

**Imported food risk statement**  
**Uncooked ready-to-eat dried meat and *Salmonella* spp.**

**Commodity:** Uncooked ready-to-eat (RTE) dried meat. Examples of this type of product include jerky and biltong.

**Microorganism:** *Salmonella* spp.

Recommendation and rationale
<p>Is <i>Salmonella</i> spp. in RTE dried meat a medium or high risk to public health:</p> <p><input checked="" type="checkbox"/> Yes</p> <p><input 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>Human illness has been associated with uncooked RTE dried meat contaminated with <i>Salmonella</i> spp. and salmonellosis can lead to incapacitating illness</li> <li><i>Salmonella</i> spp. are zoonotic pathogens and are associated with farming animals from which raw meat is used to produce uncooked RTE dried meat</li> <li>There is uncertainty around the level of reduction in risk due to the heat treatment during drying as this process varies between manufacturers</li> </ul>

General description
<p><b>Nature of the microorganism:</b></p> <p><i>Salmonella</i> spp. are facultative anaerobic, Gram-negative, non-spore forming, rod-shaped bacteria. They are found in the intestinal tract of warm and cold-blooded vertebrates and in the surrounding environment (FSANZ 2013).</p> <p>Growth of <i>Salmonella</i> spp. can occur at temperatures between 5.2 – 46.2°C, pH of 3.8 – 9.5 and a minimum water activity of 0.93 when other conditions are near optimum. <i>Salmonella</i> spp. can survive for months or even years in low moisture foods and are able to survive frozen storage at -20°C. <i>Salmonella</i> spp. are sensitive to normal cooking conditions, however, foods that are high in fat and low in moisture may have a protective effect against heat inactivation (FSANZ 2013; Li et al. 2013).</p>
<p><b>Adverse health effects:</b></p> <p><i>Salmonella</i> spp. are a serious hazard as they cause incapacitating but not usually life threatening illness of moderate duration, and sequelae are rare (ICMSF 2002). People of all ages are susceptible to salmonellosis. However, the elderly, infants and immunocompromised individuals are at a greater risk of infection and generally have more severe symptoms (FSANZ 2013).</p> <p>Gastroenteritis symptoms include abdominal cramps, nausea, diarrhea, mild fever, vomiting, dehydration, headache and/or prostration. The onset of illness is typically 24 – 48 hours after infection (range of 8 – 72 hours) and symptoms usually last for 2 – 7 days. Severe disease such as septicaemia sometimes develops, predominantly in immunocompromised individuals. The fatality rate for salmonellosis is generally less than</p>

1% (FDA 2012; FSANZ 2013).

The particular food matrix and strain of *Salmonella* spp. influence the level of *Salmonella* spp. required for illness to occur. It has been reported that as low as one or 100 cells caused illness, however, in other cases significantly more cells were required for illness to occur (ICMSF 1996; FDA 2012).

**Consumption pattern:**

RTE dried meat was not identified as being consumed by any of the respondents (2 years and over) in the 1995 National Nutrition Survey (McLennan and Podger 1999) or the respondents (2-16 years) in the 2007 Australian National Children's Nutrition and Physical Activity Survey (DOHA 2008).

**Key risk factors:**

Inadequate level of added curing substances (salt and nitrite) and inappropriate combinations of time, temperature and humidity applied to the drying process contribute to the production of unsafe dried meat products. Another risk factor is the level of *Salmonella* spp. contamination in the raw ingredients (FSIS 2001; MLA 2003).

**Risk mitigation:**

To manage *Salmonella* spp. contamination in the production of RTE dried meat, source raw meat that has been produced such that the potential for *Salmonella* spp. contamination is minimised. Good manufacturing practice, good hygienic practices to prevent cross-contamination in food manufacturing and handling play an important role in minimising *Salmonella* spp. contamination.

Salting and drying (temperatures of 55 - 65°C) are critical steps in the manufacture of RTE dried meat. The combination of these two enables the product to reach a low moisture level at around 30% (MLA 2003). The temperature and time combination applied to the drying step tends to vary from one manufacturer to another. *Salmonella* spp. are usually eliminated in dried meat production process, and the combination of low moisture and high salt content restricts *Salmonella* spp. growth if any (Naidoo and Lindsay 2010).

For dried meat products that are cooked, *Salmonella* spp. would be inactivated. For example, 65°C for 10min or equivalent (MLA 2003).

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. [Paragraph 2.2.1–5\(1\) of the Code](#) states that a food that is sold as a dried meat must be dried to a water activity of no more than 0.85.

**Compliance history:**

The imported food compliance data sourced from the Imported Food Inspection Scheme of the Australian Department of Agriculture for January 2007 – June 2013 showed that of the 29 *Salmonella* spp. tests applied to dried meat there were no fails.

There has been one notification on the European Commission's Rapid Alert System for Food and Feed (RASFF) for *Salmonella* spp. in several undisclosed meat products imported from Germany during the period of January 2007 – June 2013. It was not stated if any of these products were RTE dried meat.

There have been no food recalls in Australia due to the presence of *Salmonella* spp. in imported or domestically produced RTE dried meat from January 2007 – June 2013.

**Surveillance information:**

Salmonellosis is one of the most commonly reported enteric illnesses worldwide, and the second most frequently reported cause of enteric illness in Australia. It is a notifiable disease in all Australian states and territories with a notification rate in 2012 of 49.8 cases per 100,000 population (11,273 cases). The previous five year mean was 46.9 cases per 100,000 population per year (ranging from 38.6 – 54.2 cases per 100,000 population per year) (FSANZ 2013).

**Illness associated with consumption of RTE dried meat contaminated with *Salmonella* spp.**

There are limited reports of salmonellosis outbreaks associated with consumption of RTE dried meats.

- Outbreak in the United States in 2003 associated with consumption of beef jerky, 23 cases of illness due to infection with *S. Kiambu* were recorded. The very slow drying process under a low humidity condition applied in jerky production has been identified as a contributing factor leading to the development of heat resistant *Salmonella* in the final product (Buege et al. 2006; FSIS 2012)
- Outbreak in the United States in 2001, 6 cases of illness associated with consumption of beef jerky (CDC 2013)
- Outbreak in the United States in 1995 associated with consumption of beef jerky, 93 cases of illness due to infection with *S. Montevideo*, *S. Typhimurium* and *S. Kentucky* (CDC 1995).

**Prevalence of *Salmonella* spp. in RTE dried meat**

Data on the prevalence of *Salmonella* spp. in RTE dried meat is limited.

- Survey in the United States from 1990 – 1999, *Salmonella* spp. were isolated from 0.31% of jerky (n=648) (Levine et al. 2001)

**Other relevant standard or guideline**

- [FSANZ guidelines for the microbiological examination of ready-to-eat food](#) deem food to be satisfactory if no *Salmonella* spp. are detected in 25g. Food is deemed potentially hazardous if any *Salmonella* spp. are 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 meat products.

In the United States the production of poultry jerky must achieve at least a 7.0 log<sub>10</sub> reduction of *Salmonella* spp. as required by the Code of Federal Regulation 9 CFR 381.150. Beef jerky should achieve at least a 5.0 log<sub>10</sub> reduction of *Salmonella* spp. (FSIS 2012).

**Other considerations**

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

**This Risk Statement was compiled by FSANZ in:** August 2014 (minor editorial updates in June 2016)

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