

### Imported food risk statement

#### Ready-to-eat cooked and processed meat products and staphylococcal enterotoxin

**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.

**Microbial enterotoxin:** Staphylococcal enterotoxin (SE)

Recommendation and rationale
<p>Is SE in RTE cooked and processed meat products 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><b>Rationale:</b></p> <ul style="list-style-type: none"> <li>Limited evidence for RTE cooked and processed meat products being contaminated with high levels of <i>Staphylococcus aureus</i> or the presence of SE.</li> <li>Limited evidence for Staphylococcal food poisoning attributed to the consumption of RTE cooked and processed meat products. Where it was reported, it predominantly occurred in the food service setting and was often associated with infected food handlers, food handling deficiencies or improper storage temperatures.</li> <li><i>S. aureus</i> is inactivated by the cooking process applied during the production of RTE cooked and processed meat products.</li> <li>Although SE can survive the cooking process, large numbers of <i>S. aureus</i> are required for SE production to occur. Implementation of good hygienic practice and temperature control minimises growth of <i>S. aureus</i>.</li> </ul>

General description
<p><b>Nature of the microbial enterotoxin:</b></p> <p><i>Staphylococcus</i> spp. are facultative anaerobic Gram-positive, non-spore forming spherical-shaped bacteria. They are commonly found in the environment, humans (nose and skin) and animals. Although several <i>Staphylococcus</i> species can produce SEs, including both coagulase-negative and coagulase-positive isolates, the majority of staphylococcal food poisoning (SFP) is attributed to SE produced by coagulase-positive <i>S. aureus</i> (FDA 2012; FSANZ 2013).</p> <p>Growth of <i>S. aureus</i> can occur at temperatures between 7 – 48°C, pH of 4.0 – 10.0 and a minimum water activity of 0.83 when other conditions are near optimum. SEs are resistant to heat inactivation and cannot be destroyed by cooking. SEs remain stable under frozen storage (FSANZ 2013).</p>

**Adverse health effects:**

SE is a moderate hazard as it generally causes illness of short duration and usually no sequelae (ICMSF 2002). People of all ages are susceptible to SFP. However, the severity of symptoms may vary depending on the amount of SE consumed and the general health status of individuals. The young and elderly are more likely to develop more serious symptoms (FSANZ 2013).

SFP is characterized by rapid onset gastroenteritis that appears around three hours after ingestion (normal range of 1 – 6 hours). Common symptoms of SFP include nausea, vomiting, abdominal cramps and diarrhea. Recovery is usually between 1 – 3 days (FSANZ 2013).

People become ill after exposure to very small quantities of SE (less than 1 µg). These levels of toxin are generally observed when *S. aureus* populations exceed 10<sup>5</sup> CFU/g of food (FDA 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:**

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).

Temperature abuse may allow growth of *S. aureus* and potential SE production.

**Risk mitigation:**

Cooking applied in the production of RTE cooked and processed meat products is lethal to *S. aureus*, but not to SE.

Time and temperature abuse of food products should be avoided by applying good practices of temperature control in food manufacturing and handling. Good manufacturing practices and good hygienic practices will also play a role in preventing SFP.

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 coagulase positive staphylococci in packaged cooked cured/salted meat of n=5, c=1, m=100/g, M=1000/g.

**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 165 coagulase positive staphylococci tests applied to RTE cooked and processed meat products there were no fails.

There was one notification on the European Commission's Rapid Alert System for Food and Feed (RASFF) for high levels of *S. aureus* in various meat products from the Netherlands during the period January 2007 – December 2015. However, it was not stated if any of these products were RTE cooked and processed meat products.

There have been no food recalls in Australia due to the presence of SE or *S. aureus* in imported or domestically produced RTE cooked and processed meat products from January 2007 – December 2015.

#### **Surveillance information:**

SFP is not a notifiable disease in Australia. There was one reported outbreak in Australia in 2013, one reported outbreak in 2012 and two reported outbreaks in 2011. Factors that may have contributed to the outbreaks include the role of infected food handlers, poor food handling practices and temperature abuse of food. It is generally recognised that there may be significant under reporting of SFP due to the short duration of illness and self-limiting symptoms. In Australia it is estimated that *S. aureus* accounts for 1% of foodborne illness caused by known pathogens (FSANZ 2013; Pillsbury et al. 2013; OzFoodNet 2014; OzFoodNet 2015).

#### **Illness associated with consumption of RTE cooked and processed meat products contaminated with SE**

A search of the scientific literature via the EBSCO Discovery Service and the US CDC Foodborne Outbreak Online Database during the period 1990 – December 2015 identified there are limited reports of SFP outbreaks associated with consumption of RTE cooked and processed meat products:

- There have been several outbreaks, such as those described by CDC (1997) and Richards (1993), that were associated with RTE cooked and processed meat products attributed to food handling deficiencies, inadequate storage temperatures and/or preparation by infected food handlers
- There were eight confirmed SFP outbreaks linked to consumption of RTE cooked and processed meat products and 18 outbreaks associated with ham (not stated if it was cooked) on the US CDC Foodborne Outbreak Online Database from 1998 – 2014. The majority of these SFP outbreaks occurred in a food service setting (CDC 2015).

#### **Prevalence of *S. aureus* in RTE cooked and processed meat products**

A literature search with the EBSCO Discovery Service during the period 1990 – December 2015 identified that surveys of RTE cooked and processed meat products have detected *S. aureus* in 0-31% of samples (Park et al. 2014; Xing et al. 2014). Examples of surveys are listed below:

- Survey in Egypt in 2012, *S. aureus* was not detected on beef frankfurters (n=40) and was detected on 10% of beef luncheon meat (n=40) samples at retail, although the levels were not reported. *S. aureus* was also detected on 20% of hand swabs (n=20) and 30% of nasal swabs (n=20) of food handlers, demonstrating the potential role of food handlers in food contamination (Awadallah et al. 2014)
- Survey in China in 2012, *S. aureus* was detected in 31.3% of RTE cooked meats (n=32), although the levels of *S. aureus* were not reported (Xing et al. 2014)
- Survey in Korea, *S. aureus* was not detected in cooked sausages or mixed pressed ham at the end of production (after the second heating step) at the factory (n=45) (Park et al. 2014)
- Survey in Wales from 1995 – 2003, where unsatisfactory levels of *S. aureus* ( $10^2$  –  $10^4$  CFU/g) were isolated in 0.4% of RTE sliced beef and poultry meat (n=1589) and 1.4% of RTE sliced ham (n=973), and unacceptable levels of *S. aureus* ( $\geq 10^4$  CFU/g) were isolated in 0.06% of RTE sliced beef and poultry meat (n=1589) and 0.1% of RTE sliced ham (n=973) collected at retail (Meldrum et al. 2005).

#### **Other relevant standard or guideline**

- [FSANZ guidelines for the microbiological examination of ready-to-eat food](#) have a satisfactory level for coagulase positive staphylococci of  $<10^2$  CFU/g. Food is deemed potentially hazardous if levels of coagulase positive staphylococci are  $\geq 10^4$  CFU/g or SE is detected (FSANZ 2001)
- 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).

#### Approach by overseas countries

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

The Canadian microbiological guidelines recommend *S. aureus* limits in heat treated fermented sausage to be to n=5, c=1, m=50, M=10,000 (Health Canada 2008).

#### Other considerations

Testing for high levels of coagulase-positive staphylococci is an indicator test for the presence of SE.

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

**This risk statement was compiled by FSANZ in: June 2016**

#### References

Australian Bureau of Statistics (2011) National Nutrition and Physical Activity survey, 2011-2012, Basic CURF, CD-ROM. Findings based on ABS Curf data.

Awadallah MAI, Ahmed HA, Merward AM (2014) Prevalence of non-O157 shiga toxin-producing *Escherichia coli* and enterotoxigenic *Staphylococci* in ready-to-eat meat products, handlers and consumers in Cairo, Egypt. *Global Veterinaria* 12(5):692–699

CDC (1997) Outbreak of staphylococcal food poisoning associated with precooked ham - Florida, 1997. *Morbidity & Mortality Weekly Report* 46(50):1189–1191

CDC (2015) Foodborne outbreak online database (FOOD). Centers for Disease Control and Prevention, Atlanta. <http://www.cdc.gov/foodborneoutbreaks/>. Accessed 3 February 2016

Codex (2003) General principles of food hygiene (CAC/RCP 1 - 1969). Codex Alimentarius Commission, Geneva

Codex (2005) Code of hygienic practice for meat (CAC/RCP 58 - 2005). Codex Alimentarius Commission, Geneva

DOHA (2008) 2007 Australian national children's nutrition and physical activity survey - Main findings. Department of Health and Ageing, Canberra. <http://www.health.gov.au/internet/main/publishing.nsf/Content/health-publth-strateg-food-monitoring.htm>. Accessed 27 March 2015

FDA (2012) Bad bug book: Foodborne pathogenic microorganisms and natural toxins handbook, 2nd ed. US Food and Drug Administration, Silver Spring. <http://www.fda.gov/food/foodborneillnesscontaminants/causesofillnessbadbugbook/default.htm>. Accessed 23 July 2015

FSANZ (2001) Guidelines for the microbiological examination of ready-to-eat foods. Food Standards Australia New Zealand, Canberra. <http://www.foodstandards.gov.au/publications/documents/Guidelines%20for%20Micro%20exam.pdf>. Accessed 24 March 2016

FSANZ (2013) Agents of foodborne illness. 2nd ed, Food Standards Australia New Zealand, Canberra.  
[http://www.foodstandards.gov.au/publications/Documents/FSANZ\\_FoodborneIllness\\_2013\\_WEB.pdf](http://www.foodstandards.gov.au/publications/Documents/FSANZ_FoodborneIllness_2013_WEB.pdf).  
Accessed 4 September 2013

Health Canada (2008) Health products and food branch (HPFB) - Standards and guidelines for microbiological safety of food - An interpretive summary. In: Compendium of Analytical Methods, Volume 1. Health Canada, Ottawa,

ICMSF (2002) Selection of cases and attributes plans. Ch 8 In: Microorganisms in food 7: Microbiological testing in food safety management. Kluwer Academic/Plenum publishers, London, p. 145–172

Meldrum RJ, Ribeiro CD, Smith RMM, Walker AM, Simmons M, Worthington D, Edwards C (2005) Microbiological quality of ready-to-eat foods: Results from a long-term surveillance program (1995 through 2003). *Journal of Food Protection* 68(8):1654–1658

MLA (2015) Guidelines for the safe manufacture of small goods. Meat & Livestock Australia, Sydney

OzFoodNet (2014) OzFoodNet Quarterly report, 1 January to 31 March 2013. *Communicable Diseases Intelligence* 38(1):E70–E77

OzFoodNet (2015) Monitoring the incidence and causes of diseases potentially transmitted by food in Australia: Annual report of the OzFoodNet Network, 2011. *Communicable Diseases Intelligence* 39(2):E236–E264

Park MS, Wang J, Park JH, Forghani F, Moon JS, Oh DH (2014) Analysis of micorbiological contamination in mixed pressed ham and cooked sausage in Korea. *Journal of Food Protection* 77(3):412–418

Pillsbury A, Chiew M, Bates J, Sheppard V (2013) An outbreak of staphylococcal food poisoning in a commercially catered buffet. *Communicable Diseases Intelligence* 37(2):E144–148

Richards MS, Rittman M, Gilbert TT, Opal SM, DeBuono BA, Neill RJ, Gemski P (1993) Investigation of a staphylococcal food poisoning outbreak in a centralized school lunch program. *Public Health Reports* 108(6):765–771

Xing X, Li.G., Zhang W, Wang X, Xia X, Yang B, Meng J (2014) Prevalence, antimicrobial susceptibility, and enterotoxin gene detection of *Staphylococcus aureus* isolates in ready-to-eat foods in Shaanxi, People's Republic of China. *Journal of Food Protection* 77(2):331–334