

Imported food risk statement
Uncooked slow dry cured ready-to-eat ham and *Salmonella* spp.

Commodity: Uncooked slow dry cured ready-to-eat (RTE) ham. Examples of this type of product include Iberian ham, Parma ham, Serrano ham and prosciutto.

Microorganism: *Salmonella* spp.

Recommendation and rationale
<p>Is <i>Salmonella</i> spp. in uncooked slow dry cured RTE ham 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"> • Growth of <i>Salmonella</i> spp. are inhibited in uncooked slow dry cured RTE ham due to the low water activity (high salt, fat and reduced moisture content) of the product • The slow dry curing process achieves a greater than 5 log₁₀ reduction in <i>Salmonella</i> spp. • Limited evidence for uncooked slow dry cured RTE ham being contaminated with <i>Salmonella</i> spp. or causing illness in humans

General description
<p>Nature of the microorganism:</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>Adverse health effects:</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:

In the 2007 Australian National Children’s Nutrition and Physical Activity Survey, <1% of children aged 2 – 16 years reported consumption of uncooked slow dry cured ham (DOHA 2008). In the 2011 – 2012 Nutrition and Physical Activity Survey (part of the 2011 – 2013 Australian Health Survey) <1% of children (aged 2 – 16 years), <1% of adults (aged 17 – 69 years) and <1% of people aged 70 and above reported consumption of uncooked slow dry cured ham (Australian Bureau of Statistics 2011-12).

For both the 2007 and the 2011 – 2012 surveys, mixed foods that contained uncooked slow dry cured ham 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:

Incorrect levels of added curing substances (salt and nitrite), and inappropriate combination of temperature, time and humidity applied to the curing process are key risk factors (Rentfrow et al. 2012; MLA 2015).

Pigs are an animal reservoir for *Salmonella* spp. and consequently *Salmonella* spp. are often found in raw pork products (Baer et al. 2013).

Risk mitigation:

Using raw ingredients free of *Salmonella* spp. provides the first level of protection against *Salmonella* spp. contamination in the production of uncooked slow dry cured RTE ham. Good manufacturing practice, good hygienic practices to prevent cross contamination and good temperature control in food manufacturing and handling play an important role in minimising *Salmonella* spp. contamination.

The low water activity of dry cured RTE ham has been found to inhibit growth of *Salmonella* spp. Greater than 5 log₁₀ reductions in *Salmonella* spp. have been reported on artificially inoculated dry cured hams at the end of the aging process (Reynolds et al. 2001; Portocarrero et al. 2002).

In Australia Division 3 of [Standard 4.2.3 of the Australia New Zealand Food Standards Code](#) states that RTE meat must be produced in Australia under 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 1013 *Salmonella* spp. tests applied to uncooked slow dry cured RTE ham there were no fails (test limit of n=5, c=0, m=not detected in 25g applied).

There have been three notifications on the European Commission’s Rapid Alert System for Food and Feed (RASFF) for *Salmonella* spp. in ham from France and Germany and an additional 18 notifications for chilled/frozen pork meat products from multiple countries during the period January 2007 – December 2015. However, it was not stated if any of these products were uncooked slow dry cured RTE ham.

There have been no food recalls in Australia due to the presence of *Salmonella* spp. in imported or domestically produced uncooked slow dry cured RTE ham from January 2007 – December 2015.

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 2014 of 69.7 cases per 100,000 population (16,353 cases). This is an increase from the previous five year mean of 51.5 cases per 100,000 population per year (ranging from 43.8 – 55.3 cases per 100,000 population per year) (FSANZ 2013; NNDSS 2015).

Illness associated with consumption of uncooked slow dry cured RTE ham contaminated with *Salmonella* spp.

A search of the scientific literature via the EBSCO Discovery Service and the US CDC Foodborne Outbreak Online Database during the period 1990 – July 2015 identified there are limited reports of salmonellosis outbreaks associated with consumption of commercially produced uncooked slow dry cured RTE ham.

- Outbreak in Spain in 1993, 3 cases (all in one family) due to consumption of Serrano ham. *S. Typhimurium* was isolated from the patients, and *Salmonella* spp. with a matching biochemical test was isolated from the Serrano ham. It was suggested that cross-contamination in the patient's home may have occurred and the lower salt content and relatively higher water activity of some parts of the Serrano ham may have allowed the *Salmonella* to survive (Gonzalez-Hevia et al. 1996)
- Outbreak in Finland in 1997 – 1998, at least 70 cases due to consumption of cured ham. *S. Newport* was isolated from patients. However, it is not known if the implicated product was uncooked slow dry cured RTE ham (Lyytikainen et al. 2000)

Prevalence of *Salmonella* spp. in uncooked slow dry cured RTE ham

A literature search with the EBSCO Discovery Service during the period 1990 – July 2015 identified data on the prevalence of *Salmonella* spp. in uncooked slow dry cured RTE ham is limited.

- Survey in the United Kingdom from 2008 – 2009, *Salmonella* spp. were not detected in prosciutto or Parma ham samples (n=184) or Serrano ham samples (n=60) at retail (Gormley et al. 2010)
- Survey in Spain from 1998 – 2004, *Salmonella* spp. were not detected in cured dried ham samples (n=35) (Cabedo et al. 2008)
- Survey in Cyprus from 1991 – 2000, *Salmonella* spp. were isolated from 0.1% of cured meat samples (n=1567), although the proportion of these that were uncooked slow dry cured RTE ham was not reported (Eleftheriadou et al. 2002)
- Survey in the United States from 1990 – 1999, *Salmonella* spp. was isolated in 0.22% of food classified as sliced ham and luncheon meats (n=2,293) although the proportion of these that were uncooked slow dry cured RTE ham was not stated (Levine et al. 2001)

Relevant standard, guideline or advice

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

In the United States establishments producing RTE meat products (including salt cured products) are recommended to implement a process achieving a 5 log₁₀ reduction of *Salmonella* spp. (FSIS 2012).

Other considerations

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

This risk statement was compiled by FSANZ in: March 2016

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