

## SPICES, HIGH-RISK FOODS AND PUBLIC HEALTH: A SALMONELLA OUTBREAK ON SYDNEY HARBOUR

**Paul Millett**

*Senior Food Inspector*

*Northern Sydney Area Public Health Unit*

**Michael Staff**

*Public Health Medical Officer*

*Northern Sydney Area Public Health Unit*

This article illustrates how a simple epidemiological investigation can determine the possible cause of an outbreak of foodborne illness in the absence of direct microbiological evidence of contamination. The identification, as the likely source of an outbreak, of a high-risk food that was flavoured by a spice after cooking—and that had no subsequent heat treatment—has implications for food handlers, food inspectors and the regulators of imported spices.

### INTRODUCTION

*Salmonella typhimurium* is the most common salmonella serovar causing foodborne illness in humans and is responsible for 30 to 40 per cent of cases in which a salmonella pathogen has been isolated.<sup>1</sup> Of these isolates, phage type 135 is one of the most common and has been linked to large outbreaks of food poisoning in Australia.<sup>2</sup>

The addition of contaminated spices to cooked foods that will receive no further heat treatment has the potential to cause human illness. Pathogens in spices can remain relatively dormant until they are mixed with a suitable medium (for example: cooked rice, egg or meat) and subjected to favourable growing conditions in which they can multiply to hazardous levels. Salmonella has been isolated in a number of spices,<sup>3</sup> with contaminated paprika having been linked to a large outbreak involving an estimated 1000 cases of foodborne illness caused by the consumption of flavoured potato chips.<sup>4</sup>

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**TABLE 1**  
**ODDS RATIOS FOR INDIVIDUAL FOOD EXPOSURES**

Food	Cases n = 11	Controls n = 25	Odds ratio	95% CI
Egg	8	6	8.4	1.8–39.6
Beef	7	13	1.6	0.4–6.5
Ham	6	13	1.1	0.3–4.4
Lettuce	3	12	0.4	0.1–1.8
Tea	4	9	1.0	0.2–4.3
Coffee	4	13	0.5	0.1–2.2
Biscuits	4	9	1.0	0.2–4.3

Note: One participant did not consume any food or drink.

## INCIDENT

In April 1998, a group of 47 people, mostly of retirement age, took part in a short cruise on Sydney harbour. A brunch was served which consisted of some sandwich ‘fingers’ as well as tea and coffee. By the same time the next day, several of the cruise participants were suffering symptoms including: vomiting, diarrhoea, abdominal cramps, headache and/or fever. A member of the cruise party notified the Northern Sydney Public Health Unit (NSPHU) of the illnesses and an investigation was begun by the food inspectors.

## METHODS

With the assistance of the South Eastern Sydney Public Health Unit (SESPHU), a full inspection of the cruise operator’s boat and catering facilities was undertaken. A list of food served was ascertained and passed onto NSPHU to facilitate follow-up of the possible outbreak. A full list of all the cruise participants and their phone numbers was obtained from the cruise organiser. Food inspectors from NSPHU then interviewed participants by phone to obtain relevant food histories and details of any recent illness. The following case definition was established: a person who had attended the cruise function; consumed the food provided; and had suffered vomiting, diarrhoea and/or abdominal pain within a period of 24 hours. Results were coded and entered into a database using the TELEFORM program. Odds ratios were calculated to explore associations between food exposure and illness using the STATA 5.0 statistical package.

## RESULTS

### Inspection of premises

Inspection of the premises failed to identify any evidence

of poor hygiene or incorrect food-handling practices. In particular, food-storage facilities were found to be operating at the correct temperature and there was no evidence of likely cross-contamination.

### Food exposures and illness

Thirty-seven of the 47 cruise participants were interviewed, the majority of whom were women aged in their sixties and seventies. Of those interviewed, 11 reported illness after the cruise, with most having experienced vomiting, diarrhoea, and abdominal cramps and some complaining of fever, headaches and chills. The mean time of onset of symptoms was approximately 12 hours. Three people had visited their general practitioner and submitted stool specimens which were later confirmed positive for *Salmonella typhimurium* with identical phage types (135). Table 1 shows the various foods consumed, whether or not individuals became ill, and the corresponding odds ratios.

## DISCUSSION

Preliminary investigations suggested that the outbreak had a foodborne source and stool cultures subsequently isolated *S typhimurium* phage type 135 as the common pathogen. The case-control study implicated the consumption of curried egg as the most likely cause of illness by demonstrating a statistically significant odds ratio.

Cooked egg is an ideal medium for salmonella growth and has been associated with numerous outbreaks of salmonella food poisoning.<sup>5</sup> Furthermore, salmonella species have been detected in spices (such as curry powder) and can be a risk when added directly to foods that receive no further heat treatment.<sup>6</sup> Other possible scenarios that may have led to salmonella contamination

of the egg include poor hygiene practices by an infected foodhandler or cross-contamination with uncooked food (for example, raw chicken). However, initial inspections found no evidence to support either of these hypotheses.

The cruise operator's premises were reinspected after our results were obtained and two samples of curry powder were found and submitted for microbiological analysis. Both samples were found to be negative for salmonella. The food handlers who prepare food for the cruises were provided with education on correct handling, preparation and storage of high-risk foods.

Despite the lack of direct microbiological confirmation, the strong epidemiological evidence identifying curried egg as the likely source of the outbreak has implications for the food industry. While safe food handling techniques are vital for food caterers, these alone cannot prevent outbreaks of illness associated with the use of spices in food preparation unless raw ingredients are free of pathogens. Most spices are imported and the safety of these food ingredients lies foremostly with the regulators of imported food (the Australian Quarantine Inspection Service). The increase in the international trade of these products and the emergence of new salmonella serovars in the countries exporting these products demands continued vigilance and stringent control at all levels of food production.<sup>7</sup> Further reported outbreaks of foodborne illness linked to contaminated spices such as the one described here may indicate a need for increasing the routine surveillance of imported spices.

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