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## **FAO/WHO GLOBAL FORUM OF FOOD SAFETY REGULATORS**

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### ***ESCHERICHIA COLI O157: H7 OUTBREAK IN SCOTLAND IN 1996/97***

#### **SUMMARY**

An outbreak of *Escherichia coli* (*E. coli*) O157:H7 infectious intestinal disease occurred in Central Scotland in late November 1996. A total of 496 cases was linked to the outbreak. In all there were 21 deaths of infected persons, although some were not as a direct result of the infection. All of those who died were elderly.

The cause of the outbreak was traced to contamination of cooked meat at a butchers. Investigations revealed very poor food hygiene practices that allowed cross contamination between raw and cooked meat. This outbreak illustrates the importance of:

- Hazard analysis and implementation of control measures;
- Good management and staff training;
- Effective enforcement.

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## **ESCHERICHIA COLI O157: H7 OUTBREAK IN SCOTLAND IN 1996/97**

### **OUTLINE AND BACKGROUND**

1. An outbreak of *Escherichia coli* (*E.coli*) O157:H7 infectious intestinal disease occurred in Central Scotland commencing in late November 1996. A total of 496 cases was linked to the outbreak. There were 17 deaths confirmed as directly resulting from infection with *E.coli* O157. A further 3 deaths were where people had the infection and were weakened by it, but died of other causes. Although infection was confirmed, 1 further death was of uncertain cause. All of those who died were elderly and many were frail.

2. *E coli* O157 was first identified as a human illness in 1982. Since then the number of cases has increased. For some unknown reason the rate in Scotland is higher than for most other countries. Infection requires ingestion of the organism. This may either be directly from a food source, or via person to person spread. There is no cure or antidote and reactive treatment only is possible.

### ***The Organism***

3. *E.coli* is a bacterium of which many strains (or types) live harmlessly in the gut of humans and animals. However, certain strains are pathogenic and can cause gastro-intestinal disease and complications. The strain involved in the Scottish outbreak (O157:H7) was highly virulent. Of particular importance is that it required relatively few organisms to cause harm. *E. coli* O157 infection is very serious for vulnerable groups, especially the elderly and very young. Complications can develop, including bloody diarrhoea and kidney and other problems. Death can follow in the most serious cases.

4. *E. coli* O157 exists in a wide range of animals and, in animals, does not often lead to disease symptoms. The main animal reservoir is thought to be the rumen and intestines of cattle.

### ***Control measures***

5. Control measures to combat *E. coli* O157 have to be implemented throughout the food chain. As cattle probably form the main animal reservoir one control measure is to reduce the incidence of the organism in herds. However, although methods involving measures such as changing feeding regimes, development of vaccines and the experimental use of bacteriophage and probiotics are being tried, control to date has not been particularly effective. This has meant that food hygiene controls are of paramount importance. These include on-farm measures such as control of hygiene during milking and ensuring that animals are clean when sent to slaughter, so that there is less chance of contamination of meat by faeces on the hide during its removal.

6. Controls in the slaughterhouse are particularly important to reduce the possibility of faecal contamination of meat. Special care must be taken during removal of hides and when removing the intestine. Further on in the food chain it must be assumed that all raw meat is potentially contaminated. Therefore hygiene measures must be taken to avoid cross contamination and ensure the thorough cooking of raw meat to kill any contaminating organisms. Butchers are a critical link in the meat production chain.

## THE OUTBREAK

7. The possibility that there was an outbreak of *E. coli* O157 food related illness was recognised on November 22 1996 and an Outbreak Control Team was set up on the following day. The cases of infection could be broken down into three groups:

- Attendees at a church lunch;
- Residents of a nursing home;
- Individual cases.

### *The Church Lunch*

8. Of the 87 people attending the church lunch for elderly parishioners, 45 suffered common symptoms of gastric disorder within days and 8 died. A common strain of *E. coli* O157 was isolated from a large number of those affected. It was concluded that an ingredient of the meal was responsible and it was identified that stewed beef had been the source of the infection.

9. The stew had been cooked by being boiled in a bag at a butchers on the Friday evening. It was left to cool overnight and was still warm when delivered to the church, the next day. The bags of stew were then left, without refrigeration, in the church overnight. On Sunday it was emptied out of the bags and reheated before being served.

10. Investigations concluded that the contamination was either the result of improper cooking of the stew or the contamination of the outside of the bag following cooking. The former route was thought to be the most likely. Many defects in food hygiene were found at the butchers, including:

- A broken heating element on the boiler, so that it was uncertain that the proper temperature was maintained;
- No temperature probes were used to check the internal temperature of cooked meat;
- Staff were poorly managed and not trained and had little idea of the principles of safe cooking;
- No quick cooling of cooked meat;
- Incomplete separation of raw and cooked meat processing streams and equipment;
- Cooked meat placed on a table used for preparation of raw meat (a possible route of contamination for the outside of the bag of stew) ;
- Cleaning was undertaken with a view to appearance using washing up liquid. There was no use of disinfectants and staff used the same cleaning cloths on surfaces used for raw and cooked meats. No cleaning schedules existed.

11. All of these factors made cross contamination between raw and cooked meat highly likely. Although the handling of the stew at the church would have led to a multiplication of the organism, the cause of the outbreak was contamination of the stew at the butchers. Most likely due to inadequate cooking.

12. A further factor that contributed to the extent of this outbreak was that the butchers supplied a large number of other outlets with cooked meats. This made the tracing and recall of contaminated meats difficult.

### ***The Nursing Home***

13. The Home was a residential home for elderly persons suffering from senile dementia. A selection of cooked meats was purchased from a second butcher. The meats were used in sandwiches and this resulted in a significant number of the residents falling ill with *E. coli* O157. There were 5 deaths, 3 of which were directly attributable to the infection.

14. The butchers that produced the stew did not produce the cooked meats purchased. However the second outlet did have cooked meats from the first butchers. The practice in the second outlet at the time (which was normal practice) was to slice the cooked meats on a slicing machine and display them on a single tray. Cross contamination between the meat produced by the first butcher and other meat was therefore likely, either from the slicing machine or via the tray.

### ***The individual cases***

15. As well as the cases of infection connected with the church and the nursing home there were many individual cases in the community involving the same strain of *E. coli* O157. There were 8 deaths, although 2 were probably not directly related to the infection.

16. Many of the cases of individual infection could be related to the consumption of cooked meats purchased from the same butchers that produced the stew or other outlets supplied by them.

### ***Source of the infection***

17. It was not possible to trace back to where the *E. coli* O157 contamination had originated. It is presumed that it was a result of a contaminated beef carcass being delivered to the butchers. Contamination would probably have occurred during slaughter or carcass dressing process, either at the abattoir or at the wholesalers.

## **INQUIRIES, RECOMMENDATIONS AND SUBSEQUENT ACTIONS**

18. Following the outbreak two inquiries were undertaken. The first was by an expert, independent body, the Pennington Group. The second was a Fatal Accident Inquiry into the deaths. The butcher at the centre of the outbreak was also charged with criminal offences and went to trial, but we will not deal with that here.

19. The Pennington Group was charged with examining the circumstances that led to the outbreak and to advise on the implications for food safety and general lessons to be learned. The Group took a precautionary and preventive approach, stressing public health considerations. They focussed on the HACCP<sup>1</sup> system, which is a structured system for identifying hazards and how they are best controlled. The Group made many recommendations including:

- Application of HACCP throughout the food chain, including acceleration of its introduction to butchers;
- Hygiene measures on farms, especially in relation to sending clean animals for slaughter;
- Introduction of a licensing system for all butchers;
- Greater emphasis on enforcement of controls in butchers.

20. The Fatal Accident Inquiry (FAI) examined in great detail the defects identified at the butchers at the centre of the outbreak. (See paragraph 10 above.) The FAI also had some criticism of the handling of the outbreak. In particular that more effort could have been put into the early identification of

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<sup>1</sup> HACCP – Hazard Analysis and Critical Control Point

customers who had purchased contaminated meat, but who might not have consumed it. That said, this was hampered by the complex nature of the butcher's business and difficulties in obtaining information.

21. The FAI report also commented on the role of Environmental Health Officers in inspecting the butcher's premises before the outbreak. It was highlighted that although inspections had taken place there was a failure to recognise some significant food hygiene deficiencies and to insist on the application of HACCP.

22. In summing up the FAI report endorsed the Pennington Group's conclusions about the need for licensing of butchers. But continued by saying that one step further may be needed to ban cooking at butchers unless it takes place in premises entirely separate from the raw meat processing and where at the point of sale there is a total separation of staff and equipment.

### **ACTION TAKEN SUBSEQUENTLY**

23. Some of the key changes introduced subsequently have been:

- Guidance has been issued to the Meat Hygiene Service in relation to accepting only clean animals for slaughter and clean dressing of carcasses;
- Environmental Health Officers have been instructed to take early action on HACCP in high risk premises;
- Introduction of a licensing system for butchers. In England the Food Safety (General Food Hygiene) (Butchers' Shops) Amendment Regulations 2000 introduced a requirement for premises of butchers shops to be licensed by food authorities. Requirements include that HACCP procedures are in place, and separation of raw and cooked food. Similar Regulations were brought in for Wales, Scotland and Northern Ireland.

### **CONCLUSION**

24. This outbreak demonstrates that:

- A relatively simple breakdown in hygiene can have serious public health consequences;
- The importance of a HACCP approach, and the knowledge to implement it effectively;
- Training of food handlers in food hygiene awareness is important in the reduction of food borne hazards;
- Effective enforcement is essential.