A LARGE OUTBREAK OF NOROVIRUS GASTROENTERITIS LINKED TO A CATERING COMPANY, NEW SOUTH WALES, OCTOBER 2003

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BACKGROUND

Noroviruses (formerly known as Norwalk-like viruses) can cause large outbreaks of gastrointestinal disease in humans.[1] Infection with norovirus is commonly characterised by a sudden onset of diarrhoea and/or vomiting, lethargy, headache, abdominal discomfort, nausea, anorexia, and fever. Symptoms start about 12–36 hours after a person acquires the infection and usually resolve within 72 hours. Most people recover with rest; however, symptoms can sometimes be severe and require treatment in hospital. Illness often results in working days lost and other costs.[2]

Noroviruses are shed in the faeces or vomit of infected people when they are ill and possibly for a few days after symptoms cease. Noroviruses are highly infectious and can survive in food, water, and on environmental surfaces for long periods.[1,3,4] Transmission of noroviruses is usually via the faecal–oral route, through person-to-person contact, consumption of contaminated food or drink, contact with contaminated surfaces or objects, or possibly by aerosol when someone with norovirus infection vomits.[1,3,4,5]

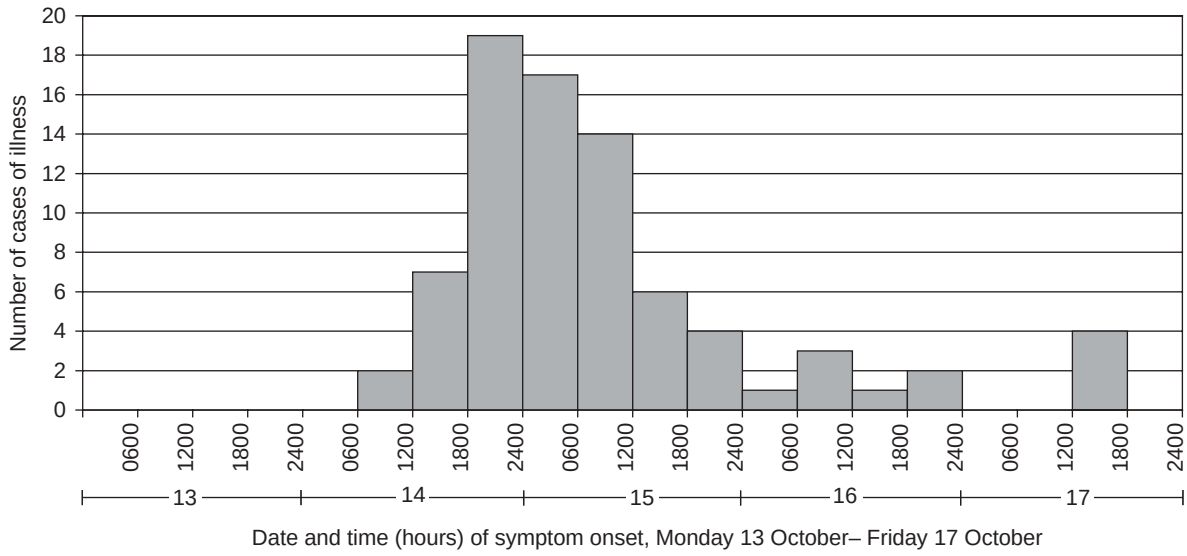
The *NSW Public Health Act 1991* states that clinicians and hospitals must report to public health units any case of gastrointestinal disease occurring in an institution or where two or more cases of foodborne disease that are linked are identified. On 16 October 2003, the Greater Murray Area Health Service in southern NSW was alerted to a suspected outbreak of diarrhoea and vomiting illness among people who had attended a number of events in a rural city from Monday 13 to Wednesday 15 October. One catering company based in that city had provided the food and beverage for these events. Active surveillance through local general medical practitioners and hospital emergency departments did not identify any other clusters of gastrointestinal illness in the city. This article describes an investigation undertaken to determine the extent of the outbreak, the causative agent, risk factors for illness, and measures taken to control the spread of the outbreak.

METHODS

Staff of the catering company were interviewed about the type of foodstuffs used and about the sources of purchase, food handling practices, personal hygiene practices, toilet

FIGURE 1

ONSET OF DIARRHOEA OR VOMITING AMONG CASES OF ILLNESS IN A GASTROENTERITIS OUTBREAK IN A RURAL CITY, NSW, 13–17 OCTOBER 2003



Source: Interviews with event attendees.

and hand-washing facilities at work, days worked in weeks prior to 13 October, and recent history of illness or symptoms of gastroenteritis. We requested that the catering company provide a list of all the events that they had catered between 13 and 15 October. Menus of food and beverage items served at each event were also requested. The organisers of the events were contacted to request a list of the people who attended.

A retrospective cohort study was conducted among people who attended any of the events catered for by the catering company between 13–15 October to identify risk factors associated with cases of illness. We analysed the association between cases of illness and food consumed at each meal at each event. Exposures included food or beverage items provided at morning tea (including sweet slices, cakes and muffins) and lunch items (including different types of sandwiches, sliced fruit, deep-fried foods, and orange juice). Respondents who answered 'don't know' to a particular food exposure were excluded from the analysis of that particular food exposure. A case of illness was defined as diarrhoea and/or vomiting with onset between 13 and 17 October, in a person who attended any of the events catered for by the catering company between 13 and 15 October.

Respondents who at the time of interview reported still having diarrhoea or loose stools, or who still felt unwell, were requested to supply a stool sample for testing. Specimens were examined for organisms including: norovirus by a single tube, reverse transcriptase Polymerase Chain Reaction (PCR) assay;[6,7] rotavirus and adenovirus by antigen detection; *Salmonella*, *Shigella*, *Campylobacter* and other bacteria by culture; and *Cryptosporidium* and *Giardia* by enzyme immunoassay (EIA).

EpiInfo 2002 was used to analyse the interview data. We compared the relative risk of illness among people who reported an exposure (such as eating sweet slices) with that of people without that exposure. Univariate analysis was performed using the chi-square test and when expected cell counts were less than 5, Fisher's exact two-sided *p* value was used.

On 16 October, a food inspector from the Greater Murray Area Health Service inspected the catering company's premises including the toilet and hand washing facilities and the food storage facilities, and observed food handling and hygiene practices. A list of the manufacturers of the foodstuffs used by the catering company was obtained. No food prepared by the caterers between 12–15 October was available for testing.

RESULTS

Retrospective cohort study

Catering company staff reported that from 12 October they prepared 21 meals for 14 events held between 13–15 October. Of the 14 events, three were held over a two-day period and a number of meals were served at each of these events. Many people interviewed had consumed more than one catered meal on one or more days. Two hundred and

TABLE 1

ATTACK RATES AMONG FIVE GROUPS OF PEOPLE WHO CONSUMED MEALS SERVED AT FOUR EVENTS IN A RURAL CITY IN NSW THAT WERE PREPARED BY A CATERING COMPANY, 13 TO 15 OCTOBER 2003

Groups who had consumed catered meals	Meal items	Reported number of people at each meal *N*	Number of people interviewed *N*	People with diarrhoea and/or vomiting *N*	Attack rate among those interviewed %
Group A *Monday morning tea*	Muffins, scones, cakes, slices	99*	72	42	58
Group A *Monday lunch*	Mixed sandwiches, fruit, orange juice	99*	79	46	58
Group A *Tuesday morning tea*	Muffins, scones, cakes, slices	99*	70	44	63
Group B *Monday lunch*	Mixed sandwiches, deep fried food, fruit	11	9	7	78
Group C *Monday lunch*	Mixed sandwiches, fruit, orange juice	15	15	11	73
Group C *Tuesday lunch*	Mixed sandwiches, fruit, orange juice	16	16	12	75
Group D *Wednesday lunch*	Mixed sandwiches, fruit, orange juice	13	13	6	46
Group E† *All Monday lunches*	Mixed sandwiches, fruit, deep fried food, orange juice	139	105	66	63

* Best estimate of number of people in Group A.

† All people interviewed who had a catered lunch on Monday 13 October and comprises of people from Group A, B and C, and two people who attended other lunches.

Source: Event attendance lists and interviews with event attendees.

thirty-five people were reported to have attended these events. We attempted to reach all these people and made contact with 137 (58 per cent) all of whom agreed to be interviewed either by telephone or face-to-face. Eighty reported illness with onset of diarrhoea and/or vomiting between 13–17 October (Figure 1). Cases of illness were identified among people who ate food from 16 of the 21 meals.

Of the 137 people interviewed, most (127) had attended one or more of four particular events (identified as events A, B, C and D). A high proportion of the people who had attended one or more of these four events were interviewed (Table 1). Of the 127 people interviewed from groups A, B, C and D, two were excluded from the analysis due to illness known to be due to another cause. For the 125 people from groups A, B, C and D, their mean age was 42.6 years (range 18–70 years) and 60 per cent were women. Seventy-three (59 per cent) reported illness after attending these events, and all these people had diarrhoea and/or vomiting between 13–17 October. The most common symptoms reported by people who became ill were diarrhoea, fatigue, nausea and vomiting (Table 2). Thirteen (18 per cent) saw a doctor and one person was admitted to hospital. A quarter reported that other members of their households had since become ill with similar symptoms.

In univariate analysis, of 135 different food and beverage items examined, there was no association between illness and food items consumed for any of groups B, C or D. In Group A, illness was statistically associated with passionfruit slices consumed at morning tea on 13 October, with ham sandwiches consumed at lunch that same day, and with any sweet slice consumed at morning tea on 14 October. Among all people interviewed who ate lunches on 13 October (Group E), illness was associated with consumption of ham sandwiches (Table 3).

TABLE 2

SYMPTOMS EXPERIENCED BY 73 PEOPLE WHO ATTENDED FOUR EVENTS IN A RURAL CITY IN NSW THAT WERE CATERED BY A CATERING COMPANY AND WHO HAD ONSET OF VOMITING AND/OR DIARRHOEA BETWEEN 13 AND 17 OCTOBER.

Symptom	*N*	%
Diarrhoea	68	93
Fatigue–lethargy	62	85
Nausea	60	82
Vomiting	59	81
Abdominal cramps	52	71
Chills	50	69
Body aches	49	67
Fever	47	64
Headache	47	64
Bloody diarrhoea	2	3

Source: Responses by event attendees collected by questionnaire.

Laboratory testing

Of four stool specimens submitted by cases for testing, three were confirmed positive for Norovirus by PCR molecular testing, and were negative for other viruses, bacterium, and parasites.

Illness and food handling practices of the catering company

Catering company staff reported that three people were involved with food handling and preparation from 12 October to 15 October and another person assisted in delivering meals to the events. One food handler reported becoming ill with diarrhoea and vomiting around midday 15 October. Although the other two food handlers denied a history of illness in either the week of or prior to the outbreak, it was otherwise reported that these two people had been ill with diarrhoea and vomiting in the two days prior to the outbreak. It was also reported that a family member of one of these food handlers had been sick with diarrhoea and vomiting on 10 October, and also that all sweet slices were prepared in the home of this food handler, rather than at the catering premises.

A leg of corned beef was prepared on the catering premises on 12 October. Cakes and slices served on 13 October were prepared (reportedly in the homes of the caterers) the night before, as were those served on 14 October. Sandwiches were prepared daily by laying the bread and ingredients out on a large bench and combining ingredients to make a variety of sandwich types. All fruits and sandwich ingredients were cut up by hand, and ham, tomato and cucumber were sliced on a machine slicer. Frozen foods were deep fried just prior to delivery.

The caterers reported washing hands using a hand gel prior to handling food but did not use gloves for food preparation. On inspection, hand-washing facilities were inadequate and it was reported that soap and hand towels were not routinely provided.

Public health intervention

The Greater Murray Area Health Service advised the catering company food handlers on health, hygiene, and food handling practices in accordance with the Food Standards Code and NSW Health recommendations.[8,9] The Greater Murray Area Health Service issued local media releases to remind food businesses and the public that ill people should not handle or prepare food while they are sick or for at least 48 hours after their symptoms cease, and that thorough hand washing and disinfecting of surfaces was the best protection against secondary spread of illness among close contacts such as household members. The catering company voluntarily ceased all operations from 16 October for a short period.

DISCUSSION

A large outbreak of gastrointestinal illness occurred among people who had consumed food prepared by a catering company and served at numerous events in mid-October 2003. Epidemiological evidence implicated several foods. Interviews with food handlers and

TABLE 3

FOOD ITEMS PREPARED BY THE CATERING COMPANY WHICH WERE SIGNIFICANTLY ASSOCIATED WITH ILLNESS IN PEOPLE ATTENDING FOUR EVENTS IN A RURAL CITY IN NSW, 13 TO 15 OCTOBER 2003

Group	Number of people interviewed from each meal#	Illness/ Exposed		Illness/ Not exposed		Relative Risk (95% CI)	*P* value
	N	*N*	%	*N*	%		
Group A: *Monday morning tea; passionfruit slice*	61	7/7	100.0	25/54	46.3	2.2 (1.6–2.9)	<0.01
Group A: *Monday lunch; ham sandwich*	67	27/37	73.0	14/30	46.7	1.6 (1.0–2.4)	0.03
Group E: *All Monday lunches; ham sandwich*	91	38/50	76.0	21/41	51.2	1.5 (1.1–2.1)	0.01
Group A: *Tuesday morning tea; any sweet slice*	68	20/26	76.9	22/42	52.4	1.5 (1.0–2.1)	0.04

those who could not recall eating the food item were excluded from the analysis.

Source: Event menus provided by catering company and questionnaire responses of event attendees.

inspections of the catering premises suggested that contamination of the foods by ill food handlers had occurred. Laboratory evidence suggested the causative agent was a norovirus. The onset of illness in cases occurred within a 48-hour period, suggesting a common point source for this outbreak.[2] The shape of the epidemic curve and the investigation findings point towards food contamination of ready-to-eat foods as the source, consistent with the epidemiological findings of previous gastroenteritis outbreaks caused by noroviruses.[1,10]

This investigation had a number of limitations. Some participants in the study reported that it was difficult to recall what they ate at the events due to the smorgasbord-style presentation of the food. Many people interviewed had eaten one or more meals on one or more days. This introduced the potential for multiple exposures and made it difficult to determine an incubation period and interpret the findings of univariate analysis. By the time the investigators had determined the point source, the catering company had cleaned its premises, however interviews with staff alerted the investigators to potential problems within the operation.

During outbreak investigations, it may be helpful to provide managers of food businesses with a fact sheet that describes what they should do when their business is being investigated as a possible source of a disease outbreak. This may facilitate their cooperation with the investigation.

To strengthen prevention of foodborne disease outbreaks in such a setting, the Australian and New Zealand Food Regulation Ministerial Council agreed in December 2003 to mandatory food safety programs in identified high risk areas including catering. The NSW Food Authority will implement the agreement in New South Wales.

CONCLUSION

This outbreak investigation highlighted a number of important food safety issues. To minimise the risk of large-scale foodborne illness outbreaks, businesses that prepare foods must do so in a safe manner.[8,9] Food handlers who have enteric infections should exclude themselves from food handling while sick and for at least 48 hours after complete resolution of symptoms, regardless of the food preparation setting; that is, whether food preparation is done in a commercial premises or a domestic kitchen. The timely collection of stool specimens from all food handlers involved in an outbreak may be useful when a food handler is suspected to be the source of an outbreak.

REFERENCES

1. Hocking AD. *Foodborne Microorganisms of Public Health Significance: 6th edition*. Sydney: Australian Institute of Food Science and Technology Incorporated, NSW Branch, 2003.
2. Hellard ME, Sinclair MI, Harris AH, Kirk M and Fairley CK. Cost of community gastroenteritis. *J Gastroenterol Hepatol* 2003: 18; 322–328.
3. Centers for Disease Control and Prevention. Norovirus activity: United States, 2002. *MMWR Morb Mortal Wkly Rep* January 24, 2003; 52(03): 41–45.
4. Chin J (editor). *Control of Communicable Diseases Manual. 17th edition*. Washington DC: American Public Health Association, 2000.
5. Kapikian AZ. Viral Gastroenteritis. Chapter 11. *Viral Infections of Humans: 4th edition*. Evans AS and Kaslow RA (editors). New York: Plenum Medical Book Company, 1984; 285–343.
6. Moe CL, Gentstch J, Ando T, Grohmann G, Monroe SS, Jiang X, Wang J, Estes MK, Seto Y, Humphrey C, Stine S and Glass RI. Application of PCR to detect Norwalk virus in fecal specimens from outbreaks of gastroenteritis. *J Clin Microbiol* 1994; 32(3): 642–648.
7. Wright PJ, Gunesekere IC, Doultree JC and Marshall JA. Small round structured (Norwalk-like) viruses and classical human caliciviruses in southeastern Australia, 1980–1996. *J Med Virol* 1998; 55: 312–320.
8. Australia New Zealand Food Standards Code. Available online at www.foodstandards.gov.au/foodstandardscode (accessed 1 December 2003).
9. Communicable Diseases Branch, NSW Department of Health. Fact*Sheet*: Viral Gastroenteritis. *N S W Public Health Bull* 2003; 14(9–10): 206.
10. Anderson AD, Garrett VD, Sobel J, Monroe SS, Fankhauser RL, Schwab KJ, Bresee JS, Mead PS, Higgins C, Campana J and Glass RI. Outbreak Investigation team. Multi-state outbreak of Norwalk-like virus gastroenteritis associated with a common caterer. *Am J Epidemiol* 2001; 154(11): 1013–19.