

Imported food risk statement
Cheese (production includes a heat treatment step) in which growth of
***Listeria monocytogenes* will not occur**

Commodity: Cheese that has undergone a heat treatment step during production and in which growth of *Listeria monocytogenes* will not 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. low pH and water activity) that limit growth of *L. monocytogenes*.

Microorganism: *Listeria monocytogenes*

Recommendation and rationale
<p>Is <i>L. monocytogenes</i> in cheese that has undergone a heat treatment step during production and in which growth of the organism will not occur a medium or high risk to public health*:</p> <p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> Uncertain, further scientific assessment required</p> <p>Rationale:</p> <ul style="list-style-type: none"> • Listeriosis occurs when foods containing high levels of <i>L. monocytogenes</i> are consumed • Effective through chain controls include a heat treatment step sufficient to inactivate <i>L. monocytogenes</i> present in the raw milk • Post-processing contamination can occur, however growth of <i>L. monocytogenes</i> to levels that are associated with illness will not occur due to the physico-chemical characteristics of these products • There is limited evidence of listeriosis attributed to this category of cheese <p>*Provided that effective through chain controls are in place</p>

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 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</p>

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, 71% of children aged 2 – 3 years and 66% of children aged 4 – 8 years reported consumption of this category of cheese (DOHA 2008). In the 2011 – 2012 Nutrition and Physical Activity Survey (part of the 2011 – 2013 Australian Health Survey), 43% of children aged 2 – 3 years, 39% of children aged 4 – 8 years and 31% of adults (aged 19 years and above) reported consumption of cheese (ABS 2014). The reported 2011 – 2012 survey data includes consumption of all types of cheese grouped together, including cheese in which growth of *L. monocytogenes* can and will not occur. Only 1% of people (aged 2 and above) reported consumption of cheese in which growth of *L. monocytogenes* can occur (ABS 2014).

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 can be a contaminant of milk sourced from infected herds. Through chain controls, including effective heat treatment during cheese production, will negate this risk for this category of cheese.

Post processing contamination can occur, although a number of factors and/or product characteristics influence the potential for growth of *L. monocytogenes* in cheese including pH, salt concentration, water activity, maturation/ripening conditions, temperature and duration of refrigerated/chilled storage (FSANZ 2006; FSANZ 2014).

Risk mitigation:

Good hygienic practices in food manufacturing and food handling minimise *L. monocytogenes* contamination of food. The implementation of control measures 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* will not occur of $n=5$, $c=0$, $m=10^2$ CFU/g.

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.

It is considered likely that growth of *L. monocytogenes* will not occur in RTE foods consumed frozen and those intended to be thawed just before consumption (to be eaten cold or re-heated). However, final use of the frozen product and instructions for use should be taken into consideration, for example product intended to be thawed and chilled for retail sale (where growth of *L. monocytogenes* can occur).

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* will not occur in hard and semi-hard 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 217 *L. monocytogenes* tests applied to this category of cheese there were 7 fails, a 3.2% failure rate. The failed samples were Piccante Gorgonzola from Italy. The test applied to these cheese samples was based on the detection of the presence of *L. monocytogenes* (the levels were not enumerated). Standard 1.6.1 of the Code has an acceptable level of <100 CFU/g for RTE food in which growth of *L. monocytogenes* will not occur. If the <100 CFU/g limit had been applied to these imported cheese samples it is likely that the failure rate would be lower. There were an additional 1349 *L. monocytogenes* tests applied to cheese where it is uncertain whether growth of *L. monocytogenes* will not 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 has been one notification on the European Commission's Rapid Alert System for Food and Feed (RASFF) for the presence of *L. monocytogenes* in Gouda cheese (semi-hard cheese) from Poland during the period from January 2007 – January 2014 (it was not stated if the product had undergone a heat treatment step). *L. monocytogenes* was detected in a 25g sample, although the level was not reported. There were an additional 58 notifications from multiple countries for cheese where it is uncertain whether growth of *L. monocytogenes* will not occur. Some of these cheese notifications may belong in this category of cheese, however, the description provided in RASFF did not provide enough information to determine this.

There have been four food recalls in Australia for this category of cheese due to the presence of *L. monocytogenes* from January 2007 – January 2014. These recalls were all for domestic product and included Cheddar, Gouda and hard pepper cheese.

Although there have been detections of *L. monocytogenes* and food recalls, growth of *L. monocytogenes* to levels that would be of risk to public health and safety will not occur.

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 step) in which growth of pathogens will not 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 limited reports of listeriosis outbreaks potentially associated with consumption of this category of cheese.

- Outbreak in the United States in 2006, 3 cases of illness and 1 fatality linked to consumption of pasteurised sheep cheese (not stated if growth of *L. monocytogenes* will not occur in the product) (Oregon DHS 2008; CDC 2014)
- Outbreak in Denmark in 1989 – 1990, 26 cases of illness with a 26% fatality rate linked to consumption of blue mould cheese or hard cheese (not stated if the production included heat treatment) (Jensen et al. 1994; Norton and Braden 2007)

Prevalence of *L. monocytogenes* in cheese (production includes a heat treatment step) in which growth of pathogens will not occur

A search of the scientific literature via the EBSCO Discovery Service and other published literature during the period 1990 – September 2014, identified that data on the prevalence of *L. monocytogenes* in this category of cheese is limited.

- Survey in the United Kingdom in 2004 – 2005, where *L. monocytogenes* was isolated in 0.3% of semi-hard cheese samples made from pasteurised milk (n=584) collected at retail, the level of contamination was 10^2 CFU/g (Little et al. 2008)
- Surveys in Australia in 2002 – 2005, *L. monocytogenes* was isolated in 4.3% of pasteurised low moisture cheese samples collected as part of the Dairy Food Safety Victoria product testing program, although levels were not reported (n=185) (FSANZ 2006)

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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