Outbreak of *Clostridium perfringens* Infection at an Aberdeen Restaurant December 2004

Report of the Outbreak Control Team

Dr Helen Howie, Consultant in Public Health Medicine, NHS Grampian
Elaine Davies, Acting Senior Environmental Health Officer, Aberdeen City Council
Jayne Leith, Health Protection Nurse Specialist, NHS Grampian

on behalf of the Outbreak Control Team
Acknowledgement

Dr Howie, Chairman of the Outbreak Control Team would like to express her thanks to the following for all the help and assistance received during the management of the outbreak and compiling the final report

- All staff in the Environmental Health Service, Aberdeen City Council
- All members of the Outbreak Control Team
- Health Protection Team, NHS Grampian

Members of the Outbreak Control Team

Dr Helen Howie  Consultant in Public Health Medicine, NHS Grampian
(Chair)
Elaine Davies  Acting Senior Environmental Health Officer, Aberdeen City Council
Shaunagh Kirby  Corporate Communications, NHS Grampian
Jayne Leith  Health Protection Nurse Specialist Nurse, NHS Grampian
Dr Thomas Reid  Consultant Microbiologist, NHS Grampian
Dr Maria Rossi  SpR Public Health Medicine

In attendance
Julie Anderson  Secretarial support, NHS Grampian
Susan Duthie  TB Nurse specialist, NHS Grampian
Lynsey McNair  Environmental Health Officer, Aberdeen City Council
Lesley Middleton  Corporate Communications, NHS Grampian
Dr Diana Webster  Consultant in Public Health Medicine, NHS Grampian

The Outbreak Control Team met once on 21 December 2004
1. Introduction

The Environmental Health Service of Aberdeen City Council received a complaint on Monday 20 December 2004 from a member of a party who attended a restaurant in Aberdeen on Saturday 18 December. Several members of the party had complained of diarrhoea and abdominal pain.

The complaint was reported to the NHS Grampian Health Protection Team and the initial investigation strategy was agreed with the Environmental Health Service of Aberdeen City Council. Environmental Health Officers and Health Protection Nurse Specialists contacted the affected individuals and completed the NHS Grampian Enteric Surveillance Forms and subsequently the outbreak specific questionnaire. Environmental Health Officers inspected the premises on Monday 20 and Tuesday 21 December and an outbreak control team meeting was held on Tuesday 21 December 2004.

2. Background

*Clostridium perfringens* is a bacterium, which is widely distributed in the environment and frequently occurs in low numbers in the intestines of humans and many domestic and feral animals. It can produce spores, which persist in soil, sediments, and areas subject to human or animal faecal pollution. The spores are heat resistant and can survive despite cooking.

*Clostridium perfringens* food poisoning is commonly associated with meats, meat products, poultry and gravy. If the food is slowly cooled, inappropriately stored or inadequately reheated it is possible for the spores to germinate and the organism to multiply rapidly. When these organisms are swallowed in large numbers some reach the intestine where they, in turn, form spores and release an enterotoxin which causes the illness.

The symptoms of *Clostridium perfringens* food poisoning include abdominal cramps and diarrhoea that begin approximately 7-22 hours after consumption of food contaminated with *Clostridium perfringens*. The symptoms usually settle within 24 hours but less severe symptoms may persist in some individuals for 1 or 2 weeks. Human to human transmission does not normally occur.

3. Epidemiological Investigation and Results

One hundred and eighty seven people had eaten at the restaurant on Saturday 18 December. Most of the groups were small with 2-8 people in each party but there were four large parties of 11-36 people. Two parties reported gastrointestinal symptoms. No other reports of illness were received from any other groups.
3.1 Case definition

Suspected case – an individual who ate at the restaurant on the 18 December and who became ill with diarrhoea between Sunday 19 and Monday 20 December.

Confirmed case – an individual who ate at the restaurant on the 18 December and who became ill with diarrhoea between Sunday 19 and Monday 20 December and in whom Clostridium perfringens enterotoxin was detected by immunoassay or by presence of the enterotoxin gene.

3.2 Descriptive Epidemiology of Group 1

Group 1 consisted of 26 individuals whose table was booked for 18.30 hours. Fifteen individuals subsequently complained of diarrhoea and abdominal pain and fulfilled the case definition for a suspected case. Twenty-two individuals from this party were interviewed using the food specific questionnaire based on the menu (86% response rate). The other four individuals were unavailable for interview.

From the 22 detailed interviews it was established that
- there were 9 females and 13 males
- age range was from 18 – 70 years
- incubation period ranged from 6.5 – 19.5 hours
- symptoms were short lived
- 16 reported symptoms
- 3 reported vomiting, diarrhoea and abdominal pain
- 11 reported diarrhoea and abdominal pain
- 1 reported diarrhoea only
- 1 reported abdominal pain only
- none reported enteric illness prior to the meal
- 15 met the case definition for a suspected case

Figure 1 Epidemic curve for suspected cases in Group 1 by time of onset
3.3 Analytical epidemiology of Group 1

From the initial investigations the hypothesis was postulated that for Group 1, who had booked a table for 18.30, eating turkey and/or trimmings at the restaurant on 18 December increased the chance of becoming ill with diarrhoea. A small cohort study was undertaken to test this hypothesis. The food histories of the 22 individuals interviewed in Group 1 were analysed and the food specific attack rates are presented in Table 1 below.

<table>
<thead>
<tr>
<th>Table 1 Food specific attack rates for Group 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Starters</strong></td>
</tr>
<tr>
<td>Melon</td>
</tr>
<tr>
<td>Tiger prawns</td>
</tr>
<tr>
<td>Broth</td>
</tr>
<tr>
<td>Pate</td>
</tr>
<tr>
<td>Prawn cocktail</td>
</tr>
</tbody>
</table>

| **Main course** |       |           |       |       |       |       |       |       |       |
| Turkey       | 14    | 15        | 93    | 1     | 7     | 14    | 6.53  | 0.0006 |
| Chicken      | 0     | 1         | 0     | 15    | 21    | 71    | NC    |       |
| Steak        | 1     | 5         | 20    | 14    | 17    | 82    | 0.24  | 0.02 |
| Pasta        | 0     | 1         | 0     | 15    | 21    | 71    | NC    |       |

| **Desserts** |       |           |       |       |       |       |       |       |       |
| Dumpling     | 5     | 6         | 83    | 10    | 16    | 63    | 1.33  | 0.61 |
| Fruit salad  | 2     | 3         | 66    | 13    | 19    | 68    | 0.97  | 1   |
| Cheesecake   | 4     | 5         | 80    | 11    | 17    | 64    | 1.24  | 1   |
| Lumpy bumpy  | 3     | 7         | 43    | 12    | 15    | 80    | 0.54  | 0.14 |

Assume the cases who were not interviewed ate the turkey but did not get ill.

| **Turkey** |       |           |       |       |       |       |       |       |       |
|           | 14    | 19        | 74    | 1     | 7     | 14    | 5.16  | 0.01 |

Response rate was 86% (22/26). NC = not calculated. P value – measure of significance
Ill = suspected cases. AR = attack rate. RR = relative risk.

The attack rates and relative risks were calculated for each of the foods eaten. The relative risk is an estimate of the increased risk from eating the food. This showed that those individuals who ate the turkey were 6 times more likely to become ill than those who did not eat the turkey and this result was significant, i.e. unlikely to have occurred by chance (RR = 6.53, p = 0.0006). In addition the one individual who ate steak also tasted some turkey and became ill and this increases this likelihood of the turkey being the food vehicle.

The data was re-analysed assuming that the four individuals who were not interviewed ate the turkey but did not become ill. This showed that those individuals who ate the turkey were 5 times more likely to become ill than those who did not eat the turkey and this result was still significant (RR = 5.16, p = 0.01).
3.4 Descriptive epidemiology of Group 2

There were 11 individuals in Group 2 and their table was booked for 19.00 hours. Seven out of eleven individuals from this group were interviewed using the food specific questionnaire based on the menu. Four individuals were unavailable for interview.

From the 7 detailed interviews it was established that
- 7 were male
- age range was from 34 - 45 years
- incubation period ranged from 2-18 hours
- symptoms were short lived
- 1 reported vomiting, diarrhoea and abdominal pain
- 4 reported diarrhoea and abdominal pain
- 2 asymptomatic
- 1 symptomatic individual reported that a member of his household had a short lived illness, where vomiting was the main symptom, in the week prior to the meal
- one individual’s onset of diarrhoea and abdominal pain was reported as 18 December. Accordingly this individual does not fit the case definition.
- 4 individuals met the case definition for a suspected case

The food histories of these cases were not analysed as only 7 were available for interview and there was a report of illness in family members prior to the meal.

4. Environmental Health Investigation and Results

Two Environmental Health Officers visited the premises on 20 and 21 December 2004. The reason for the visit was explained to the proprietors. Discussions took place between the officers, the proprietors and the various chefs and other staff members who were on the premises, both at the time and on 18 December, to establish details of food handling practices. A physical inspection was also carried out.

No food cooked on 18 December was available for sampling but the following issues of concern were noted:

- Meals were being prepared on a very large scale due to the time of year. Chill capacity was unlikely to have met the needs of the business.

- The procedure described for cooking, cooling and re-heating turkey crowns and chipolata sausages were inconsistent amongst staff. The restaurant could not demonstrate adequate food safety control or the implementation of food safety management over the period in question as no temperature control procedures or records were available.

- None of the management or staff had undertaken formal structured training in food hygiene in recent years and the exact level of any training
previously carried out was unclear. Staff in management and supervisory positions did not have adequate hygiene awareness for such responsible positions.

- Within the chill cabinet raw meats and poultry were stored above ready to eat sauce leading to risk of contamination.

- Date labelling was not comprehensive hence the safe shelf life was unclear.

- There was no soap available at the kitchen wash hand basin.

The proprietor quickly engaged the service of a food safety adviser who had been involved in developing a basic food safety monitoring system at the premises earlier in 2004. Adequate control, monitoring and recording systems were put in place for cooking, cooling, storage and re-heating of all foods along with arrangements for training of all staff to appropriate levels of competence.

At this point Environmental Health were assured that training was being arranged for early in January 2005. No further action was deemed necessary at this time. A letter summarising the events, problems found and action required was sent to the proprietors in January 2005.

5. Microbiological investigation and results

*Clostridium perfringens* can be isolated from an anaerobic culture of stool samples. As carriage of *C. perfringens* is almost universal in healthy humans, other methods are used to differentiate cases from carriers. Finding exceptionally large numbers of the bacteria in the faeces of patients would differentiate between a case and a healthy carrier. *C. perfringens* food poisoning is confirmed by the detection of the enterotoxin in the faeces of patients detected by immunoassay or by detection of the enterotoxin gene.

Group 1 - 10 individuals submitted faecal samples
Group 2 - 1 individual submitted a faecal sample

Eleven faecal samples were tested and found negative for the following bacterial pathogens; Salmonella, Shigella, Campylobacter, Yersinia, Aeromonas, E coli O157 and Cryptosporidium. In addition, samples were cultured on selective medium for *Clostridium perfringens*.

Seven faecal samples were tested using a commercial ELISA (enzyme linked immuno sorbent assay) which detects norovirus antigen. All were negative for norovirus.

Eleven samples were submitted to the Food Safety Microbiology Laboratory at the Centre for Infection of the Health Protection Agency

- *C. perfringens* enterotoxin was detected in 8 faecal samples
• *C. perfringens* isolates were subtyped by the amplified fragment length polymorphism (ALFP) technique. Three isolates belonged to AFLP Type B.

Nine individuals from Group 1 met the case definition for a confirmed case with detection of enterotoxin either by immunoassay or by gene detection. One individual submitted a specimen, which was positive, but was unavailable for interview and therefore the epidemiological information is missing.

6. Communications - with public, press and professionals

All General Practitioners, the Out of Hours Co-operative and NHS 24 were alerted to the outbreak on 20 December 2004. The Director of Public Health, the Food Standards Agency, Health Protection Scotland and the Scottish Executive Health Department were advised.

The statement provided to the media on the 24 December is included in Appendix 1.

7. Discussion

The epidemiological investigation was limited to the two large groups who ate at the restaurant. The Outbreak Control Team was not aware of any reported illness amongst other parties despite the media coverage. A third group was contacted but it was not possible to interview the individual members of the group. The analytical epidemiology was limited to one group. This was considered reasonable as the environmental health investigation suggested it would have been possible for just one group to be affected i.e. not all servings would have been affected.

The small cohort study shows that someone who ate turkey and/or trimmings was six times more likely to become ill than someone who did not eat the turkey. This finding is significant and strongly suggests the turkey and/or trimmings as the food vehicle for the infection. This finding is strengthened by the report that one individual who had eaten steak but also tasted the turkey became ill.

Fifteen individuals from Group 1 met the case definition for a suspected case and *C. perfringens* enterotoxin was detected in nine of these individuals by immunoassay or detection of the enterotoxin gene. The presence of the *C. perfringens* enterotoxin gene indicates the potential of the strain to cause diarrhoea, whilst the molecular subtyping strongly suggests that the strains were from a common source. Taken together these results provide good evidence that *C. perfringens* caused this outbreak.

The Environmental Health Service of Aberdeen City Council carries out inspections to ensure compliance with food safety legislation at intervals based on risk as assessed at the previous inspection. Their enforcement
policy ensures that increasingly severe levels of action are taken where compliance is inadequate but it cannot ensure that all businesses comply fully at all times.

The premises were graded as category C at the time of the last inspection in July 2003 and were therefore considered lower risk than many other premises locally. The proprietors understood the need for food safety systems to be put in place and had previously used a Food Safety Adviser in this regard but their involvement/interest stopped there.

During the visits in December it was ascertained that:

- The proprietors’ knowledge of food safety was poor and its importance therefore was not adequately appreciated, although the need for training of staff was known. The kitchen staff also had poor knowledge of food hygiene, having had no recent structured formal training.

- Identification of risks critical to food safety had not been fully or formally carried out. Accordingly risks were not controlled or monitored. The control and monitoring procedures previously drawn up for temperature monitoring were allowed to lapse. Capacity was stretched at the time of year. Space and time were at a premium.

- With regard to the turkey meal it is considered likely that conditions were suitable for the survival and growth of *Clostridium perfringens*.

Since the introduction of the legal requirement to identify, control and monitor risks which are critical to food safety in 1995, the experience of Aberdeen City Council’s food hygiene inspectors is that this requirement is generally not well understood or carried out by local businesses. Reliance is often left to others, including the enforcing authorities, to instruct how to deal with what is possibly seen as a difficult and inconvenient part of running a food business, rather than taking a pro-active approach themselves in the responsible manner required by law.

Proprietors who do not fully appreciate their responsibilities in terms of ensuring the food they provide is safe run the risk of causing an incident such as this and all the consequent repercussions.

This incident emphasises why it is imperative that proprietors of food premises understand, arrange and check that appropriate training has taken place and that food safety systems are consistently and continuously appraised, controlled and monitored, especially when menus change or production volume increases.

8. Conclusion

Whilst not fully conclusive because none of the foods consumed were available to test, the clinical picture, food histories, environmental investigation and microbiological results strongly suggest this outbreak was caused by *Clostridium perfringens*.
9. Recommendations

- The Environmental Health Service of Aberdeen City Council will continue to emphasise the importance of risk control using all means available to it, including reporting offences to the Procurator Fiscal where it is considered appropriate and necessary. **Action: Environmental Health Service, Aberdeen City Council**

- Training of food handlers in food hygiene as an aid to understanding and controlling risk is another high priority, which will continue to be pursued. **Action: Environmental Health Service, Aberdeen City Council**

10. Follow up actions

In March 2005 the final confirmation of the microbiological results from the Food Safety Microbiology Laboratory at the Centre for Infection were reported to Environmental Health Services

The premises were also revisited and further matters of concern were noted, notably that staff training had not been carried out as agreed and other matters of risk to food safety were not fully identified and controlled.

An assessment in terms of Aberdeen City Council’s Food Safety Enforcement Policy was made and it was decided to report the matter to the Procurator Fiscal. At the hearing on 10 August 2006 the company pleaded guilty to both of the two charges made and a fine of £1000 was levied by the Sheriff.

In the meantime, the proprietors and other members of staff have attended the Royal Environmental Health Institute for Scotland approved Elementary level food hygiene course and the two main chefs have attended the Intermediate level course.

The business has participated in Cooksafe training i.e. training on risk identification, control and monitoring organised by Aberdeen City Council and funded by the Food Standards Agency. At the time of the last inspection the business was found to be operating a satisfactory food safety management system with all managers and food handling staff able to display appropriate understanding of food safety control.
Appendix 1

24 December

NHS Grampian’s Health Protection Team and Environmental Health Department of Aberdeen City Council are currently following up a number of small clusters of short-lived gastro-intestinal illness in the community.

We can confirm that one of these clusters concerns fifteen individuals who suffered a short-lived diarrhoeal illness after eating out in Aberdeen over the weekend of 18/19 December.

All appropriate investigations have been undertaken and control measures have been put in place. It is often difficult to find the organisms that cause these short-lived infections.

This is a common time of year for viral gastro-intestinal illnesses, which occur in a variety of settings within the community where people are gathered together.

To prevent these infections there are three important messages:

- people with diarrhoea and/or vomiting should stay off work or school for 48 hours after their symptoms have gone and stay away from hospitals, care homes, nurseries and community gatherings
- remember to wash hands thoroughly before eating or handling food and after using the toilet
- remember to prepare and cook food safely, especially at this time of year (further information from www.food.gov.uk)