

**Imported food risk statement
Dried coconut and *Salmonella* spp.**

Commodity: Dried coconut. This includes coconut that has been dried or desiccated. Fresh coconut, coconut milk powder and products containing coconut are not covered by this risk statement.

Microorganism: *Salmonella* spp.

Recommendation and rationale
<p>Is <i>Salmonella</i> spp. in dried coconut 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"> • <i>Salmonella</i> spp. are a serious hazard as they cause incapacitating, though not usually life threatening, illness of moderate duration and sequelae are rare. • Salmonellosis outbreaks associated with dried coconut are rare. • An effective control measure, i.e. pasteurisation of raw coconut meat, is used to minimise <i>Salmonella</i> spp. contamination of dried coconut. • Good manufacturing practices and good hygienic practices will minimise post-processing contamination. • International and Australian compliance and recall data have shown limited evidence of <i>Salmonella</i> spp. associated with dried coconut.
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 other low moisture environments) 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. Sequelae can occur but 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>Salmonellosis symptoms include abdominal cramps, nausea, diarrhoea, mild fever, vomiting, dehydration,</p>

headache and/or prostration. The onset of illness of salmonellosis is typically 24 – 48 hours after exposure to an infectious dose (range of 8 – 72 hours) and symptoms usually last for 2 – 7 days. Severe disease such as septicaemia sometimes develops, predominantly in immunocompromised individuals. A small number of individuals develop sequelae such as arthritis, appendicitis, meningitis or pneumonia as a consequence of infection. The fatality rate for salmonellosis is generally less than 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 patterns:

In the 2011 – 2012 Nutrition and Physical Activity Survey (part of the 2011 – 2013 Australian Health Survey) 12.8% of children (aged 2 – 16 years), 10.8% of adults (aged 17 – 69 years) and 16.0% of people aged 70 and above reported consumption of dried coconut (Australian Bureau of Statistics 2011). Mixed foods that contained dried coconut as an ingredient were included in the analysis. The survey derived data from one day of dietary recall data.

Key risk factors:

During harvesting, the key risk factor is contact with the soil and the potential for pathogens to be present on the ground at the time of harvest (e.g. in animal excrement). Key risk factors during the primary processing of coconuts include contamination from soil, equipment and other environmental factors. When coconuts are split open, contamination with bacteria may occur. After splitting, coconuts may be dried naturally in the sun. The key risk factors during this process include the cleanliness of the drying area, contact with the coconut husk and soil, and the uncontrolled presence of animals and birds that can shed and transmit *Salmonella* spp. The dried coconut can then be further desiccated or chipped (FAO 1999; ICMSF 2000; Harris 2012).

Although the drying process reduces the bacterial load, some *Salmonella* may survive. *Salmonella* spp. are able to survive in dried products for long periods (ICMSF 2000; Harris 2012). Foods with a high lipid content and low water activity have been shown to have a protective effect on *Salmonella* cells that enhance survival but does not permit growth (Lake et al. 2010).

Post-processing contamination of low moisture products, such as dried coconut, is also a risk factor. Lack of good manufacturing practices can introduce *Salmonella* spp. from the environment, raw ingredients and workers (Chen et al. 2009; Li et al. 2013).

Risk mitigation:

Good agricultural practices and protection of the product from animals and birds during the drying process will help mitigate the risk of *Salmonella* contamination.

Pasteurisation of raw coconut meat in a water bath at 80°C for 8-10 minutes effectively kills *Salmonella* spp. and is used by the coconut industry to make dried, desiccated and chipped coconut (Schaffner et al. 1967). Prevention of recontamination of the pasteurised coconut from the processing environment and during subsequent handling is critical (Simonsen et al. 1987; ICMSF 2000). Good manufacturing practices and good hygienic practices in food manufacturing and food handling will minimise *Salmonella* recontamination of dried coconut.

In Australia [Schedule 27 of the Australia New Zealand Food Standards Code](#) has a microbiological limit for *Salmonella* in dried, chipped, desiccated coconut of n=10, c=0, m=not detected in 25g.

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 – May 2016 showed that of the 870 *Salmonella* spp. tests applied to dried coconut there were 11 fails (a 1.3% failure rate). The failed samples were for desiccated coconut imported from multiple countries.

There have been nine notifications on the European Commission's Rapid Alert System for Food and Feed (RASFF) for *Salmonella* spp. in desiccated and dehydrated coconut from multiple countries during the period January 2007 – May 2016.

There have been no food recalls in Australia due to the presence of *Salmonella* spp. in imported or domestic dried coconut from January 2007 – May 2016.

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 2015 of 72.8 cases per 100,000 population (17,089 cases). This is an increase from the previous five year mean of 56.4 cases per 100,000 population per year (ranging from 49.2 – 69.4 cases per 100,000 population per year) (FSANZ 2013; NNDSS 2016).

Illness associated with consumption of dried coconut contaminated with *Salmonella* spp.

A search of the scientific literature via Web of Science, PubMed, Scopus, CAB abstracts and other publications during the period 1990 – April 2016 identified limited salmonellosis outbreaks associated with consumption of dried coconut:

- Outbreak in England in 1998/1999 – 18 cases of *Salmonella* Java phage type Dundee infection linked to consumption of desiccated coconut. The outbreak strain was isolated from retail packets in the grocer's warehouse. The contaminated desiccated coconut appeared to be part of a single consignment imported in October 1998 (Ward et al. 1999).

Prevalence of *Salmonella* spp. in dried coconut

A search of the scientific literature via Web of Science, PubMed, Scopus, CAB abstracts and other publications during the period 1990 – April 2016 did not reveal any data on the prevalence of *Salmonella* spp. in dried coconut.

Other relevant standards or guidelines

- 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 low-moisture foods *CAC/RCP 75-2015* covers good manufacturing practices and good hygienic practices for the manufacturing of low-moisture foods for human consumption (Codex 2016).
- Codex code of hygienic practice for desiccated coconut *CAC/RCP 4-1971* covers raw material requirements, plant facilities and operating requirements, and end product specifications for desiccated coconut (Codex 2011a).
- Codex standard for desiccated coconut *CODEX STAN 177-1991* covers the production and processing of desiccated coconut (Codex 2011b).

Approach by overseas countries

Many countries and regions, such as the European Union, have HACCP-based measures in place for the production of desiccated and dried coconut.

Other considerations

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

This risk statement was compiled by FSANZ in: November 2016

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