Imported food risk statement
Cheese (production includes a heat treatment step) in which growth of *Listeria monocytogenes* can occur

Commodity: Cheese that has undergone a heat treatment step during production and in which growth of *Listeria monocytogenes* can occur. Examples of this type of product include cheese prepared from pasteurised or thermised milk (with additional hurdles) or those subject to a high temperature curd cook; and have physico-chemical characteristics (e.g. high pH and water activity) such that growth of *L. monocytogenes* can occur.

Microorganism: *Listeria monocytogenes*

Recommendation and rationale
Is *L. monocytogenes* in cheese that has undergone a heat treatment step during production and in which growth of the organism can occur a medium or high risk to public health: ☑ *Yes* ☐ *No* ☐ *Uncertain, further scientific assessment required* **Rationale:** • Human illness has been associated with this category of cheese contaminated with *L. monocytogenes*. For susceptible populations, infection with *L. monocytogenes* can have severe consequences • Food recall data in Australia, surveillance and compliance data internationally have shown detections of *L. monocytogenes* in this category of cheese • *L. monocytogenes* contamination can happen after pasteurisation and growth of *L. monocytogenes* can occur during refrigerated storage

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 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, in some foods growth of *L. monocytogenes* can occur, 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 patterns:

In the 2007 Australian National Children's Nutrition and Physical Activity Survey, <1% of children (aged 2 – 16 years) reported consumption of Brie, Camembert and/or Ricotta cheese (production includes a heat treatment step) (DOHA 2008). In the 2011 – 2012 Nutrition and Physical Activity Survey (part of the 2011 – 2013 Australian Health Survey), 1% of people (aged 2 and above) reported consumption of Brie, Camembert and other surface ripened cheese (ABS 2014). The published data for the 2011 – 2012 survey at this level of specificity of cheese type is not available by age group breakdown.

For both the 2007 and the 2011 – 2012 survey, mixed foods that contained cheese 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:

L. monocytogenes has been identified as a concern for this category of cheese in previous work performed by FSANZ (2006; 2014). *L. monocytogenes* can be a contaminant of milk sourced from infected herds. Through chain controls, including effective heat treatment during cheese production, will inactivate *L. monocytogenes* present in this category of cheese. However, re-contamination can occur after this processing step as *L. monocytogenes* is an ubitiqious organism and can become established in processing environments. Due to the inherent characteristics of this commodity, growth of *L. monocytogenes* can occur, even when stored at <4°C.

Risk mitigation:

Good hygienic practices in food manufacturing and food handling minimise *L. monocytogenes* contamination of food. The implementation of control measures (e.g. temperature control) so that growth of high levels of *L. monocytogenes* will not occur 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.

Pasteurisation of milk, or equivalent measures during production as specified under clause 16 of Standard 4.2.4 in the Australia New Zealand Food Standards Code (the Code), will inactivate *L. monocytogenes*. Good hygienic practices in food manufacturing and food handling will minimise *L. monocytogenes* contamination of this category of cheese.

In Australia Standard 4.2.4 of the Code sets out a number of food safety requirements for primary production and processing of dairy products, including the implementation of documented food safety programs for dairy primary production, collection, transportation and processing.

Standard 1.6.1 of the Code has a microbiological limit for *L. monocytogenes* in ready-to-eat (RTE) food in which growth of *L. monocytogenes* can occur of n=5, c=0, m=not detected in 25g.

Clause 6 of Standard 1.6.1 of the Code states that, for the purposes of the Schedule, growth of *L. monocytogenes* will not occur in a RTE food if –

(a) the food has a pH less than 4.4 regardless of water activity; or
(b) the food has a water activity less than 0.92 regardless of pH; or
(c) the food has a pH less than 5.0 in combination with a water activity of less than 0.94; or
(d) the food has a refrigerated shelf life no greater than 5 days; or
(e) the food is frozen (including foods consumed frozen and those intended to be thawed immediately before consumption); or
(f) it can be validated that the level of *Listeria monocytogenes* will not increase by greater than 0.5 log CFU/g over the food's stated shelf life.

Additional information can be found in the FSANZ document *Guidance on the application of microbiological criteria for Listeria monocytogenes in RTE food*.

Public information for vulnerable populations to avoid consumption of RTE food in which growth of *L. monocytogenes* can occur is available on various government websites including FSANZ's website.

Compliance history:

For the purposes of this assessment, it was considered likely that growth of *L. monocytogenes* can occur in soft and particular semi-soft cheeses. The imported food compliance data sourced from the Imported Food Inspection Scheme of the Australian Department of Agriculture for January 2007 – January 2014 showed that of the 314 *L. monocytogenes* tests applied to this category of cheese there were 9 fails, a 2.9% failure rate (based on detection of the presence of *L. monocytogenes*, the levels were not enumerated). The failed samples were soft Gorgonzola from Italy and France. There were an additional 1349 *L. monocytogenes* tests applied to cheese where it is uncertain whether growth of *L.* monocytogenes can occur. It is likely that some of these cheese samples may fit into this category of cheese, however, there is not enough information to confirm this.

There were 24 notifications on the European Commission's Rapid Alert System for Food and Feed (RASFF) for the presence of *L. monocytogenes* in cheeses in which it is considered likely that growth of *L. monocytogenes* can occur from multiple countries during the period from January 2007 – January 2014 (it was not stated if the production included heat treatment). Among the notified products the counts of *L. monocytogenes* ranged from presence in a 25g sample to 8.5 x 10^4 CFU/g. There were an additional 58 notifications from multiple countries for cheese where it is uncertain whether growth of *L.* monocytogenes can occur. It is likely that some of these cheese samples may fit into this category of cheese, however, the description provided in RASFF did not provide enough information to confirm this.

There have been nine food recalls in Australia for this category of cheese from January 2007 – January 2014. Eight of these recalls were for soft cheeses produced domestically. The other recall was for soft cheese imported from Italy.

Surveillance information:

Listeriosis is a notifiable disease in all Australian states and territories with a notification rate in 2013 of 0.3 cases per 100,000 population (76 cases). This is the same as the previous five year mean of 0.3 cases per 100,000 population per year (ranging from 0.3 – 0.4 cases per 100,000 population per year) (NNDSS 2014).

Illness associated with consumption of cheese (production includes a heat treatment) in which growth of pathogens can occur 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 – September 2014, identified there are a number of reported listeriosis outbreaks associated with consumption of with this category of cheese.

- Outbreak in Australia (multi-jurisdictional) in 2012 – 2013, 34 cases of illness including one miscarriage and six other fatalities linked to consumption of Brie and Camembert cheese made from pasteurised milk. The outbreak strain of *L. monocytogenes* was isolated from product produced by the implicated manufacturer and in product sampled at retail (OzFoodNet 2013)
- Outbreak in the United States in 2009, eight cases of illness linked to consumption of Mexican-style cheese made from pasteurised milk. The outbreak strain of *L. monocytogenes* was isolated from the cheese production plant. Post-pasteurisation contamination occurred, possibly due to a vat gasket cleaning issue (Jackson et al. 2011)
- Outbreak in Canada in 2008, 38 cases of illness including three miscarriages linked to consumption of a commercial soft washed-rind cheese made from pasteurized milk. Post-processing contamination occurred, such as cross-contamination at retail (Gaulin et al. 2012)
- Outbreak in Germany in 2006 – 2007, 189 cases of illnesses with a 14% fatality rate, linked to consumption of a soft cheese made from pasteurised milk (Koch et al. 2010)

Prevalence of *L. monocytogenes* in cheese (production includes a heat treatment step) in which growth of pathogens can occur

A search of the scientific literature via the EBSCO Discovery Service during the period 1990 – September 2014, identified that surveys of this category of cheese have isolated *L. monocytogenes* in 0 – 11% of samples (Brito et al. 2008; Barancelli et al. 2011). Examples of surveys are listed below:

- Survey in Brazil in 2008 – 2009, *L. monocytogenes* was not detected in Minas Frescal (Latin-style soft cheese) samples made from pasteurised milk (n=130) collected at cheese manufacturing plants (Barancelli et al. 2011)
- Survey in Brazil in 2005 – 2006, *L. monocytogenes* was isolated in 11% of Minas Frescal cheese samples (Latin-style soft cheese) samples made from pasteurised milk (n=55) at retail, the level of contamination was 2.48 – 4.28 $\log_{10}$ CFU/g (Brito et al. 2008)
- Survey in the United Kingdom in 2004 – 2005, where *L. monocytogenes* was isolated in 0.2% of unripened soft (fresh) cheese (n=412) and 0.06% of ripened soft cheese (n=1622), samples were made from pasteurised milk and collected at retail, the level of contamination was $<10^2$ CFU/g (Little et al. 2008)

Other relevant standards or guidelines

- Codex general principles of food hygiene *CAC/RCP 1 – 1969* provides key hygiene controls from primary production through to final consumption (Codex 2003)
- Codex code of hygienic practice for milk and milk products *CAC/RCP 57-2004* covers additional hygienic provisions for the production, processing and handling of milk and milk products (Codex 2004)
- Codex guidelines on the application of general principles of food hygiene to the control of *L. monocytogenes* in foods *CAC/GL 61 – 2007* (Codex 2007) states:
    - For ready-to-eat 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 ready-to-eat foods in which growth of *L. monocytogenes* cannot occur the microbiological criterion for *L. monocytogenes* is n=5, c=0, m=100 CFU/g
- There are *E. coli* limits in Standard 1.6.1 of the Code for all cheeses. Generic *E. coli* is used as an indicator of process hygiene (ICMSF 2011)

Approach by overseas countries

Many countries, such as the European Union, the United States and Canada, have HACCP-based measures in place for production of this commodity.

Other considerations
Quarantine restrictions apply to products under this commodity classification. Refer to the ICON database.

This risk statement was compiled by FSANZ in: July 2015

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