

The OzFoodNet story: 2000 to present day



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OzFoodNet is a network of epidemiologists whose primary interest is foodborne disease. The network is now over 10 years old and in this time, there have been many research studies and outbreak investigations undertaken by the network. A considerable body of published work exists that details the achievements and workings of the OzFoodNet network and the OzFoodNet sites. Lessons have been learnt from outbreak investigations, with improved surveillance systems developed for pathogens such as *Listeria monocytogenes*. The work of OzFoodNet plays an important part in informing food safety policy and regulations.

The origins of OzFoodNet

OzFoodNet is a collaborative program to enhance the surveillance of foodborne disease. The program was established in 2000 by the then Australian Government Department of Health and Aged Care and state and territory health departments. One of the events that led to the formation of OzFoodNet was an outbreak in 1995 of Shiga-like toxin producing *Escherichia coli* (STEC) causing haemolytic uremic syndrome (HUS) associated with mettwurst sausage^{1,2}. Within months of the outbreak, Australian governments were seeking to develop new national food safety standards. However, there were challenges in the development of these standards due to the lack of comprehensive data on the incidence and causes of foodborne illness³. With no state or national foodborne disease surveillance system, public health practitioners and policy makers could only rely on case reports, infrequent outbreak reports, irregular and *ad hoc* summaries of foodborne disease, and overseas surveillance data to formulate food safety standards⁴. One project concluded that there was value in a population based systematic and enhanced surveillance system to better understand the epidemiology of foodborne disease. Given this finding, an 18 month trial of

enhanced foodborne disease surveillance commenced in the Hunter region of NSW⁵. The trial was a proof of principle and a national work program on food safety coordinated by the Australian Government Department of Health and Ageing (DoHA) built upon this initiative in the Hunter with the formation of OzFoodNet: A national system to enhance foodborne disease surveillance³.

What is OzFoodNet

OzFoodNet is a network of epidemiologists based in each state and territory health department and DoHA. At each site there are 1 to 3 epidemiologists, with some sites also having a supportive surveillance or administrative staff member. The network includes other organisations, including Food Standards Australia New Zealand (FSANZ), Australian Government Department of Agriculture, Fisheries and Forestry, the Public Health Laboratory Network and the National Centre for Epidemiology and Population Health (NCEPH) (Figure 1). OzFoodNet is a member of the Communicable Diseases Network Australia, a sub-committee of the Australian Health Protection Principal Committee.

OzFoodNet is a network for detecting and responding to nationally important foodborne diseases, monitoring the burden of these illnesses, and identifying the sources of specific foodborne outbreaks through enhanced communication and cooperation amongst jurisdictions. The network was modelled on the Centre for Disease Control (CDC) FoodNet model of active surveillance⁶ and has evolved into a mature network. Many of the epidemiologists are long standing members of the network and some have been with OzFoodNet from its inception. The OzFoodNet network is funded through DoHA by the Australian Government.

Regular communication within the network and with the relevant stakeholders and partners has been one of the key factors in the

network's ability to function effectively. Prior to the formation of OzFoodNet, no such data sharing and communication existed between states. Through rapid communication using list servers, a fortnightly enteric disease surveillance report, regular monthly teleconferences, and face to face meetings held several times a year at different OzFoodNet sites – network members have been able to communicate in a regular and timely fashion, sharing information, data, ideas and co-operating in outbreak investigations. There is a high level of trust within the network which is one of OzFoodNet's strengths.

OzFoodNet is also partner of the WHO Global Foodborne Infections Network, which is a capacity-building program that promotes integrated, laboratory based surveillance and intersectoral collaboration among human health, veterinary and food-related disciplines⁷. Some OzFoodNet epidemiologists have participated as trainers in courses covering both the Western Pacific Region and South-East Asia region, where they are able to share their knowledge and experience in a training environment but also build relationships with international colleagues and networks interested in foodborne disease.

Achievements

In the early years of the network there was a strong emphasis on research and in developing a better understanding of foodborne disease. Several studies examined the risk factors for campylobacteriosis^{8,9}; studies into particular *Salmonella* types from certain areas of Australia, such as *S. Mississipi* in Tasmania¹⁰ and also research into the identification of risk factors for sporadic listeriosis cases¹¹.

OzFoodNet and NCEPH have estimated that there were 5.4 million cases of foodborne infectious gastroenteritis annually in Australia circa 2000³. The burden of foodborne disease in Australia is

substantial, costing approximately \$1.2 billion dollars annually, mainly resulting from lost productivity when people with gastroenteritis stayed home from work, or having other people staying home to look after them. Currently, an NCEPH work program is underway to provide revised estimates of foodborne disease incidence in Australia, circa 2010. Funding to revise these estimates has been provided by DoHA, Food Standards Australia New Zealand (FSANZ) and the New South Wales Food Authority.

Much of the work of OzFoodNet in recent years has been focused on foodborne outbreak investigations including between four to six multijurisdictional outbreaks annually. Working as a collaborative network involving states and territories and other Australian Government agencies has resulted in the detection and investigation of a number of notable and instructive multijurisdictional outbreaks of foodborne disease (Table 1). These have included national outbreaks of *Salmonella* Saintpaul associated with rockmelons,¹² *S. Litchfield* associated with papaya¹³, a *Listeria monocytogenes* outbreak associated with chicken meat sandwiches and wraps on a domestic airline¹⁴, an outbreak of Hepatitis A associated with semi-dried tomatoes^{15,16}, and outbreaks of norovirus due to imported oyster meat¹⁷. At times, foodborne outbreaks have crossed international borders, with a *Sbigella sonnei* outbreak in Australia and Denmark associated with imported baby corn from Thailand¹⁸.

Multi-jurisdictional outbreak investigations coordinated by OzFoodNet are critical to maintaining a safe food supply for Australia. These investigations also assist in the development of national policies and regulation to prevent foodborne disease. OzFoodNet maintains a national Outbreak Register which is a detailed repository of data concerning outbreaks of enteric-related disease in Australia from 2001 to the present. Regulatory agencies rely on these data in order to inform risk assessment and standards development. Information from the OzFoodNet Outbreak Register has been used to inform

Table 1. Summary of selected significant multijurisdictional outbreak investigations undertaken by OzFoodNet.

Year	Outbreak	Insights and Outcomes
2006	<i>Salmonella</i> Saintpaul associated with rockmelons	<ul style="list-style-type: none"> Evidence of fresh produce as vehicle for <i>Salmonella</i> transmission Production and processing practices around rockmelon pose public health risk Information used to inform primary production standards
2009	<i>Listeria monocytogenes</i> in chicken sandwiches and wraps	<ul style="list-style-type: none"> Advancements in molecular typing of <i>Listeria</i> could be utilised in a surveillance system to detect outbreaks Development and implementation of an enhanced surveillance system for Listeriosis cases
2009	Hepatitis A outbreak and semi dried tomatoes	<ul style="list-style-type: none"> Public Health action and trade level recalls Provided an example of the complex movement of food globally and related trace-back difficulties in an outbreak setting.
2012	<i>Listeria monocytogenes</i> and soft cheese	<ul style="list-style-type: none"> Detection of the outbreak through enhanced surveillance Public Health action to control and prevent further disease National recall of implicated products



Figure 1. The recent 39th OzFoodNet Face to Face meeting held in Melbourne in February included a large number of OzFoodNet stakeholders as well as the network's epidemiologists.

food policy and contribute to food standards that are developed by FSANZ

Vehicles for *Salmonella* outbreaks have been varied – from eggs and egg products, poultry and meat products, and dishes such as sandwiches and condiments/sauces¹⁹. Egg-associated outbreaks have been documented frequently over the last several years^{20–22} with enhanced data collection around egg-associated outbreaks being one of the network's current areas of focus²³. In 2010, egg-associated outbreaks compromised 14% of all outbreaks investigated and 36% of all *Salmonella* outbreaks²⁴. The outbreak data in relation to eggs has been one of the resources used to inform the development of the *Primary Production and Processing Standard for Eggs and Egg Products (Standard 4.2.5 by FSANZ)*.

Enhanced surveillance systems

The network has developed a national approach to surveillance for some foodborne pathogens of particular interest so that consistent and comparable information is collected when needed and to detect potential outbreaks.

Following a national outbreak of *Listeria* in 2009¹², OzFoodNet undertook to improve *Listeria* surveillance and outbreak detection through the establishment of an enhanced *Listeria* surveillance system. This system uses a variety of molecular typing techniques which have been developed in recent years and been used to detect clusters of cases based on the molecular types. Information is stored on a web based database enabling real time data entry and analysis. The food histories of cases are analysed when clusters are detected to identify potential sources of infection.

A recent application of this enhanced surveillance system occurred in late 2012, when OzFoodNet began investigating an outbreak of a particular *Listeria monocytogenes* subtype. Epidemiological analysis of the case data in this enhanced surveillance system was able to quickly identify a possible association between cases and the consumption of soft cheese that led to a national recall of the

suspected products thought to be associated with the outbreak (<http://www.foodstandards.gov.au/consumerinformation/foodrecalls/currentconsumerlevelrecalls/jindicheesepotential5792.cfm>).

Challenges

One of the strengths of the OzFoodNet work has been the ability to detect and investigate promptly potential multi-jurisdictional outbreaks of foodborne disease. Much of the work of OzFoodNet relies on the laboratories that provide typing information on a variety of isolates such as *Salmonella* and *Listeria monocytogenes*. There have been changes and improvements in molecular characterisation techniques such as multiple-locus variable number tandem repeat Analysis (MLVA) over the past few years. Due to these developments, multijurisdictional outbreaks or cluster investigations by OzFoodNet now involve detailed case definitions concerning *S. Typhimurium* phage types, MLVA types and pulse field gel electrophoresis (PFGE) patterns to include all jurisdictions and the differences in *Salmonella* typing methods that exist across Australia. The different characterisation techniques in each jurisdiction have been implemented and utilised based on the need to capture timely surveillance data for the jurisdiction. These evolving techniques provide greater discrimination of organisms which often aids outbreak investigations. However, their development has resulted in some challenges for surveillance between Australian states and territories.

Conclusions

OzFoodNet has successfully conducted surveillance and responded to outbreaks of foodborne illness since its commencement in 2000. This success has been based on continued funding support by DoHA and on the building and maintenance of strong working relationships that have fostered collaboration between many different partners, including public health units, health departments, laboratories, reference laboratories, food safety agencies, and primary industry departments.

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Further information on the network is available from the OzFoodNet website, www.ozfoodnet.gov.au.

References

- Patton, A.W. *et al.* (1996) Molecular microbiological investigation of an outbreak of haemolytic-uremic syndrome caused by dry fermented sausage contaminated with Shiga-like toxin producing *Escherichia coli*. *J. Clin. Microbiol.* **34**, 1622–1627.
- Cameron, A.S. *et al.* (1995) Community outbreak of haemolytic uremic syndrome attributable to *Escherichia coli* O111:NM-South Australia, 1995. *MMWR* **44**, 550–551, 557–558.
- Hall, G. and Kirk, M. (2005) Foodborne illness in Australia – Annual incidence circa 2000. Australian Government Department of Health and Ageing.
- Sk, C. *et al.* (1996) Foodborne disease: current trends and future surveillance needs in Australia. *Med. J. Aust.* **165**, 672–675.
- Voetsch, A.C. *et al.* (2000) Enhanced surveillance for foodborne disease in the Hunter. A model for national surveillance in Australia? *Food Aust.* **52**, 97–99.
- Kirk, M. *et al.* (2008) Food safety: foodborne disease in Australia: the OzFoodNet experience. *Clin. Infect. Dis.* **47**, 392–400. doi:10.1086/589861
- Global Foodborne Infections Network (GFN) Strategic Plan 2011–2015. World Health Organisation. Page 3.
- Stafford, R.J. *et al.* (2007) A multi-centre prospective case control study of *Campylobacter* infection in persons aged 5 years and older in Australia. *Epidemiol. Infect.* **135**, 978–988. doi:10.1017/S0950268806007576
- Stafford, R.J. *et al.* (2008) Population-attributable risk estimates for risk factors associated with *Campylobacter* infection, Australia. *Emerg. Infect. Dis.* **14**, 895–901. doi:10.3201/eid1406.071008
- Ashbolt, R. and Kirk, M.D. (2006) *Salmonella* Mississippi infections in Tasmania: the role of native Australian animals and untreated drinking water. *Epidemiol. Infect.* **134**, 1257–1265. doi:10.1017/S0950268806006224
- Dalton, C.B. *et al.* (2011) A national case-control study of risk factors for Listeriosis in Australia. *Epidemiol. Infect.* **139**, 437–445. doi:10.1017/S0950268810000944
- Munnoch, S. *et al.* (2009) A multi-state outbreak of *Salmonella* Saintpaul in Australia associated with cantaloupe consumption. *Epidemiol. Infect.* **137**, 367–374. doi:10.1017/S0950268808000861
- Gibbs, R. *et al.* (2009) An outbreak of *Salmonella enterica* serotype Litchfield infection in Australia linked to consumption of contaminated papaya. *J. Food Prot.* **72**, 1094–1098.
- OzFoodNet Working Group. (2009) OzFoodNet Quarterly Report, 1 July to 30 September 2009. *Commun. Dis. Intell.* **33**, 426–432.
- OzFoodNet Working Group. (2010) Monitoring the incidence and causes of diseases potentially transmitted by food in Australia: annual report of the OzFoodNet network, 2009. *Commun. Dis. Intell.* **34**, 396–426.
- Donnan, E.J. *et al.* (2012) A multistate outbreak of hepatitis A associated with semidried tomatoes in Australia, 2009. *Clin. Infect. Dis.* **54**, 775–781. doi:10.1093/cid/cir949
- Webby, R.J. *et al.* (2007) Internationally distributed frozen oyster meat causing multiple outbreaks of norovirus infection in Australia. *Clin. Infect. Dis.* **44**, 1026–1031. doi:10.1086/512807
- Lewis, H.C. *et al.* (2009) Outbreaks of *Shigella sonnei* in Denmark and Australia linked to consumption of imported raw baby corn. *Epidemiol. Infect.* **137**, 326–334. doi:10.1017/S0950268808001829
- Astridge, K.H. *et al.* (2011) Foodborne disease outbreaks in Australia 2001–2009. *Food Aust.* **63**, 44–50.
- Stephens, N. *et al.* (2007) Large outbreaks of *Salmonella* Typhimurium phage type 135 infections associated with the consumption of products containing raw egg in Tasmania, Australia. *Commun. Dis. Intell.* **31**, 118–124.
- Slinko, V.G. *et al.* (2009) Outbreaks of *Salmonella* Typhimurium phage type 197 of multiple genotypes linked to an egg producer. *Commun. Dis. Intell.* **33**, 419–425.
- Reynolds, A. *et al.* (2010) An outbreak of gastroenteritis due to *Salmonella* Typhimurium phage type 170 associated with consumption of a dessert containing raw egg. *Commun. Dis. Intell.* **34**, 329–333.
- Moffatt, C.R. *et al.* (2012) An outbreak of *Salmonella* Typhimurium phage type 135a gastroenteritis linked to eggs served at an Australian Capital Territory cafe. *Commun. Dis. Intell.* **36**, E281–E285.
- The OzFoodNet Working group. (2012) Monitoring the incidence and causes of diseases potentially transmitted by food in Australia: annual report of the OzFoodNet Network, 2010. *Commun. Dis. Intell.* **36**, E213–E241.

Biographies

Michelle Green is the OzFoodNet epidemiologist in Tasmania, and was the OFN Epidemiologist in the Northern Territory for 6 years. Prior to her time as an epidemiologist, she spent nearly 10 years as a microbiology scientist in clinical pathology laboratories.

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