Imported food risk statement
Ready-to-eat cooked and processed meat products and Shiga toxin-producing *Escherichia coli*

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: Shiga toxin-producing *Escherichia coli* (STEC)

Recommendation and rationale

Is STEC in RTE cooked and processed meat products a medium or high risk to public health?

☐ *Yes*

☑ *No*

☐ *Uncertain, further scientific assessment required*

Rationale:

- Prevalence of STEC in RTE cooked and processed meat products is low and there is limited evidence of human illness attributed to consumption of RTE cooked and processed meat products.
- STEC are inactivated by the cooking process applied during the production of RTE cooked and processed meat products.

General description

Nature of the microorganism:

E. coli are facultative anaerobic, Gram-negative, rod-shaped bacteria. They are found in warm-blooded animals and humans as part of the normal intestinal flora (FSANZ 2013). The majority of *E. coli* are harmless, however some have acquired specific virulence attributes, such as Shiga toxin-producing *E. coli* (STEC), which can cause severe diarrheal disease in humans (FDA 2012). Major foodborne pathogenic STEC strains include O26, O45, O103, O111, O121, O145, O157 (FDA 2012) and O104 (ECDC/EFSA 2011). The major animal reservoir of STEC is ruminants. STEC can also colonise other animals and birds, although the incidence of STEC is lower than in ruminants (FSANZ 2013; Meng et al. 2013).

Growth of *E. coli* can occur at temperatures between 7 – 46°C, pH of 4.4 – 10.0 and a minimum water activity of 0.95 when other conditions are near optimum. Some STEC strains are able to survive at pH 2.5 – 3.0 for over 4 hours. STEC is able to survive frozen storage at -20°C, however, it is readily inactivated by cooking (FSANZ 2013; Meng et al. 2013).

Adverse health effects:

STEC is a severe hazard as it can cause life threatening illness or substantial chronic sequelae (ICMSF 2002). People of all ages are susceptible to infection with STEC. However, the young and the elderly are more susceptible and are more likely to develop serious symptoms (FSANZ 2013).

Symptoms include diarrhoea, abdominal pain, vomiting and fever. The onset of illness is typically 3 – 8 days after infection and most patients recover within 10 days of the initial onset of symptoms. Acute STEC infections (haemorrhagic colitis) are characterised by severe abdominal cramps and bloody diarrhoea. Approximately 3 – 7% of haemorrhagic colitis cases develop the sequelae haemolytic uraemic syndrome (HUS). HUS is characterised by acute kidney injury, thrombocytopenia and haemolytic anaemia. Children under five years of age are more susceptible to developing HUS following STEC infection. About 30% of patients with HUS develop minor sequelae such as proteinuria, and 5% of patients develop severe sequelae such as stroke and kidney failure. The fatality rate of HUS is 3 – 5% (Meng and Schroeder 2007; FDA 2012; FSANZ 2013).

It is generally accepted that very low levels (10 – 100 cells) of STEC can cause illness. However, depending on the food matrix and strain of STEC, illness may occur at exposure to even lower levels of STEC (FSANZ 2003; 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).

Using raw meat of ruminant origin in which the prevalence of STEC is high for the manufacture of RTE cooked and processed meat products presents a higher risk than using raw meat of animal species such as pig in which STEC prevalence is low (Meng et al. 2013).

Risk mitigation:

Adequate cooking will inactivate STEC. For example, 65°C for 2 minutes or equivalent will achieve a greater than 7 $\log_{10}$ reduction of STEC in cooked beef, roast beef and cooked corned beef (ICMSF 1996; FSIS 1999; FSIS 2005).

Good manufacturing practice and good hygienic practices to prevent cross-contamination in food manufacturing and handling play an important role in minimising STEC contamination of RTE cooked and processed meat products.

To manage STEC contamination in the production of RTE cooked and processed meat products, source raw meat that has been produced such that the potential for STEC contamination is minimised. Good manufacturing practices, good hygienic practices to prevent cross-contamination in food manufacturing and handling play an important role in minimising STEC contamination and proliferation in RTE cooked and processed meat products.

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.

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 181 generic *E. coli* tests applied to RTE cooked and processed meat products there were no fails. Foods were not specifically tested for STEC.

There were two notifications on the European Commission's Rapid Alert System for Food and Feed (RASFF) for STEC in RTE cooked and processed meat products from January 2007 – December 2015. Products included roast beef from Argentina and Germany. There was an additional notification for various beef meat products from Belgium, however, it was not stated if any of these products were RTE cooked and processed meat products. There were no notifications for excessive levels of generic *E. coli.*

There have been no food recalls in Australia due to the presence of STEC or excessive levels of *E. coli* in imported or domestically produced RTE cooked and processed meat products for the period of January 2007 – December 2015.

Surveillance information:

Infection with STEC is a notifiable disease in all Australian states and territories, with a reported incidence rate in 2015 of 0.6 cases per 100,000 population (137 cases), which includes both foodborne and non-foodborne cases. This is an increase from the previous five year mean of 0.5 cases per 100,000 population per year (ranging from 0.4 – 0.8 cases per 100,000 population per year). The most common STEC serotype identified in Australia in 2011 was O157 (38% of cases), followed by O111 (17% of cases). There were 7 cases of STEC-associated HUS reported in Australia in 2011 (OzFoodNet 2015; NNDSS 2016).

Illness associated with consumption of RTE cooked and processed meat products contaminated with STEC

A search of the scientific literature via the EBSCO Discovery Service and the US CDC Foodborne Outbreak Online Database during the period 1990 – March 2016 identified limited reported outbreaks associated with STEC and consumption of RTE cooked and processed meat products:

- Outbreaks have occurred, such as that described by Rajpura et al. (2003), involving consumption of RTE cooked and processed meat products that were incorrectly prepared on-site at food businesses due to cross-contamination
- There were two STEC outbreaks linked to consumption of deli meats on the US CDC Foodborne Outbreak Online Database from 1998 – 2014. At least one of these outbreaks occurred in a food service setting (CDC 2015).

Prevalence of STEC in RTE cooked and processed meat products

Data on the prevalence of STEC in RTE cooked and processed meat products is limited:

- Survey in Egypt in 2012, STEC strains O26:K60 or O111:K58 were detected in 5% of beef luncheon meat samples (n=40) and STEC was not detected in beef frankfurter samples (n=40) collected at retail. STEC was also detected on 5% of hand swabs of food handlers (n=20), suggesting a role for food handlers in cross contamination (Awadallah et al. 2014)
- Survey in Canada in 2001, STEC was not detected in roast beef samples (n=101) or beef wieners (n=100) collected at retail (Bohaychuk et al. 2006).

Other relevant standard or guideline

- FSANZ guidelines for the microbiological examination of ready-to-eat food has a satisfactory level for generic *E. coli* of <3 CFU/g. Food is deemed potentially hazardous if any pathogenic strains of *E. coli* are detected (including STEC) (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.

In the United States the production of RTE cooked and processed meat products should achieve at least a 5.0 $\log_{10}$ reduction in *E. coli* O157:H7 for products containing beef (FSIS 2012).

The Canadian microbiological guidelines recommend that *E. coli* O157:H7 in heat treated sausage not be detected by a two-part sampling plan of n=5, c=0, m=0 and and limits of generic *E. coli* in heat treated fermented sausage to be n=5, c=1, m=10, M=1000 (Health Canada 2008).

Other considerations

Generic *E. coli* is commonly used as an indicator of process hygiene (ICMSF 2011).

Biosecurity restrictions apply to certain products under this commodity classification. Refer to the BICON database.

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