

# *Salmonella* Typhimurium U290 outbreak linked to a bakery

Nola A Tomaska,<sup>1,2</sup> Karin Lalor,<sup>3</sup> Joy E Gregory,<sup>3</sup> Heather J O'Donnell,<sup>4</sup> Frank Dawood,<sup>4</sup> Craig M Williams<sup>2</sup>

This report summarises the investigation of the first documented outbreak of *Salmonella* Typhimurium Phage type U290 exhibiting tetracycline resistance.

Typhimurium is the most commonly isolated *Salmonella* serovar in Australia and is responsible for the majority of identified outbreaks of bacterial gastroenteritis.<sup>1,2</sup> *S.* Typhimurium U290 has been recognised as a distinct phage type in Australia since October 2000, and re-examination of phage reaction records for unclassifiable isolates by the University of Melbourne's Microbiological Diagnostic Unit (MDU) suggests that the first case occurred in New South Wales in October 1999.

Since then and until this outbreak, only 96 human isolates and 14 non-human isolates (from broiler chickens, chicken litter, pet dogs and horses)<sup>1,3</sup> had been notified to the National Enteric Pathogen Surveillance Scheme (NEPSS).

On 31 May 2002, the Communicable Disease Section of the Department of Human Services (DHS) Victoria identified a cluster of five salmonellosis cases in an area of Northern Victoria (Area A).

An outbreak investigation team was formed under the auspices of OzFoodNet and DHS to determine the source and prevent further infection.

Other state and territory health authorities were notified of the cluster via the OzFoodNet network and asked to report recent cases of this phage type in their jurisdictions.

The initial case definition was 'any laboratory confirmed *S.* Typhimurium U290 infection notified after 30 May 2002'. Cases were interviewed, focusing on food and environmental exposures in the fortnight preceding onset. Active case finding was initiated by alerting general practice clinics in Area A, and requesting the collection of faecal samples from suspected cases.

Upon identifying a suspected common time and place of exposure, we undertook a case control study, refining the case definition to 'any person with laboratory identified *S.* Typhimurium U290 infection, onset of illness from 30 April 2002 onward, and residing in or having visited Area A'. Controls within Area A were selected by progressive digit dial, excluding those under five years of age, or who had pre-existing illness. Cases and controls were interviewed regarding foods eaten from vendors in Area A on the weekend prior to onset of illness.

1. Master of Applied Epidemiology scholar, National Centre for Epidemiology and Population Health, Australian National University, Acton, Canberra
2. OzFoodNet, Commonwealth Department of Health and Ageing, Canberra, Australian Capital Territory
3. OzFoodNet, Victorian Department of Human Services, Melbourne, Victoria
4. Communicable Diseases Section, Victorian Department of Human Services, Melbourne, Victoria

Corresponding author: Ms Nola Tomaska, OzFoodNet, Population Health Division, Commonwealth Department of Health and Ageing, GPO Box 9848, Canberra ACT 2601. Telephone: +61 2 6289 9014. Facsimile: +61 2 6289 5100. Email: nola.tomaska@anu.edu.au

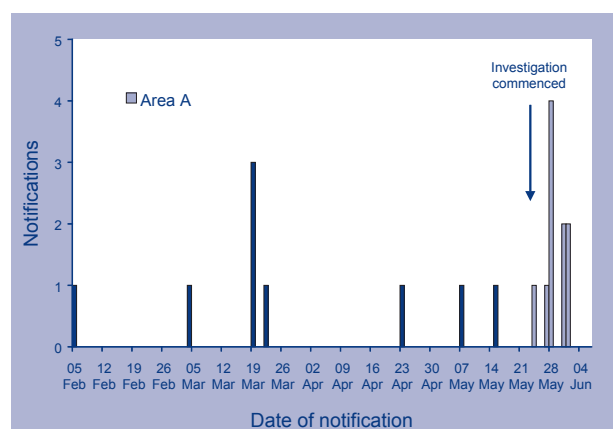
The Local Government Environmental Health Officer and the Regional Environmental Health Officer inspected Bakery X in Area A, and food and environmental samples were later obtained for testing. Food handlers from Bakery X were also interviewed regarding history of illness and potential for contamination of foodstuffs.

The MDU laboratory phage-typed all human isolates, and tested environmental and food samples obtained during the investigation.

A total of 10 cases of *S. Typhimurium* U290 were identified (Figure) and interviewed during this investigation. Consumption of food from one bakery (Bakery X) over the weekend 17–19 May 2002 was identified in nine cases. Area A is a popular tourist centre and Bakery X estimated that over 3,000 customers were served during this weekend.

The case control study results (Table) indicated that illness was strongly associated with eating at Bakery X and that cases were more likely than controls to have consumed cream and/or custard filled products from this bakery.

**Figure. Victorian *Salmonella* Typhimurium U290 notifications and Area A cluster**



Inspection of Bakery X revealed the potential for cross-contamination of food through the use of certain food handling practices and specialised equipment, specifically the use of an egg pulper, an industrial cream whipper and cloth piping bags. Effective control measures for cross-contamination were discussed with senior bakery staff and a clean up of the premises undertaken.

Three out of 37 food-handlers interviewed described having gastroenteritis coinciding with the onset period in cases, and all continued working whilst symptomatic. Proprietors were reminded that food-handlers should not work while suffering from gastroenteritis, and this was re-enforced during staff food hygiene and safety training sessions conducted in collaboration with the regional environmental health officer.

This is the first reported outbreak of *S. Typhimurium* U290 in Australia, and was epidemiologically linked to bakery products. The outbreak has public health importance for several reasons. Firstly, OzFoodNet reported four other bakery-related outbreaks of salmonellosis during 2002.<sup>4</sup> Secondly, *S. Typhimurium* U290 appears to be emerging across Australia with 122 notifications of apparently sporadic cases since this outbreak up to August 2003 (NEPSS, personal communication, 2003); Finally, this organism shows resistance to the antibiotic tetracycline.

Infection with *S. Typhimurium* U290 was strongly associated with the consumption of cream and/or custard-filled products from Bakery X. The literature suggests that contaminated eggs or cream are likely sources of infection in bakery-related outbreaks.<sup>5–9</sup> Whilst raw eggs were not used in custards and creams at Bakery X, the use of an on-site egg pulping machine created potential for cross-contamination.

**Table. Results of *Salmonella* Typhimurium U290 outbreak case control study**

Exposure	Cases (n=10)			Controls (n=24)			OR	(95% CI)
	Yes	No	% exposed	Yes	No	% exposed		
Ate bakery products (any bakeries)	10	0	100	10	13	43	1.30	0.33-5.13
Cream	6	4	60	4	19	17	7.13	1.06-55.2
Custard	5	5	50	5	18	21	3.60	0.58-24.1
Cream AND custard	9	1	90	10	13	43	11.7	1.1-289
Ate bakery X products	9	1	90	3	20	15	60	4.4-1890
Cream	6	4	60	0	23	0	Undefined	–
Custard	3	7	30	0	23	0	Undefined	–
Cream AND custard	9	1	90	0	23	0	Undefined	–

It seems likely that low level contamination of the cream occurred during preparation, and this theory is supported by the fact that only 10 cases were confirmed even though several hundred cream and/or custard products were sold over the weekend in question. Six cases reported time-temperature abuse of the bakery products after purchase and before consumption, allowing for bacterial growth, which further supports this scenario. It is possible that the magnitude of this outbreak was moderated by the cool temperatures of the Australian winter. Given the large customer base and post-purchase handling, this outbreak could have had far-reaching effects had it taken place in the summer, as was demonstrated recently by a large bakery-related outbreak in Spain.<sup>9</sup>

As a result of this outbreak investigation specific control measures were put in place to reduce the risk of cross contamination during food preparation. Particular emphasis was placed on the importance of hand washing when pulping eggs and whipping cream; the use of covers to reduce splashing; washing and sanitising of utensils and containers used with raw egg pulp; and, the use of dedicated work areas separate from other food preparation. Cloth piping bags have been replaced with single-use disposable piping bags. Specific training has been instigated to raise staff knowledge of the public health issues related to working while symptomatic of gastroenteritis.

The source and mechanism of contamination remain unidentified, however the investigation positively influenced the food handlers' knowledge and practice regarding illness and food handling.

### *Acknowledgments*

We gratefully acknowledge the following people for their invaluable assistance in this investigation: Leanne Roberts (DHS Hume Region); Mark D'Agostino, Karen Carter, Catherine Ferreira, Joanna Gaston, Kerry-Ann O'Grady, Ross Andrews, (DHS Victoria Communicable Diseases Unit); Victor Di Paola, Violette Lazanas, (DHS Victoria Food Safety Unit); the proprietors and staff of Bakery X; Mary Beers, Gillian Hall, (NCEPH); Martyn Kirk (OzFoodNet Co-ordinating Epidemiologist); Stephen Lambert, (Royal Children's Hospital); special thanks to Joan Powling, Diane Lightfoot, Mary Valcanis (Microbiological Diagnostic Unit).

### *References*

1. Microbiological Diagnostic Unit. National Enteric Pathogens Surveillance Scheme (NEPSS) human annual report 2001. Parkville: University of Melbourne, 2002.
2. Ashbolt R, Givney R, Gregory JE, Hall G, Hundy R, Kirk M, *et al.* Enhancing foodborne disease surveillance across Australia in 2001: the OzFoodNet Working Group. *Commun Dis Intell* 2002;26:375–406.
3. Millard G, Rockliff S. Microbiological status of raw chilled chicken 1999–2000. ACT Health Protection Service. Available from: <http://www.health.act.gov.au/publications/foodsurvey/1999-2000/chicken.html> Accessed 19 September 2002.
4. The OzFoodNet Working Group. Foodborne disease in Australia: incidence, notifications and outbreaks. Annual report of the OzFoodNet network, 2002. *Commun Dis Intell* 2003;27:209–243.
5. Barnes GH and Edwards AT. An investigation into an outbreak of *Salmonella Enteritidis* phage-type 4 infection and the consumption of custard slices and trifles. *Epidemiol Infect* 1992;109:397–403.
6. Centers for Disease Control and Prevention. Update: *Salmonella enteritidis* infections and grade A shell eggs—United States 1990. *MMWR Morb Mortal Wkly Rep* 39:1990. 21 December 1990.
7. Evans MR, Tromans JP, Dexter EL, Ribeiro CD, Gardner D. Consecutive *Salmonella* outbreaks traced to the same bakery. *Epidemiol Infect* 1996;116:161–167.
8. Milazzo A, Rose N. An outbreak of *Salmonella* Typhimurium phage type 126 linked to a cake shop in South Australia. *Commun Dis Intell* 2001;25:73.
9. Promed Mail. Salmonellosis, pastry—Spain (Catalonia). Archive number. 20020701.4646. 1 July 2002. Available from: <http://www.promedmail.org>