Case Report

A case of foodborne listeriosis linked to a contaminated food-production process

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Received 9 June 2013
Accepted 19 June 2013

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We report a case of listeriosis linked to consumption of contaminated ox tongue. A public health investigation identified intermittent contamination at a meat-production process and ox-tongue production was discontinued. Sensitive molecular subtyping methods are improving our ability to track sources of Listeria monocytogenes contamination through the food chain. Detailed investigation of sporadic cases of listeriosis can provide important public health information and its wider use is encouraged.

Introduction

Infection with Listeria monocytogenes is associated with the consumption of a range of ready-to-eat foods including cold sliced meats (Gillespie et al., 2010; Little et al., 2010). The increased incidence of listeriosis in England and Wales in the past decade is related to sporadic cases rather than outbreaks (Gillespie et al., 2006). Active national surveillance of listeriosis undertaken by Public Health England comprises detailed strain-characterization information coupled with standardized clinical and epidemiological data to inform on the epidemiology of L. monocytogenes infection. Although identification of suspect foods is important to prevent further cases occurring, the source of infection for sporadic cases is rarely identified because of the paucity of exposure information and the complexities of the epidemiology and food-distribution systems.

L. monocytogenes is the leading cause of food-poisoning deaths in England and Wales with approximately a third of cases resulting in death (a mean of around 40 deaths per year) (Mook et al., 2012). Reducing the number of infections is a national priority (Food Standards Agency, 2011) and an important aspect of this is to reduce the public health threat from contaminated food items. In this report we describe the investigation of a sporadic case of listeriosis that yielded an important public health dividend.

Case report

An elderly adult was admitted to hospital with fever, headache, nausea, abdominal pain, myalgia and arthralgia. He was immunosuppressed because of an underlying medical condition. L. monocytogenes was isolated from a blood culture.

The case was investigated according to operational guidelines for listeriosis (Health Protection Agency, 2012). The national Health Protection Agency (HPA) exposure questionnaire was completed by face-to-face interview. This questionnaire provides surveillance information and identifies potential sources of infection or links with other cases. The case reported regularly eating sliced cooked meats from a local food outlet (outlet B). Samples of sliced meats, including beef, roast pork, ham and ox tongue, were obtained from food outlet B.

L. monocytogenes was detected in all four samples of ox tongue with counts ranging from $50 \text{ c.f.u. g}^{-1}$ to $6.3 \times 10^4 \text{ c.f.u. g}^{-1}$, three of which were far in excess of the legal food-safety criterion of $100 \text{ c.f.u. g}^{-1}$ for ready-to-eat foods (European Commission, 2005). L. monocytogenes was not detected in any other sliced meats sampled.

The clinical and food isolates were referred to the Laboratory of Gastrointestinal Pathogens (LGP) of the HPA for characterization. PCR assays were used to confirm the isolate’s identity and serogroup, and molecular typing was performed using fluorescent amplified fragment length polymorphism (fAFLP) (Roussel et al., 2013). Clinical and food isolates were found to be indistinguishable by molecular typing (serogroup 1/2b, fAFLP IVb.19).

The source of the ox tongue was a meat producer who produced sliced ox tongue. It was supplied pre-packed in

Abbreviations: fAFLP, fluorescent amplified fragment length polymorphism; HPA, Health Protection Agency; LGP, Laboratory of Gastrointestinal Pathogens; MAP, modified atmosphere package; PFGE, pulsed-field gel electrophoresis.
modified atmosphere package (MAP) packs of 1 kg for sale at delicatessen counters. The contaminated ox-tongue samples were from different batches with use-by-dates 1 week apart. The *L. monocytogenes* 1/2b IVb.19 isolates were obtained from both opened and intact packs sampled from food outlet B. Thus, contamination was likely to have originated at the meat producer. At this point the food outlet withdrew the sliced ox tongue from sale. Samples of ox tongue obtained at the premises of the meat producer tested negative for *L. monocytogenes*. Environmental samples from the cooked-meat-production area were negative for *L. monocytogenes* whilst *L. monocytogenes* was detected from one (a drain) of 10 samples from the raw-meat-production area. This *L. monocytogenes* was characterized as a different strain, i.e. serogroup 1/2a, fAFLP VIIa.95, and there were no other instances of this strain occurring in human, food or environmental isolates referred to the HPA LGP.

The HPA national surveillance of listeriosis indicated that *L. monocytogenes* 1/2b IVb.19 had been isolated 6 months earlier from an ox-tongue sample from another food outlet (outlet A). This ox tongue originated from the same meat producer. At that time, *L. monocytogenes* 1/2b IVb.19 was isolated from two trace-back ox-tongue samples from the meat producer. Enhanced monitoring of the producer was instituted by the local Environmental Health Department and *L. monocytogenes* was not detected from subsequent ox-tongue samples. Three months later, *L. monocytogenes* was isolated from three quality-assurance samples of ox tongue, but these isolates were not referred for characterization.

An incident-management team brought together the relevant epidemiological and microbiological information. The combined evidence over the 6 month period (Table 1) indicated intermittent contamination at the meat producer. At this point, the meat producer decided to cease production of MAP sliced ox tongue.

### Discussion

This report describes a case of listeriosis linked to the consumption of contaminated ox tongue. The subsequent public health investigation identified intermittent *L. monocytogenes* contamination during production of MAP sliced ox tongue. Action was subsequently taken to cease production and remove the risk of further cases occurring.

The source of infection for sporadic cases of listeriosis is rarely identified for several reasons: a large number of potential food exposures can occur during the lengthy incubation period of 3–70 days, patients are often elderly or frail and their food history recall may be poor, or the patient may have died and no food history is available. In addition, microbiological evidence is limited as food samples for sporadic cases are not often obtained. Poor understanding of the background prevalence of *L. monocytogenes* strains is also a factor. Investigations may also be hampered by the complexity of food-distribution networks.

In 1993, a case of listeriosis in Sweden was found to be linked to ready-to-eat sliced meat (Loncarevic *et al.*, 1997). In this case, the clinical strain was isolated from sliced meats in the patient’s refrigerator, from the same sliced meats in a retail shop and from the meat producer. The causative organism was serotyped and typed using restriction enzyme analysis and pulsed-field gel electrophoresis (PFGE).

A case of listeriosis in Belgium was associated with Camembert cheese when indistinguishable strains of *L. monocytogenes* were isolated from a patient who consumed Camembert cheese and from a sample of cheese in his refrigerator (Gilot *et al.*, 1997). These strains were also subtyped by PFGE methods.

In our report, strain characterization was performed using PCRs and fAFLP. fAFLP provides an equally high strain-discriminatory power compared to PFGE (Fonnesbech Vogel *et al.*, 2004; Roussel *et al.*, 2013), but it is quicker to perform and has a higher sample throughput than PFGE. These advantages allow the systematic typing of all food and clinical isolates referred to the HPA reference laboratory and a short turnaround time to assist, in a real-time frame, investigations such as the one described in this report.

In our report, the unique strain of *L. monocytogenes* was isolated from the patient, from ox tongue that the patient regularly consumed and from the ox-tongue producer (albeit 6 months earlier). This was strong evidence of a

### Table 1. Summary of *L. monocytogenes* 1/2b IVb.19 isolates

<table>
<thead>
<tr>
<th>Sample</th>
<th>Origin</th>
<th>Obtained from</th>
<th>Specimen date</th>
<th><em>L. monocytogenes</em> Serotype</th>
<th>fAFLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ox tongue</td>
<td>Food outlet A</td>
<td>April 2011</td>
<td>1/2b</td>
<td>IVb.19</td>
</tr>
<tr>
<td>2</td>
<td>Ox tongue</td>
<td>Meat producer</td>
<td>April 2011</td>
<td>1/2b</td>
<td>IVb.19</td>
</tr>
<tr>
<td>3, 4, 5</td>
<td>Ox tongue</td>
<td>Meat producer</td>
<td>July 2011 (3 samples on separate dates)</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>6</td>
<td>Index patient</td>
<td>Blood culture</td>
<td>October 2011</td>
<td>1/2b</td>
<td>IVb.19</td>
</tr>
<tr>
<td>7, 8</td>
<td>Ox tongue (open pack)</td>
<td>Food outlet B</td>
<td>October 2011</td>
<td>1/2b</td>
<td>IVb.19</td>
</tr>
<tr>
<td>9, 10</td>
<td>Ox tongue (unopened pack)</td>
<td>Food outlet B</td>
<td>October 2011</td>
<td>1/2b</td>
<td>IVb.19</td>
</tr>
</tbody>
</table>
common link. This link was only established because of a high level of national surveillance that was able to recognize *L. monocytogenes* 1/2b IV.19 as an unusual strain.

The sensitive molecular subtyping methods for clinical and food isolates now in place will improve our ability to track sources of *L. monocytogenes* contamination through the food chain as well as improving the ability to detect listeriosis outbreaks. Obtaining the necessary food and environmental samples will require thorough investigation of listeriosis cases with targeted food sampling. In this sense, the investigation of sporadic cases of listeriosis needs to be put on the same footing as that of other serious foodborne pathogens, for example verocytotoxin-producing *Escherichia coli* and *Salmonella* Typhi and Paratyphi, where detailed public health investigation is the norm.

Improved surveillance has implications at the European level where the incidence of listeriosis has also increased. Higher levels of reporting of confirmed cases and the use of standardized typing methods may identify more suspect food items, particularly where outbreaks are insidious and involve more than one country (Denny & McLauchlin, 2008).

**Conclusion**

This report describes a case of listeriosis caused by consumption of ox tongue. On the basis of this single case, intermittent contamination of sliced ox tongue production was identified. Ox-tongue production was discontinued and the risk of future cases was eliminated. This was an impressive public health dividend from the investigation of a sporadic case. We hope our experience will encourage thorough investigation of sporadic cases with increased use of targeted food sampling.

**Acknowledgements**

The authors thank the Environmental Health Officers who assisted with this investigation.

**References**


