

Gastroenteritis outbreak in a sporting team linked to barbecued chicken

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Background

On 25 May 2001, the Centre for Disease Control, Northern Territory Department of Health and Community Services in Darwin, was alerted by local media reports to an apparent outbreak of gastroenteritis that occurred in a visiting interstate sporting team 2 days before. The 16-member team was competing in the Arafura Games, a biennial, international sports competition conducted in Darwin. After corroborating the report by interviews with the team management and by reviewing hospital records, an outbreak investigation was initiated.

Methods

Hypothesis generating interviews were conducted with the team members. Information was collected regarding food consumption history, demographic details, symptomatology, and time of illness onset. From these interviews, a meal organised for team members only and consumed several hours prior to onset of symptoms by affected team members, was identified as the likely source of the outbreak. A retrospective cohort study was conducted to determine any link between illness and eating particular foodstuffs at this meal. The case definition was defined as: 'any member of the team who ate at this team meal (commencing 11pm 23 May) and who became ill with one or more symptoms of vomiting, abdominal pain or diarrhoea, from 11pm, 23 May to 11am, 24 May'. The information was entered into a database using Epi Info Version 6 software. Relative risks were calculated for each food item.

The then Territory Health Services Environmental Health team investigated the food handling practices of the supermarket delicatessen where the food items consumed at the common team meal were purchased. Their aim was to identify potential environmental source(s) of the foodborne illness, and enforce public health legislation where appropriate.

Results

Epidemiological investigations

Descriptive study

On 23 May 2001, after their sporting commitments were completed, the team and their management met at their hotel for a late evening meal consisting of food purchased from a supermarket 6 hours prior to the meal. The foods purchased were 3 hot barbecued chickens, potato salad, coleslaw, bread rolls, fruit juice in small cartons, and confectionary. Soon after they were purchased, one of the team unpacked and handled one of the chickens and placed it on the only plate available (denoted 'plate chicken' in analytical study below). The other chickens were left in their wrappers untouched ('wrapper chicken') and all the chickens, as well as the other food items, were refrigerated until the meal commenced, 5¹/₂ hours later. Between 2¹/₂ and 4 hours after the meal commenced, 6 members of the team (3 male, 3 female; age range 18-26 years) became unwell, initially with malaise (5/6), severe vomiting (5/6) and crampy abdominal pain (4/6), and diarrhoea some hours later (6/6). Five presented to an accident and emergency department and all were discharged after receiving supportive treatment. No samples were obtained for microbiological diagnosis. No other clusters of acute gastrointestinal disease were reported around the time of this outbreak, neither in the hotel where the team were residing nor elsewhere in Darwin.

Analytical study

All 16 team and staff members completed the questionnaire (100%). Two members, who did not participate in the evening team meal and remained well, were excluded from the analysis. Six members of the team had symptoms in keeping with the case definition, giving an overall attack rate of 6/14 (37.5%).

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The number of team members who ate the various food items, and the relative risks for becoming ill, are shown in the Table. Two team members who ate chicken could not remember which chicken they ate; one became ill and one did not. These 'unknowns' can be analysed in a number of ways in calculating relative risks for eating the two types of chicken. The most conservative approach, assuming the former ate wrapper chicken and the latter ate plate chicken, yielded a relative risk for eating plate chicken of 5.0 (Table).

Environmental investigation

At the time of the site inspection, acceptable standards of food safety practices were observed and there were no potential sources of the outbreak identified.

Discussion

This small outbreak of an acute gastrointestinal illness has all the hallmarks of food poisoning due to a pre-formed toxin produced by an enterotoxin-producing bacterium, although microbiological proof is lacking. The short incubation period with abrupt onset, the symptomatology, and the short, self-limiting nature of the illness, are all typical of disease caused by either of the 2 pathogens that are commonly implicated in such illnesses, *Staphylococcus aureus* and *Bacillus cereus*.¹ Illness caused by *B. cereus* is usually associated with eating boiled or fried rice that has been cooked and kept warm for an extended period.^{2,3} In this outbreak, *S. aureus* was considered to be the more likely cause, being a commonly recognised

aetiological agent for foodborne outbreaks associated with poultry,^{1,4} the likely vehicle for enterotoxin in this outbreak.^{5,6} High salt foods like commercial barbecued chickens favour the growth of *S. aureus* over other bacteria.

The most conservative estimate of relative risk for eating 'plate chicken' in our analysis was 5.0, making it the most likely food vehicle. The 'plate chicken' may have become contaminated whilst it was in the store, either prior to cooking or during handling by store employees after cooking, or during handling by the purchaser. However, there were no other reports of food poisoning in the region around the time of this outbreak and the conclusion of the environmental investigation was that food handling practices of the store were acceptable. It is more likely that the team member who handled the food was the source of contamination, especially considering the 2 chickens that were not handled by this team member were not associated with illness. The considerable heat load on the team's motel refrigerator when all of the food items were placed within it several hours prior to the meal, could have slowed the rate of cooling of the chickens, thereby allowing enterotoxin to be produced in sufficient quantities to cause disease.

There was a failure of the notification procedure at the beginning of this outbreak which delayed the initiation of the investigation. Gastroenteritis is a notifiable condition in the Northern Territory if it occurs in an institution, in a food handler, or if two or more cases that are apparently related are recognised. The 5 cases who presented to hospital were clearly related yet were not notified because

Table. Association between exposure to a particular food item eaten at the evening meal and symptoms of an acute gastrointestinal illness

Food item	No. ill team members		No. well team members		RR
	Ate item	Did not eat item	Ate item	Did not eat item	
'Plate' chicken	5	1	2	6	5.0
'Wrapper' chicken	3	3	4	2	0.8
Potato salad	4	2	5	3	1.1
Coleslaw	3	3	5	3	0.8
Fruit juice	4	2	6	2	0.8
Bread rolls	5	1	7	1	0.8
Confectionary	4	2	6	2	0.8

the treating team was unaware of the necessity to do so. Immediate remediable action included a presentation to Accident and Emergency staff regarding notification requirements pertaining to diseases likely to be seen in their setting. This information will be incorporated into the regular presentation given by the Centre for Disease Control to Accident and Emergency medical staff given at times of staff turnover.

In the setting of an apparent cluster of related cases, efforts should have been taken to collect specimens for microbiological analysis. In the Accident and Emergency Department, appropriate specimens would have included faeces for microscopy/culture of conventional enteric pathogens, and vomitus and faeces for microscopy, culture and enterotoxin testing for *S. aureus* and *B. cereus* (enterotoxin testing is normally only available at public health laboratories). In suspected foodborne outbreaks caused by *S. aureus* or *B. cereus*, further specimens should ideally be taken during the epidemiological and environmental investigation. These would include hand and nasal swabs from the food handler for culture of *S. aureus*, and samples of the implicated food (if it is still available) for culture and enterotoxin testing for both organisms.¹ With regard to *S. aureus*, valuable epidemiological evidence can potentially be gained from matching phage-types isolated from the food handler, the food items, and the case. Less important is obtaining samples from fomites associated with food preparation, such as the plate that the implicated chicken was stored and served upon, as these are unusual sources of contamination with enterotoxin producing organisms. Because the illness caused by these organisms is a short self-limiting one, and the organism and enterotoxin are cleared relatively quickly, effort should be made to collect the samples within 48 hours after onset of symptoms.

The public health consequence of foodborne outbreaks caused by enterotoxin-producing bacteria is mainly morbidity associated with a short term, often incapacitating illness, but one that rarely leads to death or long term health sequelae. Unlike foodborne outbreaks where the mechanism of spread is waterborne or by the faecal-oral route, food poisoning outbreaks due to preformed enterotoxin ingestion are not self-perpetuating. Apart from physical discomfort experienced by affected team members, and disruption to their sporting program, no other adverse public health consequences eventuated in the outbreak described here.

In summary, this small outbreak of an acute gastrointestinal illness linked to barbecued chicken has features that strongly suggest an enterotoxin-producing bacterium as the causative agent, although microbiological proof is lacking. It is not possible to be definitive about the cause of the contamination of the chicken but the most likely scenario is that the team food-handler was the source. Although mortality and longer-term morbidity are uncommon with food poisoning caused by enterotoxin-producing bacteria, this outbreak highlights its capacity to cause short term, moderately-severe illness in a young and healthy population. It underscores the need for proper food handling practices, both in-store and by the consumer, and reinforces the importance of appropriate microbiological specimen collection from cases of apparent gastroenteritis outbreaks, as well as the public health importance of timely notification of such outbreaks.

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