

Imported food risk statement
Ready-to-eat cooked and processed meat products and *Listeria monocytogenes*

Commodity: Ready-to-eat (RTE) cooked and processed meat products. This includes processed or manufactured meat, including pâtés and meat pastes, that are cooked and have undergone a processing step such as curing or comminuting. RTE cooked and processed meat products that are dried and/or in ambient stable sealed packages are not covered by this risk statement.

Microorganism: *Listeria monocytogenes*

Recommendation and rationale
<p>Is <i>L. monocytogenes</i> in RTE cooked and processed meat products a medium or high risk to public health?</p> <p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Uncertain, further scientific assessment required</p> <p>Rationale:</p> <ul style="list-style-type: none"> • Human illness has been associated with RTE cooked and processed meat products contaminated with <i>L. monocytogenes</i>. • For susceptible populations, infection with <i>L. monocytogenes</i> can have severe consequences. • <i>L. monocytogenes</i> contamination can occur after heat treatment and <i>L. monocytogenes</i> is able to grow during refrigerated storage. This commodity is able to support the growth of <i>L. monocytogenes</i> during the shelf-life of the product.

General description
<p>Nature of the microorganism:</p> <p><i>L. monocytogenes</i> is a Gram-positive, non-spore forming rod-shaped bacterium that can grow in both aerobic and anaerobic conditions. It is found throughout the environment and has been isolated from domestic and wild animals, birds, soil, vegetation, fodder and wet areas of food processing environments (FSANZ 2013).</p> <p>A distinguishing feature of <i>L. monocytogenes</i> is its ability to grow at refrigeration temperatures. Growth can occur at temperatures between 1.5 – 45.0°C, pH of 4.0 – 9.6 and a minimum water activity of approximately 0.90 when other conditions are near optimum. Temperatures above 50°C are lethal to <i>L. monocytogenes</i>, however, it is able to survive frozen storage at -18°C (ICMSF 1996; FSANZ 2013).</p>
<p>Adverse health effects:</p> <p>For susceptible populations <i>L. monocytogenes</i> is a severe hazard as it can cause life threatening illness (ICMSF 2002). People at risk of invasive listeriosis include pregnant women and their foetuses, newborn babies, the elderly and immunocompromised individuals (such as cancer, transplant and HIV/AIDS patients). Less frequently reported, but also at a greater risk, are patients with diabetes, asthma, cirrhosis and ulcerative colitis (FSANZ 2013).</p>

In pregnant women invasive listeriosis can cause spontaneous abortion, stillbirth or neonatal infection. Influenza-like symptoms, fever, and gastrointestinal symptoms can also occur in the mother. In immunocompromised individuals and the elderly invasive listeriosis can cause potentially fatal bacterial meningitis with symptoms of fever, malaise, ataxia and altered mental status. The onset of illness of invasive listeriosis generally ranges from 3 days to 3 months after infection. Invasive listeriosis has a fatality rate of 15 – 30% (FDA 2012; FSANZ 2013).

Nearly all cases of listeriosis in susceptible people result from the consumption of high numbers of the pathogen (Chen et al. 2003; FAO/WHO 2004). However, some foods support the growth of *L. monocytogenes*, enabling high levels of *L. monocytogenes* to be achieved during storage that may lead to illness through exposure to these higher levels.

Exposure to *L. monocytogenes* has minimal impact on the general healthy population. If illness does occur it is often mild and may be mistaken for a viral infection or flu (FSANZ 2012).

Consumption pattern:

In the 2007 Australian National Children's Nutrition and Physical Activity Survey, 27% of children aged 2 – 16 years reported consumption of RTE cooked and processed meat products (DOHA 2008). In the 2011 – 2012 Nutrition and Physical Activity Survey (part of the 2011 – 2013 Australian Health Survey) 29% of children (aged 2-16 years), 25% of adults (aged 17-69 years) and 28% of people aged 70 and above reported consumption of RTE cooked and processed meat products (Australian Bureau of Statistics 2011).

For both the 2007 and the 2011 – 2012 surveys, mixed foods that contained RTE cooked and processed meat products were excluded from the analysis. The 2007 survey derived data from two days of dietary recall data for each respondent (a respondent is counted as a consumer if the food was consumed on either day one or day two, or both days), compared with only one day of dietary recall data for the 2011 – 2012 survey. Using two days of data will result in a higher proportion of consumers compared to a single day only, meaning the results are not directly comparable.

Key risk factors:

RTE cooked and processed meat products have received a listericidal treatment. However post-processing contamination can occur as *L. monocytogenes* is a ubiquitous organism and can become established in processing environments. The inherent characteristics of this commodity allow the growth of *L. monocytogenes*, even when stored at <4°C.

Risk factors in the production of RTE cooked and processed meat products include inadequate cooking, ineffective cooling after cooking, lack of temperature control during storage and distribution, and poor standard of hygiene during post-processing handling and packing. For meat products that are cured and cooked, incorrect levels of added curing substances (salt and nitrite) also contribute (MLA 2015).

Risk mitigation:

Good hygienic practices in food manufacturing and food handling minimise *L. monocytogenes* contamination of food. Control measures that prevent the growth of high levels of *L. monocytogenes* in the food are expected to have the greatest impact on reducing rates of listeriosis, as nearly all cases of listeriosis result from the consumption of high numbers of the pathogen.

In Australia Division 3 of [Standard 4.2.3 of the Australia New Zealand Food Standards Code](#) (the Code) requires producers of RTE meat to implement a food safety management system which identifies, evaluates and controls food safety hazards.

[Schedule 27 of the Code](#) contains microbiological limits for *L. monocytogenes* in RTE food based on whether growth can occur or not:

- For RTE food in which growth of *L. monocytogenes* can occur n=5, c=0, m=not detected in 25g
- For RTE food in which growth of *L. monocytogenes* will not occur n=5, c=0, m=10² cfu/g.

Public information for vulnerable populations to avoid consumption of RTE food that supports the growth of *L. monocytogenes* is available on various government websites [including FSANZ's website](#).

Compliance history:

The imported food compliance data sourced from the Imported Food Inspection Scheme of the Australian Department of Agriculture and Water Resources for January 2007 – June 2013 showed that of the 166 *L. monocytogenes* tests applied to RTE cooked and processed meat products there were three fails, representing a 1.8% failure rate (*L. monocytogenes* levels were not enumerated). The failed samples were fully cooked meatballs from New Zealand and frankfurters from the United States.

There were 23 notifications on the European Commission's Rapid Alert System for Food and Feed (RASFF) for the presence of *L. monocytogenes* in RTE cooked and processed meat products during the period January 2007 – December 2015. Products included cooked ham and meat pâté and were from multiple countries. Among the notified products the counts of *L. monocytogenes* ranged from the presence of the organism to 15,000 CFU/g. There were an additional 14 notifications for ham (not stated if it was cooked), six notifications for mixed meat products (not stated if these were RTE cooked and processed meat products) and 11 notifications for pâté (not stated if it was meat pâté) from multiple countries.

There have been 19 food recalls in Australia of RTE cooked and processed meat products due to the presence of *L. monocytogenes* from January 2007 – December 2015. The recalled products were produced domestically and included roast meats, silverside, pastrami and frankfurters. There were an additional seven recalls for domestically produced ham, however, it was not stated if the product was cooked.

Surveillance information:

Listeriosis is a notifiable disease in all Australian states and territories with a notification rate in 2015 of 0.3 cases per 100,000 population (70 cases). This is the same as the previous five year mean (ranging from 0.3 – 0.4 cases per 100,000 population per year) (NNDSS 2016).

Illness associated with consumption of RTE cooked and processed meat products contaminated with *L. monocytogenes*

A search of the scientific literature via the EBSCO Discovery Service, the US CDC Foodborne Outbreak Online Database and other published literature during the period 1990 – December 2015 identified a number of reported listeriosis outbreaks associated with consumption of RTE cooked and processed meat products:

- Outbreak in Switzerland in 2011, nine cases of listeriosis linked to consumption of imported cooked ham. The outbreak strain of *L. monocytogenes* was isolated from cooked ham samples collected from the same retailer. Post-processing contamination occurred at the slicing and packing facility (Hachler et al. 2013)
- Outbreak in Canada in 2008, 57 cases including 24 fatalities linked to consumption of delicatessen meats. The food safety investigation identified the plant environment was conducive to the introduction and proliferation of *L. monocytogenes* and was persistently contaminated with *Listeria* spp. (Currie et al. 2015)
- Outbreak in Australia (SA) in 2005, three cases, including one fatality, linked to consumption of cold cooked meat in a hospital. The outbreak strain of *L. monocytogenes* was isolated from cold cooked meat samples, including corned beef slices, from the hospital kitchen and from food samples from the meat manufacturer (OzFoodNet 2006)
- Outbreak in the United States in 1998-1999, 108 cases which included 14 fatalities and four miscarriages or stillbirths linked to consumption of cooked frankfurters. The outbreak strain of *L. monocytogenes* was isolated from unopened packages of frankfurters from the manufacturer. Demolition of a ceiling refrigeration unit in the frankfurter hopper room may have led to increased contamination of production equipment, environmental surfaces and the meat products produced thereafter (Mead et al. 2006).

Prevalence of *L. monocytogenes* in RTE cooked and processed meat products

The prevalence of *L. monocytogenes* in pâté has declined since the 1990's, during this time in New Zealand around 20% of pâté samples were positive for *L. monocytogenes* (Wong et al. 2005). A more recent literature search with the EBSCO Discovery Service during the period 2000 – July 2015 identified that surveys of RTE cooked and processed meat products have isolated *L. monocytogenes* in 0.9 – 38% of samples (Gombas et al. 2003; Ristori et al. 2014). Examples of the more recent surveys are listed below:

- Survey in Spain in 2006-2012, *L. monocytogenes* was isolated from 1.6% of cooked ham samples collected from industry or retail (n=487), however, levels were not enumerated (Domenech et al. 2015)
- Survey in Brazil in 2008-2009, *L. monocytogenes* was isolated from 37.7% of hot dog samples collected at retail (n=138). Two samples had *L. monocytogenes* levels between 100-1000 CFU/g, the level of contamination of the remaining samples was <100 CFU/g (Ristori et al. 2014)
- Survey in Belgium in 2005-2007, *L. monocytogenes* was isolated from 1.1% of RTE cooked meat products collected from the producer (n=639). The level of contamination was <100 CFU/g (Uyttendaele et al. 2009)
- Survey in Austria in 2003-2004, *L. monocytogenes* was isolated from 4.5% of cooked sausage-pâté samples collected at retail (n=112), the level of contamination was <100 CFU/g (Wagner et al. 2007)
- Survey in the United States, *L. monocytogenes* was isolated from 0.89% of luncheon meat samples at retail (n=9199). Eight samples had *L. monocytogenes* levels between 100-10,000 CFU/g, the level of contamination of the remaining samples was <100 CFU/g (Gombas et al. 2003).

Other relevant standard or guideline

- Codex general principles of food hygiene *CAC/RCP 1 – 1969* follows the food chain from primary production through to final consumption, highlighting the key hygiene controls at each stage (Codex 2003)
- Codex code of hygienic practice for meat *CAC/RCP 58-2005* covers additional hygienic provisions for raw meat, meat preparations and manufactured meat from the time of live animal production up to the point of retail sale (Codex 2005)
- Codex guidelines on the application of general principles of food hygiene to the control of *L. monocytogenes* in foods *CAC/GL 61 – 2007* (Codex 2009) states:
 - For RTE foods in which growth of *L. monocytogenes* can occur the microbiological criterion for *L. monocytogenes* is n=5, c=0, m=absence in 25g
 - For RTE foods in which growth of *L. monocytogenes* cannot occur the microbiological criterion for *L. monocytogenes* is n=5, c=0, m=100 CFU/g.

Approach by overseas countries

Many countries, such as the European Union, the United States and Canada, have HACCP-based regulatory measures in place for the production of RTE cooked and processed meat products.

The United States has a zero tolerance for *L. monocytogenes* in RTE products as required by the Code of Federal Regulation 9 CFR 430. Three alternative methods can be used to control *L. monocytogenes* contamination of post-lethality exposed RTE products: (i) apply a post-lethality treatment to reduce or eliminate *L. monocytogenes* and an antimicrobial agent or process to suppress or limit growth of *L. monocytogenes*; (ii) apply either a post-lethality treatment or an antimicrobial agent or process; or (iii) rely on its sanitation program to control *L. monocytogenes* (FSIS 2014).

The European Commission regulation on microbiological criteria for foodstuffs (No. 2073/2005) specifies that n=5, c=0, m=100 CFU/g as food safety criteria for *L. monocytogenes* in RTE foods able to support the growth of *L. monocytogenes*, other than those intended for infants and for special medical purposes, for products placed on the market during their shelf-life. The limit of n=5, c=0, m=absence in 25g applies to the product before the food has left the immediate control of the food business operator who has produced it (European

Commission 2005).

Other considerations

Biosecurity restrictions apply to certain products under this commodity classification. Refer to the [BICON database](#).

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