

## Food safety



Narelle Fegan

**Producing safe food is essential for protecting the health of consumers and for ensuring the sustainability and profitability of food industries, including primary production, food manufacture, food service and retail. Food safety hazards may result from contamination of food with microbial, physical or chemical hazards. This edition of *Microbiology Australia* focuses on microbial food safety hazards, including prions, viruses, bacteria and fungi. Technological advancements throughout history, such as pasteurisation, canning and refrigeration, have significantly improved the safety of our food supply; however, foodborne illness remains a global problem impacting on millions of people each year. A recent example is the large outbreak of *E. coli* O104:H4 that occurred during 2011 in Germany and many other countries across Europe and North America, which affected more than 4,000 people resulting in 50 deaths. The outbreak was associated with seeds used for sprouting that had originated from Egypt. The causative agent, *E. coli* O104:H4, had acquired new virulence properties in the form of toxin genes carried by bacteriophage, creating a highly pathogenic strain. This outbreak highlighted some of the difficulties faced by those involved in keeping the food we eat safe. Many of these challenges are discussed throughout the articles in this edition of *Microbiology Australia*.**

The way we produce our food is constantly evolving. Changing food production practices through the application of new farming technologies, climate change and the availability of water and land resources as well as intensive rearing of animals can all impact on the presence of foodborne pathogens during primary production. Technologies are constantly being developed to improve food processing, which may in turn provide new and unpredictable ways for food pathogens to enter the food supply. Consumer preferences are also changing with an increasing demand for fresh, minimally processed foods that have limited or no interventions to reduce microbial contamination or limit their growth. Changing demographics along with an increase in ageing and immunocompromised populations require that stringent food safety measures are applied to foods served to these populations.

Probably one of the most significant challenges associated with food safety are the pathogens themselves, which are constantly adapting

and changing, leading to the emergence of new pathogenic types and new modes of transmission through food. Advances in disease surveillance networks, tools for tracing outbreaks and pathogen characterisation have enabled the identification of foodborne outbreaks, which would previously have gone unnoticed. The use of standardised tests across many countries has facilitated the identification of outbreaks that may cross international borders. Food safety issues that were once restricted to a limited area may now impact on geographically diverse populations due to the globalisation of the production and trade of food in comparison to the past. This can also have a significant impact on trade with various countries requiring imported food to meet certain criteria in relation to food safety. In recent years there has also been recognition that foodborne pathogens could be used in terror attacks.

As you can see from the above challenges, keeping food safe is a complex task. It involves input from food producers, food manufacturers, consumers, researchers, clinicians, epidemiologists, politicians and regulators, and as highlighted from this edition of *Microbiology Australia*, requires skills beyond just microbiology. Understanding food safety requires knowledge of microbial ecology through the whole food chain, along with an understanding of the types of pathogens present, the virulence properties they possess and how they are transferred through food production. The availability of effective detection methods and surveillance systems is also critical for identifying outbreaks and tracing the sources of foodborne illness. Understanding the cause of outbreaks is important for preventing future occurrences. More recently, the development of new tools such as “omics” and the application of computational and mathematical science to biological/food systems has increased our fundamental knowledge on how foodborne pathogens enter, persist and behave within food systems. Such information will guide the future development of new processing technologies and underpin risk management and intervention systems to control hazards throughout the food system from farm to fork. Effective information and education around safe food handling practices and understanding risks associated with food production is important not only for those working in the food industry producing our food, but also for consumers. Having appropriate risk-based food regulation and the application of standards to the food industry is also important for limiting foodborne illness. This edition of *Microbiology Australia* covers many aspects of these complexities and highlights the challenges faced by all those who work to ensure the safety of our food supply.

### Biography

**Dr Narelle Fegan** is a microbiologist in the Food Safety and Stability Theme and current leader of the Microbiology Group at CSIRO Animal, Food and Health Sciences. Narelle has been working at CSIRO for the past 17 years on projects studying foodborne pathogens, mostly pathogenic *E. coli* and *Salmonella*. Narelle’s particular interests include understanding the epidemiology and ecology of these pathogens in foods, food animals, and in the environment.