscle failure requiring mechanical ventilation. Clinical presentation and no abnormalities in the cerebrospinal fluid were suggestive of botulism. Electroneuromyography (ENMG) did not definitely distinguish botulism from other neuromuscular diseases. The index case developed multi-organ failure and died in hospital 14 days after admission.

Four days after the index case was hospitalised, a young adult person in the same household also presented with impaired (double) vision, dysphagia and dysarthria. During interviews with the two cases and two other household members, it was found that both cases had eaten conserved olives stuffed with almonds from a previously unopened glass jar in mid-October at an interval of three days between each other. As this food item was the most plausible vehicle, it was tested before any other food item collected from the household. Of the two other household members, one had diarrhoea but none had any neurological symptoms. One of these two persons had tasted the implicated olives while the other had not eaten any.

Laboratory investigation

Serum, gastric content and faecal samples were taken from both suspected cases and sent to the Department of Food Hygiene and Environmental Health, Faculty of Veterinary Medicine, University of Helsinki for analysis of botulinum neurotoxin and *Clostridium botulinum*. The index case was sampled three days after the onset of symptoms, and samples from the second case were taken on the day of hospital admission, after the administration of a trivalent antitoxin. The serum and gastric content samples were tested in the standard mouse bioassay [1] and the gastric content and faecal samples were also tested with multiplex-PCR [2,3]. Various food samples (of 20 food items among which sun dried tomatoes, black olives, various fish products) obtained from the household refrigerator were tested by PCR, and the jar of olives from which the two cases had eaten the olives was also subjected to the mouse bioassay.

The serum sample of the index case showed a weak positive result in the mouse assay, suggesting the presence of borderline amount of botulinum neurotoxin

in the patient's serum. However, all the other clinical samples from both patients were negative for the neurotoxin. Botulinum neurotoxin type B gene was detected in the gastric content and faecal samples from both patients and in the implicated jar of olives, indicating the presence of *C. botulinum* type B organisms in these samples. The olives were strongly positive for botulinum neurotoxin type B. A PCR typing assay [4] showed the olive isolate to be *fldB* positive, suggesting the isolate to be proteolytic and thus belong to *C. botulinum* Group I.

Product trace-back investigation

The pasteurised olives stuffed with almonds had been manufactured and packed in Italy. A consignment of 900 glass jars of 314 ml had been imported to Finland in 2010. Two different batches were identified, labelled with best before dates of August 2012 and September 2012, respectively. They had been sold in three supermarkets in three cities, two in the metropolitan area (Espoo and Vantaa) and one in northern Finland (Rovaniemi), and in five restaurants in central Helsinki and Vantaa. The olives had also been delivered by the restaurants to clients and business associates. The two cases described above had received the olives as a gift. All the products that were still in store were withdrawn by the local authorities and importing company one day after notification. Rapid Alert System for Food and Feed (RASFF) and Early Warning and Response System (EWRS) notifications were issued on 21 October 2011. The restaurants helped in identifying clients to whom they had delivered olives. The supermarket chain used its records of loyalty cards to identify customers who had purchased olives. The jar found at the home of the cases was from the batch with expiry date September 2012. It was noted that some of the glass jars of both olive batches were leaking. By visual inspection it was established that the content in some of the leaking jars was spoiled. However, laboratory investigations did not reveal botulinum neurotoxin or *C. botulinum* in these jars. The Italian RASFF authorities identified that the product had been exported to at least the following countries in the European Union (EU): the Czech Republic, France, Germany, Ireland, the Netherlands, Spain and the United Kingdom as well as to some non-EU countries: Armenia, Barbados, Brazil, Japan, Russia, Saudi Arabia, Switzerland, Taiwan and the United States of America. No human cases of botulism associated with this batch of olives have been reported to date through the EWRS from other EU or non-EU countries.

Media coverage

The general public was informed about these cases by a joint press release of THL, Finnish Food Safety Authority Evira, University of Helsinki and the City of Helsinki on 21 October 2011. The product was identified in the press release by a photo of a jar of olives from the implicated batch and advice was given to seek urgent medical attention in case of symptoms (gastrointestinal symptoms or difficulties in speaking and swallowing or visual impairment) after consumption of suspected olives. Following the press release, there was an information exchange between various European and international health organisations such as the European Centre for Disease Prevention and Control, the World Health Organization Regional Office for Europe and the United States' Centers for Disease Control and Prevention. The incident gained wide coverage in the Finnish media over the weekend of 22 and 23 October and again one week later after the death of the first case.

Discussion and conclusion

Food-borne botulism remains a serious threat and may be caused by products distributed internationally. In Finland, food-borne botulism is rare and most domestic cases have been associated with fish products caused by *C. botulinum* type E toxin [5,6]. In 2009, two cases of food-borne botulism were detected among French tourists who purchased fish from Finland which was stored inappropriately and consumed after having returned home [7]. In 2006, two persons in Finland were diagnosed with food-borne botulism after having eaten vacuum-packed smoked whitefish [8]. Previously in Italy, conserved olives have also been implicated as a vehicle for food-borne botulism [9].

The immediate concern in respect to the incident described here is that jars of olives of the implicated batch may still be present in households in different countries. The assumption of severe failure in the processing, packaging and transportation of the implicated product is supported by the fact that several jars had cap leakage and the content was spoiled. The jar from which the two cases ate olives had been unopened prior to consumption and the product was within the given shelf life. However, as no other cases have been reported, it appears that only a single jar supported *C. botulinum* growth and botulinum neurotoxin production. It may also be that spoilage bacteria, as detected in some of the other jars, inhibited the growth of *C. botulinum*. The response to the cases described above was timely. However, continuous vigilance of clinicians for suspected cases of food-borne botulism is needed.

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An outbreak of food-borne botulism in Scotland, United Kingdom, November 2011

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An investigation is currently underway to explain an outbreak of food-borne botulism in Scotland. Three children in the same family were confirmed as having botulism following consumption of a meal made with a jar of korma sauce. Residual sauce from the jar, the jar lid and a remnant of the meal, all tested positive for *Clostridium botulinum* type A toxin. The children are recovering, although two remain ventilated and in intensive care unit.

Case description

In early November 2011, on two consecutive days, two siblings were admitted to hospital in Scotland with botulism diagnosed on the basis of clinical symptoms. Both children had initial symptoms of blurred vision followed by difficulty in swallowing and a descending paralysis. Both children were ventilated and trivalent botulinum antitoxin was administered, after which their condition remained stable.

Six days after the first child was admitted to hospital, a third younger sibling became unwell and deteriorated over the course of the next day. A day later, the child began to choke whilst trying to swallow liquids. This sibling was also hospitalised with a suspected diagnosis of botulism. Trivalent antitoxin was administered, and the child was discharged from hospital six days after admission.

Epidemiological investigation

The local Public Health team, supported by the Local Authority, Food Standards Agency, Health Protection Scotland and Health Protection Agency (HPA) carried out an intensive investigation including a comprehensive food history for the three days prior to symptom onset (with particular emphasis on the previous 36 hours). Korma sauce, a mild curry sauce with a blend of cream, coconut and almonds, was one of the many foods reported in the food history. The korma sauce that had been served during a family meal two days before the first sibling was admitted to hospital, had been eaten by the two elder siblings, and tasted by the third sibling and the father (but not the mother). The sauce in question was a commercially prepared food product distributed in the United Kingdom (UK) and Ireland.

Microbiological and toxicological investigation

Clinical specimens (serum, rectal washouts and gastric aspirates) and environmental samples taken from the children's home were examined for *Clostridium botulinum* and botulinum neurotoxin by the Foodborne Pathogens Reference Unit, HPA. Environmental samples from the family's rubbish bins and recycling boxes were taken. These included the remains of food items, used jars and containers with remnants of a number of foods, suspected on the basis of previous incidents and biological plausibility.

Botulinum neurotoxin was detected in the two older siblings' sera by a neutralisation mouse bioassay (MBA) [1] four days after the first sibling was hospitalised. *C. botulinum* type A was detected and subsequently isolated from their rectal washouts confirming a diagnosis of botulism. A day later, *C. botulinum* type A toxin was detected by MBA in residual sauce present in the empty used glass jar from a recycling box, its lid from a rubbish bin, and remnant of a chicken and korma sauce meal (which had been spat out by one of the two siblings and wrapped in tissue). Seven days after the third younger sibling was admitted to hospital, *C. botulinum* type A was detected in the latter's stool specimen by MBA and subsequently isolated, confirming a diagnosis of botulism.

All other items from the rubbish bin and recycling box that were tested were negative for botulinum neurotoxin.

Control measures

The implicated batch of korma sauce which had been distributed across the UK and Ireland was withdrawn from sale [2]. Consumers were warned not to eat sauce from this batch. Warnings were also issued to the public and to medical professionals about the signs and symptoms of botulism [3]. Similar warnings were issued throughout the rest of the UK and Europe, via the Early Warning Response System (EWRS) and the Rapid Alert System for Food and Feed (RASFF). Emergency procedures were put in place to ensure that clinicians could obtain botulinum antitoxin if required.

Exhaustive investigations of production and distribution of the korma sauce are continuing, but at present there is no indication of how the jar became contaminated, nor any evidence that any other jars of korma sauce from the same batch were contaminated. This product was not available on retail sale outside the UK and Ireland.

Conclusions

Food-borne botulism caused by *C. botulinum* is very rare in the UK. Since 1922 there have only been 17 recorded incidents in the UK, the largest of which was a general outbreak in 1989 affecting 27 people, caused by a contaminated batch of commercially produced hazelnut yoghurt [4]. Between 1998 and 2006, seven incidents of food-borne botulism, (one household cluster of two cases, and six apparently sporadic cases) were reported in the UK, with home-preserved food sourced outside the UK responsible for most (4/7 incidents) (Kathie Grant, personal communication, November 2011) [4].

In early November 2011, three cases of botulism occurred in a household, due to the consumption of korma sauce. The outbreak was investigated and managed by a multidisciplinary team, which through an epidemiological link and subsequent microbiological confirmation successfully identified the korma sauce as the vehicle of intoxication. Only family members who had tasted or eaten the sauce became ill. The father, who had only tasted the sauce, and the mother who had neither eaten nor tasted it remained well. No other cases have been reported elsewhere to date. Investigations are continuing into the source and cause of the contamination.

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