

A prolonged outbreak of *Campylobacter* infection at a training facility

Martyn Kirk^{1,2}, Russell Waddell¹, Craig Dalton², Alison Creaser³ and Nick Rose¹

Abstract

***Campylobacter* outbreaks are rarely detected despite *Campylobacter* being the most common food-borne illness notified to public health authorities. We report a prolonged outbreak of *Campylobacter* occurring over a three month period at a training facility. Seventy-eight cases were detected, 16 of which were confirmed *Campylobacter* infections. In seven affected groups of people using the facility, the attack rate ranged between 19% and 67%. An investigation of one sporting group showed that illness was associated with consumption of cucumber served at a self-serve salad bar. Six people attending the facility in other weeks also reported illness after eating only at the salad bar. Transmission of *Campylobacter* ceased after changes were instituted to food preparation and storage in the facility kitchen. *Comm Dis Intell* 1997;21:57-61.**

Introduction

Campylobacter outbreaks are rarely detected despite being the most common food-borne disease notified to public health authorities¹. In countries such as Australia, New Zealand and the United Kingdom, the majority of notified cases are sporadic with no readily identifiable source^{1, 2, 3}. Where outbreaks of *Campylobacter* infection are detected, they are

often of short duration and associated with point sources, such as chicken, water or milk^{4, 5, 6, 7, 8, 9}.

On 23 October 1995, the South Australian Health Commission (SAHC) was alerted to an outbreak of gastrointestinal illness among members of an external course at a training facility. Eighteen of 27 people had gastrointestinal symptoms and one person had *Campylobacter* cultured from a

faecal specimen. Further investigation revealed similar illnesses in other groups using the facility. Several groups were investigated to determine the source of the infections and to control the outbreak.

Methods

A case was defined as a person who:

- had attended the facility between August and

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- November 1995 and had a stool culture positive for *Campylobacter*, or
- had diarrhoea for one day, or
- had four of the following symptoms: diarrhoea, nausea, vomiting, abdominal pain, fever, headache, myalgia and malaise.

People reporting gastrointestinal symptoms were asked to present to their general practitioner and submit a faecal specimen for testing. Data were analysed using Epi Info version 6.02 statistical software.

Each week the training facility catered for approximately 300 people, many of whom stayed in residential blocks on site. We investigated 11 groups that used the facility between August and November 1995 to determine (1) the magnitude of the outbreak, (2) its source and (3) duration.

To determine the magnitude of the outbreak, we intensively followed up all groups that used the facility for more than one day in the week of 15 to 21 October. Leaders of groups attending in that week distributed a self-administered questionnaire asking about symptoms experienced and the onset and duration of illness.

To determine the source of the outbreak, we conducted a retrospective cohort analysis of a group of 12 year old children attending a sports camp (sporting group 3) during the week of 15 to 21 October 1995. This group was selected because participants were

easily accessible and able to provide detailed exposure histories. We conducted telephone interviews of this group using a structured questionnaire, and asked respondents about gastrointestinal illness and consumption of foods and beverages during the first three days of that week.

To determine the duration of the outbreak, we contacted groups that had used the facility up to eight weeks prior to notification of the outbreak and two weeks following the outbreak. SAHC investigators or group leaders contacted participants and collected details of the symptoms experienced, onset and duration of the illness, and if they had consulted a medical practitioner.

To identify cases that may not have been ascertained through the above methods, we also searched notifications of *Campylobacter* between August and November 1995 in the South Australian Notifiable Diseases Database. Notified cases with occupations relating to the training facility's normal business were contacted and asked if they had been at the facility during the two weeks prior to their illness.

Environmental investigations

The local council environmental health officer (EHO) inspected the kitchen and made interim recommendations concerning hygiene and sanitation. When more cases occurred the following week,

we conducted an audit of food handling procedures and hygiene at the training facility kitchen and eating area (2 November 1995). Kitchen and storeroom facilities were examined for potential sources of contamination. Food handlers at the training facility were interviewed to determine hygiene practices and any recent illness.

Laboratory investigations

During the audit of food hygiene, samples of foods, spring and mains water and swabs of food preparation areas were collected in sterile containers and stored on ice. These were submitted to the Institute of Medical and Veterinary Science (IMVS) for *Campylobacter* culture within two hours of collection^{10, 11}. Food handlers supplied faecal specimens which were tested for *Salmonella*, *Campylobacter*, *Yersinia*, *Shigella*, *Vibrio* and enteric parasites at the IMVS¹².

Results

Epidemiological findings

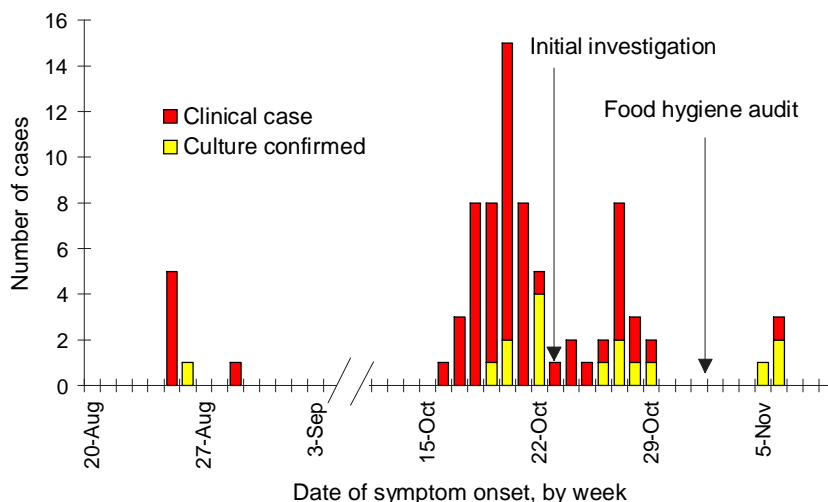
We contacted members of 11 groups that had used the facility in the three months between 18 August and 10 November (Table 1), although many more groups would have also used the facility during this period. From the 11 groups, 290 (85%) of 341 persons were contacted and agreed to participate in the investigation.

Table 1. Groups attending the training facility by dates of attendance, numbers contacted, and attack rate

Group	Dates of attendance	Total number in group	Number contacted	Number ill	Attack rate (%)	Number culture positive ¹
Sporting group 1	21 - 25/8/95	57	57	6	11	0
Training course 1	14 - 27/10/95	28	27	18	67	1
Sporting group 2	Permanent residents	21	20	5	25	0
Facility staff	Permanent residents	40	31	10	32	6
Facility students	Permanent residents	24	21	4	19	0
Sporting group 3	15 - 21/10/95	31	30	12	40	1
Training course 2	15 - 21/10/95	10	9	5	56	0
Training course 3	15 - 21/10/95	12	5	1	20	1
Sporting group 4	23 - 27/10/95	58	58	13	22	3
Training course 4	30/10 - 3/11/95	39	17	0	0	0
Sporting group 5	6 - 10/11/95	21	15	0	0	0
Total		341	290	74	26	12

1. Four culture positive cases detected by searching Notifiable Diseases Database are not included here.

Figure. Cases of *Campylobacter* infection at the training facility by date of onset of symptoms.



Seventy-eight subjects met the case definition, of whom 16 were culture confirmed (Figure). Four of the 16 culture confirmed cases were ascertained by searching the Notifiable Diseases Database for people with occupations related to the training facility. The median age of cases was 27.8 years (range 12.1 - 62.1 years, $n = 75$) and 66 of 78 cases (85%) were male. Forty-six per cent of cases consulted a medical practitioner. For the week of our intensive investigation (15 to 21 October 1995), we were able to contact 143 of 194 persons (74%) from seven groups. The attack rates in these seven groups ranged from 19% to 67%.

Symptom prevalence for the 12 cases in sporting group 3 were: diarrhoea 92%, abdominal cramps 83%, headache 83%, nausea 58%, fever 58% and myalgia 58%, while only 17% had bloody diarrhoea. The median duration of symptoms for these 12 cases was four days, with a range of one to seven days.

The outbreak lasted for almost 11 weeks, with the first cases on 25 August and the last cases on 6 November 1995. Two further groups (training course 4 and sporting group 5) attending the facility between 30 October and 10 November 1995 reported no illness among group members.

Associations with food

Exposure histories for approximately 150 foods and beverages were obtained from people attending sporting group 3. Only foods consumed at Monday and Tuesday lunchtime were significantly associated with illness (Table 2). Eating cucumber from the salad bar at the Monday lunch was associated with illness. Eating cucumber, lettuce and tomato at the Tuesday lunch also had elevated relative risks, but when adjusted for cucumber consumption on the Monday lunch these were markedly reduced. Six people from other groups using the facility also reported illness after eating only from the self-serve salad bar.

Environmental findings

Foods were served in a buffet style with a section for hot meals and cooked vegetables and at lunch time a separate self-serve salad bar. Drinks available included soft drinks, tea, coffee, spring water, cordial and milk. The salad bar contained cold meat, bread and bread rolls, and salads that were prepared externally and in the facility kitchen.

The kitchen and storerooms were inadequately cleaned and responsibilities for cleaning were not well defined. Food preparation areas for uncooked meats and ready to eat salads were not separated. Recommendations to improve food hygiene were made to the facility management. Visits to the kitchen after the outbreak confirmed major improvements in food hygiene and compliance with recommended changes.

Table 2. Attack rates, relative risks and 95% confidence intervals for selected foods consumed by members of sporting group 3, 16 to 17 October 1995

Meal	Food	Number who ate item			Number who did not eat item				
		Ill	Total	Attack rate (%)	Ill	Total	Attack rate (%)	Relative risk	95% confidence interval
Monday lunch	Cucumber	9	12	75	3	18	17	4.5	1.5-13.3
	Lettuce	8	18	44	4	12	33	1.3	0.5-3.5
	Rice	1	9	11	11	21	52	0.2	0.03-1.4
	Tomato	8	15	53	4	15	27	2.0	0.8-5.2
Tuesday lunch	Cucumber	5	6	83	7	24	29	2.9	1.4-5.9
	Lettuce	7	10	70	5	20	25	2.8	1.2-6.6
	Rice	4	11	36	8	18	44	0.8	0.3-2.1
	Tomato	5	6	83	7	24	29	2.9	1.4-5.9

All food, water and swab samples were negative for *Campylobacter*. There were no significant changes to the quality of chlorinated mains water before or during the outbreak and a water sample taken near the facility was negative for coliform bacteria. (Reg Walters, Australian Water Quality Centre, personal communication). None of the five food handlers admitted to any recent illness and all submitted faecal specimens for testing. One food handler was positive for *Campylobacter jejuni* and reported mild symptoms on 27 October 1995, after the beginning of the outbreak.

Discussion

This outbreak of *Campylobacter* infection was unusual in that it affected a large number of people and lasted for nearly three months. While 3,294 sporadic *Campylobacter* notifications were received by the SAHC during 1995, this outbreak represents the only cases in which a specific food item was implicated (unpublished data, SAHC Notifiable Diseases Database). One of the main difficulties in detecting outbreaks of *Campylobacter* infection from notification data is the current lack of an epidemiologically useful sub-typing system^{2, 13}.

The outbreak also illustrated the usefulness of collecting occupational status in surveillance reports as we were able to identify four cases in the Notifiable Diseases Database.

We suspect that this outbreak was caused by salads from the self-serve salad bar that were probably contaminated by raw meat. The salad bar was installed at the training facility five months before the outbreak occurred. The fact that at least six people became ill after eating only foods served at the salad bar further implicates it as the most likely vehicle for this outbreak.

In this outbreak we were unable to determine whether the vegetables were contaminated prior to being purchased by the facility. An investigation of the chain of distribution from greengrocer to wholesaler to producer proved very difficult due to its retrospective nature and inadequately kept records. Where possible, public health authorities should proceed as far up the distribution chain as possible.

This outbreak raises the question of food safety in the primary producing industry, as very few vegetable growers utilise hazard analysis and critical control point (HACCP) plans.

However, we believe that cross contamination in the facility kitchen was a more likely cause of this outbreak than the purchase of contaminated vegetables because (1) kitchen staff reported washing all vegetables, (2) cooked and uncooked foods were not separated during preparation and (3) no cases occurred more than one incubation period after changes to food preparation were instituted. Our audit of food hygiene identified many deficiencies and, in particular, a high risk of raw meats contaminating ready to eat salad items during preparation. Similar outbreaks of *Campylobacter* and *Salmonella* have occurred in the United States of America and the United Kingdom, after fruit and salads became cross-contaminated by uncooked meat and poultry during preparation^{14, 15}.

In recent years there has been an increasing number of reported outbreaks associated with contaminated produce. These have included *Salmonella* Bovismorbificans in alfalfa sprouts¹⁶, *Shigella* contamination of lettuces¹⁷ and salad¹⁸, *Salmonella* Heidelberg in tomato salad¹⁵, *Citrobacter freundii* contaminated parsley¹⁹, *Escherichia coli* 0157:H7 in salads²⁰, small round structured virus in salads²¹, *Cyclospora cayatenensis* contamination of raspberries²² and many others^{14, 23, 24}. Produce may become contaminated at the place of production, during transportation or during handling and preparation. Because salads are consumed raw and they are vulnerable to cross-contamination they may be responsible for a significant proportion of outbreaks reported to health authorities^{14, 23, 24}. These outbreaks emphasise the importance of HACCP plans from 'farm to plate' for primary produce such as fruit and vegetables²⁵.

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Concurrent outbreaks of *Salmonella* Typhimurium in South Australia

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Abstract

The Communicable Disease Control Branch of the South Australian Health Commission received 45 laboratory notifications of *Salmonella* between 23 December 1996 and 17 January 1997. A rapid screening test, undertaken by the Institute of Medical and Veterinary Sciences, Adelaide, was the first indication that this was more than one outbreak, prompting the establishment of separate investigations. Three *Salmonella* Typhimurium (*S. Typhimurium*) phage types were subsequently identified. Investigations are continuing into an outbreak of *S. Typhimurium* phage type (PT) 64, while investigations failed to identify any association between four cases of PT 44. As of 12 February 1997, 71 notifications had been confirmed as *S. Typhimurium* PT 135. Epidemiological investigations found this outbreak was associated with consumption of bread rolls with a meat filling distributed through local Asian grocery stores from a home-based manufacturer. The product was voluntarily withdrawn and there have been no new cases of PT 135. *Comm Dis Intell* 1997;21:61-62.

Introduction

On 31 December 1996, the Communicable Disease Control Branch of the South Australian Health Commission received a laboratory notification of a *Salmonella* isolated from the faecal specimen of a two year old female with an Indochinese name. A second case with an Indochinese name was notified on 2 January 1997 and a further seven were notified on 15 January.

Methods

On 16 January, all laboratories were asked to notify isolation of *Salmonella* by telephone. Investigation forms were sent to three practitioners who had been consulted by most of the patients and to the Womens and Childrens Hospital. A range of information including disease details, patient contacts, animal contacts, travel details and food history was collected.

From 21 January, local council environmental health officers contacted each notified case to complete the information requested in

the investigation forms. Food samples were obtained from the homes of cases, associated retail outlets and from the manufacturer of the suspected food. All food samples were refrigerated and transported to the Institute of Medical and Veterinary Sciences (IMVS), Adelaide.

The Australian Salmonella Reference Centre at the IMVS conducted serotyping and phage typing of all isolates. As an early indicator, the IMVS undertook Randomly Amplified Polymorphic DNA (RAPD) analysis of the isolates.

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