Food safety

Mitigating the risks of foodborne disease

How food producers can prevent contamination and protect their brand

Disease outbreaks from microbial food contamination can have devastating impacts. Besides the public health risks, an outbreak can damage a food producer's brand and business operation. This white paper discusses those impacts, and with real examples, provides context to the current Australian and New Zealand food safety standards. Importantly, it talks to the challenges that food manufacturers face, and provides advisory information on the food safety workflow, and the testing solutions that can help prevent a disease outbreak.

A snapshot of foodborne illness in Australia and New Zealand

Foodborne disease is a significant problem in Australasia. A 2022 report commissioned by Food Standards Australia New Zealand (FSANZ) found that Australia experiences approximately 4.67 million cases of foodborne gastroenteritis each year, with a total cost of AUD $2.1billion to the economy[1].

In New Zealand, there are an average of 500 cases of food poisoning each day, and recent data shows a significant increase in the number of hospitalisations since 2021 due to foodborne illness[2,3].

The most common disease-causing food pathogens

The most common foodborne illnesses in Australia are caused by *Campylobacter* and *Salmonella* – which account for 60 per cent and 34 per cent of cases respectively. Whilst *Escherichia coli (E.coli)* and *Listeria monocytogenes* are rarer, they are included in the top four most common pathogens of concern[4]. Similarly, New Zealand figures show *Campylobacter* comprising the largest portion of food poisoning cases (5,878), followed by *Salmonella* (750), *E.coli* (390) and *Listeria* (39)[5].

Impacts of outbreaks

Foodborne illness is costly on many fronts. From a public economic perspective, there is the loss of productivity – in fact, *Campylobacter* alone is estimated to cost the Australian economy $365 million per year in lost productivity. In terms of public health impacts, there are 47,900 hospitalisations due to foodborne gastroenteritis each year in Australia.[6]

For a food producer, a disease outbreak that is the result of food contamination can be ruinous.

There will be financial impacts – not just in fines, but in product losses and waste – and damage to a business's reputation and brand. There can also be legal implications, particularly if there is evidence of a food safety breach.

In extreme cases, a producer may be shut down or go bankrupt. An example of this can be seen in the now defunct Australian food processor, Garibaldi Smallgoods. The Garibaldi Smallgoods company went into liquidation in 1995 following a food poisoning event that was caused by contaminated sausage product. The resulting legal case was one of the longest running in South Australia, taking approximately 16 years to settle. The human toll of the incident was devastating, with one child fatality, 23 children hospitalised in a critical condition, 150 people suffering illness to varying degrees, and 120 jobs lost.[7,8]

Notable incidents in Australia and New Zealand

There have been several serious food outbreaks in Australia and New Zealand (ANZ) due to microbial contamination in more recent years. These incidents exemplify the reasons why food producers should be diligent in their efforts to manage microbial contamination. They also provide context to the current ANZ food safety standards and best practices.

Listeria cluster linked to commercial chicken product

In September 2023, a *Listeria* outbreak in the eastern states of Australia prompted significant concern, including public warnings issued from the state health authorities due to a sharp rise in cases. A commercial shredded chicken breast product served in hospitals is thought to be the source of five cases of *Listeria* in Queensland, three in New South Wales and one in Victoria. The poultry producer recalled the product whilst the cases were still under investigation.[9,10,11]

Contaminated tahini prompts mass product recalls

In March 2023, there was a mass food recall of 21 products in New Zealand due to a ***Salmonella*** contamination in tahini – a key ingredient for the popular dip, hummus. The source of contamination was identified in tahini manufactured by a Turkish producer and used in various New Zealand hummus products. In Australia, batches of the unhulled and hulled tahini products were also recalled due to potential contamination.[12,13,14]

Major egg recall and hens slaughtered due to Salmonella infection

In March 2019, hundreds of thousands of eggs sold in major supermarkets across Australia were recalled due to potential *Salmonella*-infection. The eggs came from a Victorian farm, and to prevent further contamination, the farm was ordered to euthanise its entire chicken population. Once responsible for almost 10% of the national egg market, the egg and poultry farm has since closed as a result of the events that unfolded.[15,16]

Food recalls due to microbial contamination 2013-2023

According to data obtained and examined by FSANZ, 194 food recalls were coordinated between 2013 and 2022 in Australia, with the most common microbes listed as *Listeria* (70 recalls, 36%), *Salmonella* (44 recalls, 23%) and *E.coli* (38 recalls, 20%). The FSANZ data also revealed that 87% of food recalls over the past decade were consumer level recalls, involving recovery of the product from all points in the production and distribution chain.[17]

Food safety regulations and microbiological limits

All food producers must adhere to the standards set out in the Australia New Zealand Food Standards Code, of which there are several standards on hygiene obligations and best practices[18]. In Australia, there are also standards for primary production and processing which focus on specific food groups such as meat, eggs, seafood, and dairy[19]. In New Zealand, businesses are obligated to follow the regulations under the *Food Act 2014*[20].

Testing for microbial contamination

As microbial contamination can occur in any stage of a food supply chain, food producers must be confident that their environment is safe, and that their product is meeting the criteria outlined by Standard 1.6.1. It is therefore advised that food businesses adopt a proactive approach to microbiological testing.

The challenges that food producers face with testing, however, are:

- **Time**—certain testing methods, such as culture techniques, may not provide the rapid response required for food businesses, particularly regarding products that have a short shelf life. This can prove costly, especially if contamination has been detected after products have been distributed.
- **Accuracy**—microorganisms can differ in their response to environments and control measures, so sensitive and specific testing methods must be used, and some techniques may not be as accurate as needed.
- **Complexity**—traditional culture-based testing techniques rely on various procedures to ensure accuracy, which can prove complicated and time-consuming for food producers who wish to test in their own laboratories.

Food safety testing workflow

To support the testing process, food producers or labs can follow the steps of a food safety workflow.

The key aspects of a food testing workflow include:

- Environmental monitoring
- Sample handling and preparation
- Sample enrichment
- Detection and quantification
- Confirmation and identification
- Quality control

Rapid, reliable testing solutions

In recent years, DNA-based or molecular testing methods – such as PCR (polymerase chain reaction) – have become increasingly used in the food industry for microbial detection. This is because PCR testing methods address the core challenges of time, accuracy, and complexity, and enable laboratories to streamline their food safety workflow.

Benefits of PCR testing include:

- **Rapid and automated** – Decreases the hands-on time required in the lab and results are available quickly (within 24 hours).
- **Precise** – highly specific genetics-based detection and sensitivity gives peace of mind that results are accurate.
- **Flexible and scalable** – assays for more than one pathogen can be run simultaneously.
- **Risk mitigation** – Faster, accurate testing can empower food producers to act quickly when contamination is detected, preventing costly product recalls and brand damage.
- **Efficient** – Food producers can increase their turnover and revenue through more efficient testing.

Thermo Scientific™ SureTect Food Safety PCR System

The Thermo Scientific™ SureTect Food Safety PCR System simplifies food testing by providing rapid and accurate detection of major pathogens, including, *Shiga Toxin-producing Escherichia Coli (STEC), Salmonella, Campylobacter,* and *Listeria*.

Significantly, the SureTect System utilises the Applied BioSystems™ QuantStudio™ 5 Real-Time PCR Instrument, a benchtop laboratory platform that enables a food-testing lab to run tests for multiple targets. This solution can be used to detect foodborne pathogens but also can be employed for bespoke applications such as testing whether food is halal. In this case, the PCR testing is combined with a RapidFinder™ halal identification kit, which is used to check whether there is any pork in the food or feed through the presence of DNA.

In Summary

When it comes to mitigating the risk of foodborne illness, the role of accurate pathogen testing cannot be overstated. Food producers that take a proactive approach to testing, and use accurate methods such as PCR testing, can benefit from rapid, precise results that give peace of mind that their product is safe for consumption. In incidents where contamination is detected, a fast, early result can reduce the damages of a food recall.

As a world-leading supplier of scientific technology and products, Thermo Fisher Scientific is a one-stop source for proven, reliable, food safety testing solutions. With our microbiological expertise, insights and market-leading solutions, we can help you at every step of the food safety workflow. Importantly, Thermo Fisher Scientific gives you access to a complete testing solution, and one that can be tailored to your unique requirements.

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