

**Imported food risk statement**  
**Uncooked ready-to-eat dried meat and Shiga toxin-producing *Escherichia coli***

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

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

Recommendation and rationale
<p>Is STEC in RTE dried meat a medium or high risk to public health:</p> <p><input checked="" type="checkbox"/> <i>Yes</i></p> <p><input type="checkbox"/> <i>No</i></p> <p><input type="checkbox"/> <i>Uncertain, further scientific assessment required</i></p> <p><b>Rationale:</b></p> <ul style="list-style-type: none"> <li>• Human illness has been associated with RTE dried meats contaminated with STEC and infection with STEC can have severe consequences</li> <li>• Ruminants are the main animal reservoir for STEC, however, STEC can also be found in other animals and birds</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>E. coli</i> 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 <i>E. coli</i> are harmless, however some have acquired specific virulence attributes, such as Shiga toxin-producing <i>E. coli</i> (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).</p> <p>Growth of <i>E. coli</i> 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).</p>
<p><b>Adverse health effects:</b></p> <p>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).</p> <p>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</p>

infections (haemorrhagic colitis) are characterised by severe abdominal cramps and bloody diarrhoea. In some cases, patients develop haemolytic uraemic syndrome (HUS) which can lead to kidney failure. HUS can also have neurological effects and cause seizures, stroke and coma. Approximately 3 – 7% of haemorrhagic colitis cases develop HUS. The fatality rate of HUS is 3 – 5% (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:**

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 (FSIS 2001; MLA 2003). Using raw meat of ruminant origin in which STEC prevalence is high for the manufacture of RTE dried meat 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:**

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

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.

For dried meat products that are cooked STEC 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 generic *E. coli* tests applied to RTE dried meat there were no fails. The products (beef jerky) were imported from New Zealand.

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

**Surveillance information:**

Infection with STEC is a notifiable disease in all Australian states and territories. The incidence of STEC infections notified in Australia in 2012 was 0.5 cases per 100,000 population (112 cases), which includes both foodborne and non-foodborne cases. This is the same as the previous five year mean of 0.5 cases per 100,000 population per year (ranging from 0.4 – 0.6 cases per 100,000 population per year). The most common STEC serotype identified in Australia in 2010 was O157 (58.8% of cases), O111 was the next most common serotype (FSANZ 2013).

**Illness associated with consumption of RTE dried meat product contaminated with STEC**

There are limited reports of outbreaks caused by STEC associated with consumption of RTE dried meats.

- Outbreak in the United States in 2007, 8 cases associated with consumption of commercially manufactured jerky contaminated with STEC O157:H7 (CDC 2013)
- Outbreak in the United States in 2007, 3 cases associated with consumption of beef jerky contaminated with STEC O157:H7 (CDC 2013)
- A small STEC outbreak occurred within a family in the United States in 1995 associated with consumption of home-made jerky. The investigation found that deer meat used to make the jerky was contaminated with STEC O157:H7 (Keene et al. 1997)

**Prevalence of STEC in RTE dried meat products**

Data on the prevalence of STEC in RTE dried meat is limited.

- STEC O157:H7 has been detected in biltong products in South Africa, although no prevalence rate was provided (Abong'o and Momba 2008)
- Certain batches of biltong manufactured in Canada were recalled in 2012 due to possible presence of STEC O157:H7. The products were manufactured with a batch of beef contaminated with STEC O157:H7 (CFIA 2012)

**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 meat products.

In the United States the production of RTE meat products should achieved at least a 5.0 log<sub>10</sub> reduction in *E. coli* O157:H7 for products containing beef (FSIS 2012).

**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](#).

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

## References

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