Imported food risk statement
Uncooked slow dry cured ready-to-eat ham and *Listeria monocytogenes*

Commodity: Uncooked slow dry cured ready-to-eat (RTE) ham. Examples of this type of product include Iberian ham, Parma ham, Serrano ham and prosciutto.

Microorganism: *Listeria monocytogenes*

Recommendation and rationale
Is *L. monocytogenes* in uncooked slow dry cured RTE ham a medium or high risk to public health: ☐ *Yes* ☑ *No* ☐ *Uncertain, further scientific assessment required* **Rationale:** • Listeriosis occurs when foods containing high levels of *L. monocytogenes* are consumed • Post-processing contamination can occur, however growth of *L. monocytogenes* to levels that are associated with illness is unlikely to occur due to the low water activity of these products • No evidence of listeriosis attributed to uncooked slow dry cured RTE ham • International surveillance data have shown low prevalence of *L. monocytogenes* in uncooked slow dry cured RTE ham. Where *L. monocytogenes* was enumerated the levels were low (<100 CFU/g)

General description
Nature of the microorganism: *L. monocytogenes* 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). A distinguishing feature of *L. monocytogenes* 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 *L. monocytogenes*, however, it is able to survive frozen storage at -18°C (ICMSF 1996; FSANZ 2013).
Adverse health effects: For susceptible populations *L. monocytogenes* 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). 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 that may lead to illness.

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, <1% of children aged 2 – 16 years reported consumption of uncooked slow dry cured ham (DOHA 2008). In the 2011 – 2012 Nutrition and Physical Activity Survey (part of the 2011 – 2013 Australian Health Survey) <1% of children (aged 2 – 16 years), <1% of adults (aged 17 – 69 years) and <1% of people aged 70 and above reported consumption of uncooked slow dry cured ham (Australian Bureau of Statistics 2011-12).

For both the 2007 and the 2011 – 2012 surveys, mixed foods that contained uncooked slow dry cured ham 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:

Due to variability in the slow dry curing process, it cannot be assumed that the product has undergone a listericidal process. Portocarrero et al. (2002) demonstrated that, for artificially contaminated country-style cured ham aged for 234 days, the process was not sufficient to eliminate *L. monocytogenes*. Surveys of uncooked slow dry cured RTE hams in Australia, have indicated that some products were above the water activity and pH values known to inhibit *L. monocytogenes* growth (NSWFA 2013).

Post-processing contamination including cross-contamination can occur as *L. monocytogenes* is a ubiquitous organism.

Risk mitigation:

Reducing the prevalence of *L. monocytogenes* in the processing plant environment and reducing the initial load of *L. monocytogenes* on finished RTE processed meat will lead to a significant reduction in the likelihood of listeriosis resulting from consumption of processed RTE meat (Ross et al. 2009). Good hygienic practices in food manufacturing and food handling will minimise *L. monocytogenes* contamination of uncooked slow dry cured RTE ham.

In Australia Division 3 of Standard 4.2.3 of the Australia New Zealand Food Standards Code (the Code) states that RTE meat must be produced in Australia under 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=10^2 CFU/g

Uncooked slow dry cured RTE meat products will not support the growth of *L. monocytogenes* providing the water activity is <0.92 (Codex 2009; MLA 2015). As an example, the curing step of Parma ham has been shown to lead to a final water activity of 0.90-0.93 which is effective in limiting the growth of *L. monocytogenes* (Cotugno and Bonardi 2009).

Public information for vulnerable populations to avoid consumption of ready-to-eat food that supports the growth of *L. monocytogenes* is available on various government websites including FSANZ.

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 1,038 *L. monocytogenes* tests applied to uncooked slow dry cured RTE ham there were 31 fails, representing a 3.0% failure rate (test limit of n=5, c=0, m=not detected in 25g applied; *L. monocytogenes* levels were not enumerated). The failed samples included prosciutto, Serrano ham, Parma ham and Iberian ham imported from Spain and Italy.

There have been five notifications on the European Commission's Rapid Alert System for Food and Feed (RASFF) for *L. monocytogenes* in uncooked slow dry cured RTE ham products, including coppa, jambon de Bayonne and Serrano ham during the period from January 2007 – December 2015. Products were from France, Italy and Spain. Among the notified products the counts of *L. monocytogenes* ranged from presence of the organism – 340 CFU/g. There were an additional twelve notifications for ham and five notifications for mixed pork and meat products from multiple countries, however, it was not stated if any of these products were uncooked slow dry cured RTE ham.

There have been two food recalls in Australia due to the presence of *L. monocytogenes* in uncooked slow dry cured RTE ham from January 2007 – December 2015. The recalled products were prosciutto imported from Italy and pancetta produced domestically.

Uncooked slow dry cured RTE ham has been recalled internationally, with prosciutto recalled in Canada due to possible *L. monocytogenes* contamination (CFIA 2014).

Surveillance information:

Listeriosis is a notifiable disease in all Australian states and territories with a notification rate in 2014 of 0.3 cases per 100,000 population (80 cases). This was a decrease from the previous five year mean of 0.4 cases per 100,000 population per year (ranging from 0.3 – 0.4 cases per 100,000 population per year) (NNDSS 2015).

Illness associated with consumption of uncooked slow dry cured RTE ham contaminated with *L. monocytogenes*

Although listeriosis outbreaks have been attributed to deli meat (CDC 2015), a literature search via the EBSCO Discovery Service and the US CDC Foodborne Outbreak Online Database during the period 1990 – July 2015 did not identify any listeriosis outbreaks associated with consumption of uncooked slow dry cured RTE ham.

Prevalence of *L. monocytogenes* in uncooked slow dry cured RTE ham

A literature search with the EBSCO Discovery Service during the period 1990 – July 2015 identified that surveys of uncooked slow dry cured RTE ham have isolated *L. monocytogenes* in 0 – 4.1% of samples, although where reported, the levels were low (Giovannini et al. 2007; NSWFA 2013). Examples of surveys are listed below:

- Survey conducted by the New South Wales Food Authority from 2011 – 2012, *L. monocytogenes* was not detected in uncooked slow cured RTE meat samples (n=72) collected at retail (NSWFA 2013)
- A 33 month long survey in Italy, *L. monocytogenes* was isolated in 2.0% of dry-cured deboned packaged Parma ham samples collected at the curing plant (n=708); the level of contamination was ≤30 CFU/g (Prencipe et al. 2012)
- Survey in Italy, *L. monocytogenes* was isolated in 4.1% of dry cured de-boned Parma and San Daniele hams collected at the end of the production chain (n=490), the level of contamination was <1.5 MPN/g (Giovannini et al. 2007)
- Survey in Spain from 1998 – 2004, *L. monocytogenes* was not detected in cured dried ham samples (n=25) collected from retail or industry (Cabedo et al. 2008)

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
• Codex (2009) recommends that RTE foods will not support the growth of *L. monocytogenes* if the food has a:
  ○ pH < 4.4 regardless of water activity; or
  ○ water activity < 0.92 regardless of pH; or
  ○ pH < 5.0 in combination with a water activity of < 0.94

Approach by overseas countries
Many countries, such as the European Union, the United States and Canada, have HACCP-based regulatory measures in place for 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 unable 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 (European Commission 2005).

Other considerations
Biosecurity requirements apply to certain products under this commodity. Refer to the BICON database.

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