

Transmission of calicivirus by a foodhandler in the pre-symptomatic phase of illness

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SUMMARY

After a Christmas party in a restaurant, 48 (68%) of the 82 guests contracted calicivirus gastroenteritis. The epidemiological investigation showed that salad was strongly associated with the disease episode (RR = 2.43, $P = 0.0005$). Similar symptoms occurred among other customers who had had a meal at the same restaurant on the same evening. A foodhandler who had only prepared salad and appetizers became sick about 30 min after the end of his shift. He had been free of symptoms while preparing food. Few outbreak investigations have shown calicivirus transmission by foodhandlers some hours before becoming symptomatic.

INTRODUCTION

Foodborne gastroenteritis caused by small round structured viruses (SRSV) is recognized as an increasing public health problem [1]. It is a significant public health problem because it can elicit extensive outbreaks and infect large numbers of people. In some outbreaks, it has been suggested that foodhandlers may remain infectious even after cessation of the symptoms [2, 3], but, there are few publications which describe asymptomatic foodhandlers who have been implicated in outbreaks.

We report a large outbreak of calicivirus gastroenteritis probably attributable to a foodhandler who became sick after leaving his work, hence the possibility of food contamination by an infected person still in the pre-symptomatic phase of his disease.

MATERIALS AND METHODS

Background

On 30 November 1998, the Public Health Center of Quebec City, Canada, was notified of an outbreak of

diarrhoea and vomiting among guests who had shared a dinner 2 days previously in a restaurant.

Case definition

A case was defined as a person who had experienced diarrhoea (three or more loose stools within one 24-h period) or vomiting within 3 days after eating in the restaurant implicated in the outbreak.

Epidemiological investigation

Guests were interviewed over the telephone by nurses and physicians of the Public Health Center with a standardized questionnaire to assess the frequency, time of onset and duration of illness as well as to describe the food and drink consumed. Associations between illness and the different foods were sought and tested with two tails ' P ' values using either Yates' correction of the χ^2 or Fisher's exact test. The manager was required to report to the Public Health Center all employees or attendees he knew to have been sick after the dinner on 28 November.

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Employee illness history

On 1 December, all employees of the restaurant were interviewed with a questionnaire about any recent history of gastrointestinal disorder, their work schedule in the week prior to the outbreak and the origin of the food they ate while at work. They were also asked to identify items of the menu that they had prepared and to describe the method of preparation.

Alert and case recruitment system

A surveillance system was put in place to detect any event which might have a link with this restaurant. Information was sent to emergency doctors, to external clinics, to laboratories, to the Health Information of the Quebec region and to the Public Health Centers of the Province of Quebec.

Environmental investigation

A sanitary inspection of the kitchen and a review of food preparation procedures were done on 2 December by the outbreak control team. The kitchen staff were interviewed on their current health status and their usual work routines. The manager provided samples of the food prepared at this dinner.

Laboratory investigation

Stool specimens were obtained from the guests who became sick after the meal and were cultured for salmonella, shigella, campylobacter, yersinia and enteropathogenic *Escherichia coli*. All stool specimens were first tested by the local hospital laboratory and subsequently, by the Laboratoire de santé publique du Québec (LSPQ) for viruses by electron microscopy and examined using reverse transcriptase polymerase chain reaction (RT-PCR) for SESVs. In addition, food items were also tested for the same microorganisms for which stools were cultured but no viral studies were carried out on the food.

RESULTS

Illness among the guests

The dinner menu included soup, salad, veal, chicken, vegetables and dessert. Interviews were completed for 70 (84%) of 82 people attending the dinner (group A) and 48 (68%) reported some illness. Symptoms included nausea (83%), diarrhoea (83%), vomiting

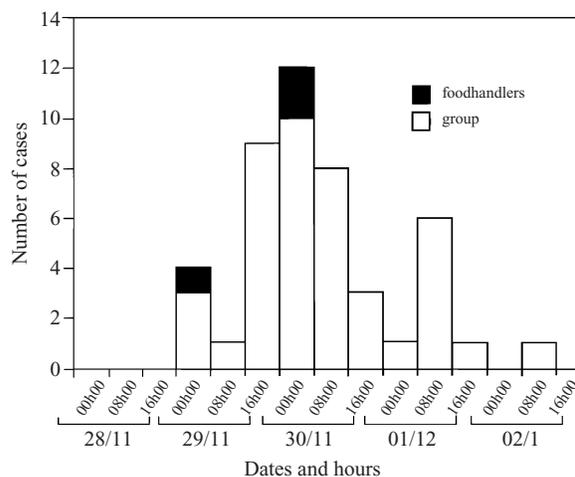


Fig. 1. Epidemic curve of the outbreak after consuming a meal in a restaurant (Quebec City, December 1998).

(63%), fever (63%), abdominal pain (73%) and headache (38%). The mean incubation period was 38 h and varied from 6–85 h. The time of onset and the distribution of cases are shown on Figure 1 for group A. Symptoms lasted 24–48 h, although no one was admitted to hospital or visited their general practitioner. The food-specific attack rates for this group (Table 1) indicate that salad was the most likely vehicle of infection (RR = 2.43, CI 95%: 1.42–4.15, $P = 0.00005$). Five other groups (1 to 5) of guests who ate at the restaurant on the same day became sick after consuming different meals. (Table 2). All of them had the same symptoms and mean incubation period.

Illness among the staff of the restaurant

Interviews of the manager and the staff of the restaurant indicated that no foodhandler was sick while preparing the different courses of the meal. One foodhandler (foodhandler A) did become sick with sudden symptoms of vomiting and diarrhoea about 30 min after leaving his work, at around midnight on 28 November and had to remain off duty for 2 days. Two other foodhandlers (foodhandlers B and C) became ill but at the same time as guests during the 2 following days.

Environmental investigation and food preparation history

We did not find any problems during the sanitary inspection. The kitchen was clean and the food preparation procedures were appropriate except for

Table 1. Food-specific attack rates and relative risks of gastrointestinal illness associated with a banquet in a Quebec City restaurant, 28 November 1988 (Group A n = 70)

Food	Eat			Did not eat			RR*	95% CI†	P values‡
	Ill	Not ill	Attack rate (%)	Ill	Not ill	Attack rate (%)			
Appetizers	11	7	61.1	30	14	68.1	0.90	0.59–1.36	0.22
Soup	13	17	43.3	31	5	86.1	0.50	0.33–0.77	0.0003
Salad	35	5	87.5	9	16	36.0	2.43	1.42–4.15	0.00002
Veal	22	10	68.8	24	11	68.6	1.00	0.73–1.39	0.9
Chicken	28	12	70.0	18	10	64.3	1.09	0.77–1.53	0.6
Eggplants	24	9	72.7	16	12	57.1	1.27	0.87–1.87	0.2
Pasta	34	19	64.2	5	2	71.4	0.90	0.54–1.50	0.7
Tiramisu	38	15	71.7	7	6	53.8	1.33	0.78–2.26	0.22

* RR, relative risk.

† P value, Yates' correction or Fisher's exact test.

‡ 95% CI, confidence interval (Taylor's series).

Table 2. Attack rate of other groups eating in a Quebec city restaurant on 28 November 1998 (n = 88)

Group	Number of people in each group	Attack rate (%)	Meal consumed
1	30	50	Appetizers, shrimps, salad, pasta, veal, chicken, salmon, ice cream
2	14	93	Appetizers, torpille, capellini del mar, soup, spinach ravioli, pizza
3	36	33	Soup, salad, veal, chicken, tiramisu
4	6	33	Beef, salad, pizza
5	2	100	Appetizers, salmon, salad, veal, shrimps

the preparation of the salad. The salad was delivered in a large box and was not washed before being placed in a large bowl. The preparation involved mixing the salad with coleslaw but no other vegetables. The salad and the coleslaw were mixed in a bowl and put on plates with bare hands by foodhandler A. The appetizers and salad were prepared at the same time.

Alert and case recruitment system

All the cases notified at the Public Health Center by the surveillance system had eaten at the same restaurant the same night.

Laboratory investigation

Six stool specimens were received from four guests (group A) who reported illness. No specimen were obtained from foodhandlers. Stool specimens were collected during the first 3 days after the onset of symptoms.

No pathogenic bacteria were isolated from stool and food specimens. Electron microscope examination of the six stool specimens detected an SRSV which morphologically was compatible with a calicivirus. Those six stool specimens were examined using RT-PCR and were all positive for calicivirus genotype two.

DISCUSSION

The clinical and epidemiological features of this outbreak suggests that this outbreak was caused by calicivirus. Diarrhoea and vomiting were sudden, the incubation period was 24–48 h and symptoms lasted 24–48 h. Calicivirus genotype two was found in stools from symptomatic guests.

The possibility that the salad could have been contaminated before purchase was considered and discarded since no other outbreak occurred in restaurants and retail shops supplied by the same wholesaler.

The contamination of raw or cold food by foodhandlers can cause very large outbreaks when associated with restaurants or other catering services⁵. In this outbreak, only one staff member (foodhandler A) became ill 24 h before guests and he had only prepared salad and appetizers. All sick guests had eaten salad and/or appetizers that had been prepared by the same person, who was not in contact with anyone who had gastroenteritis before he became sick himself. We could not find any evidence of cross-contamination. No viral analysis was carried on stool specimens of the foodhandler because he did not provide an acute stool specimen. While we know of no virological evidence which supports pre-symptomatic shedding of calicivirus, there is a circumstantial explanation to this outbreak.

Many viral and bacterial infections may be transmitted before the onset of symptoms. Most of the time, symptoms appear when viral replication reaches its maximum but there has been viral shedding before the appearance of sickness. In this outbreak, it is likely that the foodhandler was excreting virus before becoming ill. A failure to wash his hands properly could explain the contamination of the salad. The use of gloves for salad manipulation could have prevented transmission although adequate hygiene procedures remain essential for all foodhandler. In this outbreak, a foodhandler could have infected the salad while being asymptomatic, which is supported by the possibility of pre-symptomatic excretion of the virus, as suggested by some authors [6–9]. Pre-symptomatic excretion in the foodhandler is considered to have caused this outbreak even in the absence of laboratory confirmation of calicivirus infection in this person.

Restaurant owners are responsible for the safety of the food they prepare and for providing sufficient training to foodhandlers. They must ensure that food safety procedures are understood, implemented and updated [10].

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