

# AN OUTBREAK OF *SALMONELLA* LITCHFIELD ON A CAR RALLY, NORTHERN TERRITORY, 2009

Polly Wallace, Martyn D Kirk, Sally A Munnoch, Jenine Gunn, Russell J Stafford, Paul M Kelly

## Background

*Salmonella* Litchfield is a reasonably common serotype in northern Australia, but less so in southern Australia. From 2002 to 2008, non-human isolates of *S. Litchfield* were reported in 4 Australian jurisdictions and included isolates from animals (cats and dogs, farmed crocodiles and a dairy cow), foods (cucumber, millet, tree nuts, papaya and barramundi) and an environmental survey of frogs, lizards and contents from vacuum cleaners around homes in Darwin (personal communication, National Enteric Pathogens Surveillance Scheme, Microbiological Diagnostic Unit, Public Health Laboratory, University of Melbourne, 14 May 2010).

A review of OzFoodNet outbreak surveillance data identified that 3 outbreaks of *S. Litchfield* have occurred in Australia since 2001. Transmission may have been foodborne in 2 instances; the 1st from contaminated papayas<sup>1</sup> (26 cases), and cucumbers<sup>2</sup> were suspected as the cause of the other. The 3rd outbreak of *S. Litchfield* was suspected to be waterborne (OzFoodNet Outbreak Register, unpublished data, 12 April 2010).

In June 2009, an outbreak of gastroenteritis occurred among participants on a Royal Flying Doctors Service (RFDS) ([www.flyingdoctors.org.au](http://www.flyingdoctors.org.au)) car trek in the Northern Territory. The 1st reported cases tested positive to *S. Litchfield*. The RFDS car trek is an annual event to raise funds for the organisation. Participants drive over 5,000 km across the outback in cars built prior to 1971. The trekkers contribute to the economies of the many small towns along the way. In 2009, the trek began in Grafton, New South Wales on 3 June and finished in Darwin on 14 June.

OzFoodNet conducted a multi-jurisdictional investigation to determine the source of the outbreak, the mode of transmission and to recommend appropriate public health actions in response to this outbreak.

## Methods

A retrospective cohort study of RFDS trek participants was conducted. SurveyMonkey (an Internet-based survey tool) was used to create an online survey of participants based on the information provided by caterers and trek organisers. Participants provided demographic, clinical, food and other exposure information.

A case was defined as a person who developed diarrhoea ( $\geq 3$  loose stools in 24 hours) and/or abdominal cramps and at least 1 other symptom of gastroenteritis during the trek and/or who had *S. Litchfield* isolated from a clinical specimen collected during June 2009. Other symptoms of gastroenteritis included lethargy, fever and vomiting.

All caterers who provided meals for trek participants were contacted by telephone and a standard questionnaire to determine what food items were served and to clarify food handling practices was used.

Isolates were genotyped using multi-locus variable-number tandem-repeat analysis<sup>3</sup> (MLVA) and pulsed-field gel electrophoresis<sup>4</sup> (PFGE). MLVA was performed by Queensland Health and PFGE was undertaken by the Western Australia Department of Health. The survey was available on-line for 10 days. Data analysis was performed using Stata V10.

## Results

There were approximately 350 participants on the trek and contact details were provided for 82% (286/350) of participants. The response rate for the on-line survey was 50% (178/350) of all trekkers and 62% (178/286) for those participants who were able to be contacted. Seventy-six people met the case definition for *S. Litchfield* infection.

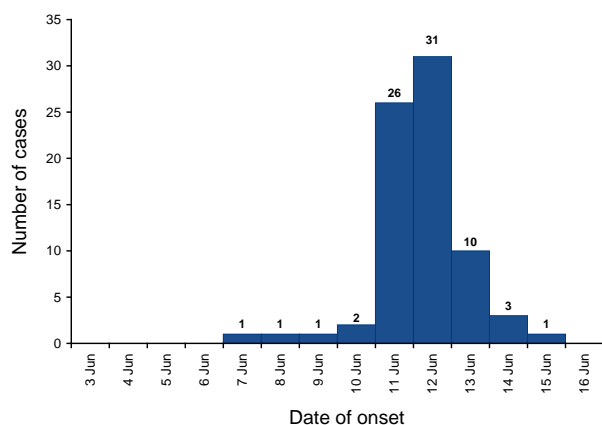
Completed surveys were received from around Australia (New South Wales 131; Victoria 15; Queensland 14; South Australia 6; Western Australia 4), Hong Kong (4), New Zealand (2) and the United Kingdom (2). The median age of respondents was 55 years (range 21–72 years) and almost all respondents were male (99% 176/178), reflecting who took part in this activity.

Among the 76 cases, 96% reported diarrhoea, 74% abdominal cramps, 74% lethargy, 55% fever and 12% vomiting. Fifty per cent of cases were ill for 6 days or more. The majority of cases became ill between 10 and 15 June 2009 (Figure). The sharp increase in the number of people becoming ill between 11 and 12 June indicates that participants were probably exposed to *S. Litchfield* in the previous 24 to 48 hours.

Univariate analysis of food exposures for preceding days showed a moderate association between illness

and consumption of barramundi fillets (attack rate 48%, relative risk 3.8, 95% CI 1.0–14.2,  $P=0.007$ ) during dinner on 10 June. Consumption of barramundi fillets accounted for 91% (69/76) of cases. Several other food items were weakly associated with illness (including some fruits). It was not possible to calculate relative risks for some exposures, as all respondents reported eating the same foods.

**Figure: Onset of illness, Royal Flying Doctor Service car trek, Grafton, New South Wales to Darwin, Northern Territory, 3 to 15 June 2009**



The 5 outbreak associated case isolates of *S. Litchfield* were indistinguishable by PFGE and MLVA. The caterers were unable to provide a sample from the batch of barramundi fillet served to the trekkers. However, the seafood supplier was able to provide a sample of barramundi fillet from a different batch for testing. This sample returned a negative result for *S. Litchfield*.

Discussion with caterers providing foods for trek participants did not identify any major breaches in food safety. In addition, no ill food handlers were reported by caterers.

## Discussion

This outbreak was difficult to investigate due to the remote location of the event and because our investigation began some time after the trek was completed. The geographical dispersion of participants to various states and countries immediately after the event necessitated a case finding method other than traditional methods, such as paper-based surveys or phone interviews. It was found that SurveyMonkey was a very effective tool in this investigation.

The only food exposure found to be significantly associated with illness was the pan fried barramundi served as the main ingredient of an evening meal. While 2 cases reported onsets of illness at 9.00 pm

and 11.30 pm on the evening that barramundi was served, incubation periods would be considered short, but these cases could still indicate the evening meal may have been the cause of the outbreak. The 3 cases of gastrointestinal illness prior to 10 June 2009 did not provide specimens for testing, but may represent background levels of illness. However, it is difficult to exclude other meals and foods as potential vehicles of infection given that it was not possible to generate relative risks.

The barramundi sample collected as part of this investigation tested negative for *S. Litchfield*. This was not unexpected as it was not a sample from the same batch as that served on the trek. However, 2 strains of *S. Litchfield* were previously isolated from three different barramundi samples reported in 2007, 2008 and 2009 (personal communication, National Enteric Pathogens Surveillance Scheme, Microbiological Diagnostic Unit Public Health Laboratory, University of Melbourne, 14 May 2010). While the historical positive isolates from barramundi raised suspicions, it was not possible to identify the food vehicle responsible for this outbreak.

As part of this investigation, health departments also discussed food safety and hygiene with trek organisers and caterers. Food safety was difficult to assess due to the remote location of meal stops for the trek, but investigation team members were able to reinforce food and water safety with the event organisers.

This investigation highlights the effectiveness of collecting data on-line and that Internet-based surveys provide timely data collection for geographically dispersed cohorts. Previous investigations have shown Internet and email have successfully been used to collect public health data in Australia<sup>5-7</sup> and overseas.<sup>8</sup>

On-line methods of data collection are likely to be used more often as access to these technologies improves. However, this use of the Internet in gathering data from participants raised important issues of data privacy, ownership and storage, which need further discussion among public health agencies.

## Acknowledgements

We would like to thank the trek organisers and participants for their help with this investigation. We acknowledge the assistance of the OzFoodNet multi-jurisdictional outbreak investigation team. We thank the following people for their technical input: Joan Powling (Microbiological Diagnostic Unit, Public Health Laboratory, University of Melbourne) who provided advice on *Salmonella* Litchfield, Lester Hiley (Public Health Reference Laboratory, Forensic and Scientific Services, Queensland Health, Brisbane) who conducted MLVA testing; Lyn O'Reilly (PathWest WA, Perth)

who performed PFGE testing and Dr Katrina Roper (Department of Health and Ageing, Canberra) who was the Coordinating Epidemiologist for the investigation. The Master of Applied Epidemiology Program is funded by the Australian Government Department of Health and Ageing.

### Author details

Polly Wallace, Master of Applied Epidemiology Scholar<sup>1,2</sup>  
Martyn Kirk, Senior Epidemiologist<sup>1,2</sup>  
Sally Munnoch, OzFoodNet Epidemiologist<sup>3</sup>  
Jenine Gunn, OzFoodNet Epidemiologist<sup>4</sup>  
Russell Stafford, OzFoodNet Epidemiologist<sup>5</sup>  
Paul M Kelly, Director, Master of Applied Epidemiology Program<sup>1</sup>

- 1 National Centre for Epidemiology and Population Health, College of Medicine, Biology and Environment, The Australian National University, Australian Capital Territory
- 2 OzFoodNet, Australian Government Department of Health and Ageing, Canberra, Australian Capital Territory
- 3 OzFoodNet, Hunter New England Area Health Service, New South Wales
- 4 OzFoodNet, Department of Health and Families, Northern Territory
- 5 OzFoodNet, Department of Health, Queensland

Corresponding author: Ms Polly Wallace, Office of Health Protection, Department of Health and Ageing, GPO Box 9848 (MDP 14), CANBERRA 2601 ACT. Telephone: +61 2 6289 2764. Facsimile: +61 2 6289 2600. Email: polly.wallace@health.gov.au

### References

1. Gibbs R, Pingault N, Mazzucchelli T, O'Reilly L, MacKenzie B, Green J, et al. An outbreak of *Salmonella enterica* serotype Litchfield infection in Australia linked to consumption of contaminated papaya. *J Food Prot* 2009;72(5):1094–1098.
2. OzFoodNet: enhancing foodborne disease surveillance across Australia: quarterly report, 1 July to 30 September 2003. *Commun Dis Intell* 2003;27(4):504–507.
3. Lindstedt BA, Vardund T, Aas L, Kapperud G. Multiple-locus variable-number tandem-repeats analysis of *Salmonella enterica* subsp. *enterica* serovar Typhimurium using PCR multiplexing and multicolor capillary electrophoresis. *J Microbiol Methods* 2004;59(2):163–172.
4. Centers for Disease Control and Prevention. Standardized molecular subtyping of foodborne bacterial pathogens by pulsed-field gel electrophoresis: a manual. Centers for Disease Control and Prevention, Atlanta, Ga. 1996.
5. Raupach JC, Hundy RL. An outbreak of *Campylobacter jejuni* infection among conference delegates. *Commun Dis Intell* 2003;27(3):380–383.
6. Oxenford CJ, Black AP, Bell RJ, Munnoch SA, Irwin MJ, Hanson RN, et al. Investigation of a multi-state outbreak of *Salmonella* Hvittingfoss using a web-based case reporting form. *Commun Dis Intell* 2005;29(4):379–381.
7. Viney KA, McAnulty JM. The evaluation of web-based data collection of enhanced surveillance of cryptosporidiosis. *N S W Public Health Bull* 2008;19(1–2):15–19.
8. Srikantiah P, Bodager D, Toth B, Kass-Hout T, Hammond R, Stenzel S, et al. Web-based investigation of multistate salmonellosis outbreak. *Emerg Infect Dis* 2005;11(4):610–612.