Testing times:

Food safety and the impact of a global pandemic on the meat industry

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Food safety has never been more critical for the meat industries of Australia and New Zealand. While there is no evidence that COVID-19 can be transmitted through either food or food packaging[1], public awareness and consumer concern about meat safety has been heightened during the pandemic. Particularly when meatworks have been identified as hotspots for coronavirus infection.

From the abattoirs, to the processing plants, to the contact labs employed to provide testing, all businesses within the poultry, white and red meat sectors have been under increased pressure to ensure their products and facilities are pathogen-free.

This white paper discusses the challenges facing the Australian and New Zealand (ANZ) meat industries in the wake of the pandemic, and the potentially devastating effects of an outbreak in the context of historic incidents. Importantly, it stipulates what preventative measures are required to ensure public safety in the form of food and environmental testing.

The COVID-19 crisis

The pandemic has wreaked havoc on the global meat industry, with disruption and closure of processing factories threatening the supply of meat in North America and Europe[2].

In July 2020, the United States (US) Centers for Disease Control (CDC) reported that over 17,000 of an estimated half a million meat and poultry processing workers had contracted COVID-19[3]. By November 2020 those figures had risen even more substantially – data collected by the US Food and Environment Reporting Network revealed at least 73,619 meatpacking workers alone had tested positive for coronavirus[4].

Antipodean numbers of coronavirus infection have been modest in comparison to the US, however, the meat sector has been recognised as a major contributor to the ‘second wave’ of cases seen in Australia. With over 300 cases linked to meatworks in Melbourne, the industry is responsible for more cases of COVID-19 than any other industry outside of aged care[5].

Why is the meat industry so vulnerable?

The conditions of meat and poultry facilities seem to be particularly conducive to the spread of SARS-CoV-2. Why is that?

Intrinsically, physical distancing between workers is difficult in meat and processing facilities. The cold temperatures, dry air and prolonged hours of close contact have all been hailed as factors in increasing the risk of COVID-19 transmission[6].

The US CDC ascribed heightened infection rates in meatworks to close proximity between workers in plants, insubstantial use of face masks and inadequate disinfection of high touch surfaces[7].

SARS-CoV-2 can also survive on stainless steel – which is the predominant surface material used in food processing facilities – for up to 7 days and remain infectious for up to 4 days[8].

Production losses

The US meat industry experienced severe production losses due to lockdowns or plant closures from COVID-19. In May 2020 this ranged from 30 per cent down in beef and pork slaughter plants and 15 per cent in chicken slaughter plants[9]. Moreover, millions of US farm animals were reportedly culled due to COVID-19 plant shutdowns[10].

By contrast, ANZ meat processing facilities did not see the shocking rates of coronavirus infection that the US experienced in 2020. Australian Meat Industry Council chief executive Mr Patrick Hutchinson attributed this to stricter hygiene and community controls, which he said had “doubled” in quarter one of 2020[11].

Despite having preventative measures in place, Melbourne’s West saw a concerning cluster of meatworks infections mid-2020, with one abattoir linked to 69 cases[12]. In response, ANZ abattoirs and processing plants intensified their cleaning regimes and environmental swabbing.

In Victoria, that meant the state’s 70-plus meat processing facilities had their production outputs cut by one-third third to implement the workplace safety measures under stage four COVID-19 restrictions. These measures were implemented on 7 August and partially eased on 28 September, 2020[13]. Premier Daniel Andrews said that meatworks – whether they were lamb, poultry or beef – would be subject to “some of the most stringent safety protocols that have been ever put in place in any industrial setting.”[14]

Foodborne disease: A meaty issue

While current World Health Organisation (WHO) advice suggests there is no evidence of the SARS-CoV-2 virus being transferred through meat product to consumers, there are a number of harmful pathogens that can be transmitted through different meat types[15]. Four of the most commonly transmitted pathogens include the *Shiga Toxin-producing Escherichia Coli* (STEC), *Salmonella, Campylobacter,* and *Listeria*[16].

In Australia, there are an estimated 4.1 million cases of food poisoning each year, resulting in 1 million doctor visits, 31,920 hospitalisations, and 86 deaths on average each year[17]. It costs the Australian economy an estimated $1.25 million annually[18].

Food poisoning affects more than 500 New Zealanders each day, with *Campylobacter* responsible for most cases[19]. In fact, in a comparison with Australia, the US and all of Europe combined, New Zealand reported the highest rates of *Campylobacteriosis* in 2018 – 142.4 cases per 100,000 population[20].

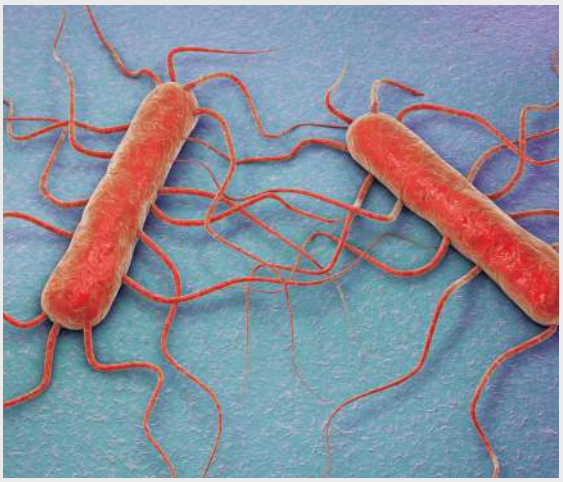
For companies within the meat industry, the consequences of testing positive for STEC or being responsible for an outbreak can be dire. Economic losses from having to close down facilities or production lines for cleaning and the discarding of product can be significant.

Meat product that has tested positive for pathogens may also result in producers being blocked from export. And in worst case scenarios – where food pathogens cause large-scale illness and require full recall – a business might suffer irreputable brand damage and fall into bankruptcy.

Importantly, the need for food product in the meat industry has wider implications for antipodean communities, as the industry contributes significantly to both Australian and New Zealand economies. In 2017-18, Australia's red meat and livestock industry alone contributed $18.5 billion to the Australian Gross Domestic Product (GDP) – or 1.5% of Australia's key industry GDP[21]. While in New Zealand, the red meat industry accounts of 4.7 per cent national employment and nearly $12 billion industry value added[22].

Jack-in-the-Box case study

One of the most notorious cases of food poisoning is an *E.coli* outbreak that resulted from contaminated hamburger patties sold at US fast food chain Jack-in-the-Box in late 1992 and early 1993. A meat traceback by the US CDC identified six slaughter plants as likely sources of carcasses used in the contaminated meat lots. The tragic event – which caused over 700 cases of food poisoning, 171 hospitalisations and 4 deaths – has been recognised as a catalyst for tighter food safety controls across the globe, including the worldwide implementation of the Hazard Analysis Critical Control Points (HACCP)[23-25].



Listeria outbreak in South Africa

In March 2018, South African authorities identified a 'ready to eat' processed meat product known as 'Polony' as the source of a *Listeria* outbreak that was responsible for over 200 deaths. By 2020, this was still recognised as the world's largest outbreak of *Listeria,* with 1,060 cases[26]. Following this event, the WHO recommended that all countries should strengthen their national food safety strategies and disease surveillance systems to prevent similar occurrences and ensure a safe food supply[27].

Pathogen testing: Industry requirements and challenges

While the ANZ meat industry has a reputation for quality, safe meat among export markets, this is underlined by strict meat safety and traceability systems. Factoring in the short shelf life of meat and poultry products, there is an industry need for testing methods that enable the fast, accurate and cost-effective detection of pathogens to ensure enhanced food safety.

Pathogen testing in food laboratories has conventionally been dependent on time-consuming, culture-based techniques. Contrarily, molecular approaches are rapid and reliable[28,29].

While molecular testing may cost more to implement, the aphorism that "time is money" is particularly apt in this context. The more time it takes for laboratories to test for protein samples, the more likely it is that meat and poultry processors will have to discard meats due to their shorter shelf lives.

Moreover, rapid detection and early identification of food pathogens can reduce the costs of holding products in cold storage and mitigate product recalls. For example, if contamination of a particular batch at a processing plant is pinpointed early into its production, it might only require the jettison of that particular batch, compared with having to discard an entire day's production of meat product.

A combined testing solution

Applied Biosystems™ QuantStudio™ 5 Real-Time PCR System and 7500 Food Safety Fast RT-PCR Systems can be used in the detection of SARS-CoV-2 when testing samples from food, packaging and the environment[30].

Simultaneously, foodborne pathogens – including STEC, *Salmonella, Listeria* and *Campylobacter* – can be detected using the Thermo Scientific™ SureTect™ pathogen detection assays, which are validated to run on those systems[30,31].

Having a combined testing option can benefit those working within the meat and poultry sectors, as it enables users to monitor for both SARS-CoV-2 and other foodborne pathogens[31].

Rapid, reliable results simplified

From slaughter houses to processing plants or the contract laboratories that service these businesses, using the SureTect Assay workflows combined with the QuantStudio 5 food safety instrument can offer rapid results in under 24 hours[32].

The QuantStudio 5 is a high-performance benchtop platform, combining ease-of-use and system connectivity. Users can benefit from the flexibility of a 6-channel, 96-well, cloud-enabled open platform suitable for running all Thermo Scientific SureTect assays[32].

Summary

In the midst of the pandemic, food safety is as important as ever. The consequences of a foodborne disease outbreak can be catastrophic, as evidenced by historical events. Workers within the meat and poultry sectors are at high-risk of exposure to COVID-19 due the close interactions required to undertake key tasks[33] For this reason, the ANZ meat industries are faced with the combined challenge of having to monitor for both SARS-CoV-2 and foodborne pathogens such as STEC, *Salmonella, Listeria* and *Campylobacter.* Thermo Fisher Scientific offers a cost-effective, rapid and accurate testing solution that can monitor for food pathogens and the virus that causes COVID-19[34].

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