

**Imported food risk statement**  
**RTE cooked prawns and shrimp and *Vibrio parahaemolyticus***

**Commodity:** Ready-to-eat (RTE) cooked prawns and shrimp. This includes prawns, shrimp and seafood mixes containing prawns and shrimp (e.g. marinara mix) that are cooked. Other crustaceans and RTE cooked prawns and shrimp that are dried or in ambient stable sealed packages are not covered by this risk statement.

**Microorganism:** *Vibrio parahaemolyticus*

Recommendation and rationale
<p>Is <i>Vibrio parahaemolyticus</i> in RTE cooked prawns and shrimp 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><b>Rationale:</b></p> <ul style="list-style-type: none"> <li>• Only some strains of <i>V. parahaemolyticus</i> cause gastroenteritis, the majority of isolates from the environment are non-pathogenic.</li> <li>• <i>V. parahaemolyticus</i> is a serious hazard as it causes incapacitating, but not usually life threatening illness of moderate duration.</li> <li>• Human illness in Australia and overseas has been associated with RTE cooked prawns and shrimp contaminated with <i>V. parahaemolyticus</i>. This may be associated with poor food handling or undercooking of product.</li> <li>• <i>V. parahaemolyticus</i> is inactivated by adequate cooking applied during the production of RTE cooked prawns and shrimp.</li> <li>• Post-cooking contamination can occur, for example if product is put into contaminated water used for cooling.</li> <li>• <i>V. parahaemolyticus</i> can grow in the product if moderate temperature abuse occurs.</li> <li>• International compliance and surveillance data have shown limited evidence of <i>V. parahaemolyticus</i> associated with RTE cooked prawns and shrimp.</li> </ul>

General description
<p><b>Nature of the microorganism:</b></p> <p><i>V. parahaemolyticus</i> are facultative anaerobic Gram-negative rod-shaped bacteria. They are found in coastal waters and estuaries. <i>V. parahaemolyticus</i> may be detected in tropical waters throughout the year, while in temperate waters they are detected in the warmer months (Wright and Schneider 2010; Oliver et al. 2013; FAO/WHO 2013). Only some strains of <i>V. parahaemolyticus</i> have the virulence factors necessary to cause gastroenteritis. The majority of isolates from the environment are non-pathogenic (ICMSF 2011; FDA 2012).</p> <p>Growth of <i>V. parahaemolyticus</i> can occur at temperatures ranging between 5 – 43°C, pH of 4.8 – 11 and a water activity of 0.940 – 0.996 when other conditions are near optimum. <i>V. parahaemolyticus</i> can grow in the salt range of 0.5 – 10% NaCl, showing optimum growth at 3% NaCl (ICMSF 1996). Temperatures above 55°C are lethal to <i>V. parahaemolyticus</i> (Wright and Schneider 2010). In general <i>Vibrio</i> spp. are sensitive to cold temperatures, however, <i>V. parahaemolyticus</i> can survive refrigeration and frozen storage (ICMSF 1996; Oliver</p>

et al. 2013). Also, *V. parahaemolyticus* strains are able to enter the viable but non-cultural state when stored under refrigeration impacting on the ability to detect the organism (Baffone et al. 2003).

**Adverse health effects:**

*V. parahaemolyticus* is a serious hazard as it causes incapacitating, but not usually life threatening, illness of moderate duration and sequelae are rare (ICMSF 2002). People of all ages are susceptible to infection with *V. parahaemolyticus*. However, the young, elderly and immunocompromised individuals are at a greater risk of more severe outcomes (Neill and Carpenter 2010; FDA 2012).

Symptoms include watery diarrhoea, abdominal cramps, nausea, vomiting, headache, low-grade fever and chills. In more severe cases bloody diarrhoea develops. The onset of illness is typically 24 – 72 hours after exposure to an infectious dose (range of 4 – 96 hours) and symptoms usually last for 2 – 6 days. Severe disease, such as septicemia, sometimes develops - predominantly in immunocompromised individuals. The fatality rate for *V. parahaemolyticus* gastroenteritis is approximately 2% (Neill and Carpenter 2010; FDA 2012; Oliver et al. 2013).

Although it is possible for individuals to become ill from consumption of lower levels of *V. parahaemolyticus* (around 10,000 cells), illness is much more likely to occur after consumption of about 100 million cells (FDA 2005).

**Consumption patterns:**

In the 2011 – 2012 Nutrition and Physical Activity Survey (part of the 2011 – 2013 Australian Health Survey) <1% children (aged 2 – 16 years), 1% of adults (aged 17 – 69 years) and <1% of people aged 70 and above reported consumption of RTE cooked prawns and shrimp (Australian Bureau of Statistics 2011). Mixed foods that contained RTE cooked prawns and shrimp were excluded from the analysis. Survey data was derived from one day of dietary recall data.

**Key risk factors:**

*V. parahaemolyticus* is an indigenous marine species and is routinely part of the microflora of raw crustaceans harvested from estuarine waters (ICMSF 2005). *Vibrio* spp. are found in warmer waters and can show seasonal variation, with numbers peaking in warmer months (Forsythe et al. 2009; Wright and Schneider 2010).

A key risk factor for RTE cooked prawns and shrimp is microbiological contamination following the cooking process. Poor post-cooking handling processes, such as the use of contaminated sea or drinking water to cool cooked prawns and shrimp, can lead to contamination with pathogenic bacteria. Cross contamination with uncooked products can re-introduce pathogens such as *V. parahaemolyticus* (ICMSF 2005; FSANZ 2005). Moderate temperature abuse post-harvest during handling, transport and/or storage can allow the growth of *V. parahaemolyticus* (FSANZ 2005; Forsythe et al. 2009).

**Risk mitigation:**

Adequate cooking will inactivate *V. parahaemolyticus*. For example, cooking to an internal temperature of 70°C for at least two minutes will inactivate *V. parahaemolyticus* (Wright and Schneider 2010). To control for undercooking, prawns and shrimp should be graded by size to ensure adequate cooking times within like-sized batches.

Following cooking, key risk mitigation steps are minimising contamination of cooked product, rapid post-cooking chilling and adherence to low temperatures (<5°C) during storage and transport. Contamination may be mitigated by the use of clean water to cool cooked prawns and shrimp, using separate equipment for raw and cooked product and food handlers not handling raw and cooked product (FSANZ 2005; Codex 2013).

In Australia Division 2 of [Standard 4.2.1 in the Australia New Zealand Food Standards Code](#) states that a seafood business must systematically examine all of its primary production and processing operations to identify potential seafood safety hazards and implement controls that are commensurate with the food safety risk, and must take all necessary steps to prevent the likelihood of seafood being or becoming contaminated.

**Compliance history:**

RTE cooked prawns and shrimp are not currently tested for *V. parahaemolyticus* under the Imported Food Inspection Scheme and therefore no compliance data is available from the Australian Department of Agriculture and Water Resources.

There were two notifications on the European Commission's Rapid Alert System for Food and Feed (RASFF) for *V. parahaemolyticus* in cooked shrimp from Indonesia and India during the period January 2007 – May 2016. There were an additional six notifications for *V. parahaemolyticus* in shrimp from Vietnam, Panama and India, however it was not stated if any of these products were cooked.

There have been no food recalls in Australia due to the presence of *V. parahaemolyticus* in imported or domestic cooked prawns and shrimp from January 2007 – May 2016.

**Surveillance information:**

Infection with *V. parahaemolyticus* is not a notifiable disease in Australia. A review of OzFoodNet reports between 2001 – 2013 identified one outbreak (2 cases) of *V. parahaemolyticus* in Australia in 2005 which was suspected to be associated with seafood, although the type of seafood was not specified (OzFoodNet 2006).

**Illness associated with consumption of RTE cooked prawns and shrimp contaminated with *V. parahaemolyticus***

A search of the scientific literature via Web of Science, PubMed, Scopus, and other publications during the period 1990 – August 2016 identified there have been a number of *V. parahaemolyticus* outbreaks associated with consumption of RTE cooked prawns and shrimp:

- Outbreak in Spain in 2012 – 100 cases of *V. parahaemolyticus* illness epidemiologically linked with consumption of cooked shrimp (relative risk of 2.19). The shrimp were an imported product from Argentina. This outbreak may be attributed to poor food handling practices. The shrimp were prepared from frozen product by a short boiling period of 1 – 2 min and then rapid cooling by submersion in water and ice. Cross-contamination may have occurred as the ice and water used was also in contact with local uncooked molluscan shellfish (Martinez-Urtaza et al. 2016).
- Outbreak in the United States in 1998 – 17 cases of *V. parahaemolyticus* illness associated with consumption of boiled shrimp (Daniels et al. 2000).
- Two outbreaks in Australia (NSW) in 1992 – involving >50 cases of *V. parahaemolyticus* illness associated with consumption of fresh cooked prawns from the same wholesale supplier on the same day (Kraa 1995).
- Outbreak in Australia (NSW) in 1990 – involving >100 cases of *V. parahaemolyticus* illness including one fatality associated with consumption of fresh cooked prawns imported from Indonesia, it was not stated if the product was imported cooked or imported raw and then cooked (Kraa 1995).

**Data on the prevalence of *V. parahaemolyticus* in RTE cooked prawns and shrimp**

A search of the scientific literature via Web of Science, PubMed, Scopus, and other publications during the period 1990 – August 2016 identified data on the prevalence of *V. parahaemolyticus* in RTE cooked prawns and shrimp is limited:

- Survey with limited sample size in Germany in 2008/2009 – *V. parahaemolyticus* was not detected in cooked prawns (n=17) (Messelhauser et al. 2010).
- Survey in Iran – *V. parahaemolyticus* was not detected in frozen shrimp (n=20) or RTE shrimp products (n=55) (Zarei et al. 2012).
- Survey in the United Kingdom in 2003 – cooked crustacean batches sampled from production premises (n=35) and from retail premises (n=372) were satisfactory for *V. parahaemolyticus* (*V. parahaemolyticus* counts <30 CFU/g) (Sagoo et al. 2007).
- Survey in New Zealand in the mid-1990s – *V. parahaemolyticus* was not detected in cooked shrimps or prawns (n=64) imported into New Zealand (Lake et al. 2003).

### Other relevant standards or guidelines

- [FSANZ compendium of microbiological criteria for food](#) categorises food as satisfactory (for consumption) if *V. parahaemolyticus* levels are <3 CFU/g. Food is deemed potentially hazardous if *V. parahaemolyticus* levels are >10<sup>4</sup> CFU/g.
- 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 practice for fish and fishery products *CAC/RCP 52-2003* applies to the growing, harvesting, handling, production, processing, storage, transportation and retail of fish, shellfish and aquatic invertebrates and products thereof from marine and freshwater sources that are intended for human consumption. Section 14 of *CAC/RCP 52-2003* is specific to processing of shrimps and prawns and describes controls at individual processing steps (Codex 2013).
- Codex standard for quick frozen shrimps or prawns *CODEX STAN 92-1981* covers the production and processing of quick frozen shrimps or prawns, including fully cooked shrimps or prawns (Codex 2014).
- Codex guidelines on the application of general principles of food hygiene to the control of pathogenic *Vibrio* species in seafood *CAC/GL 73-2010* highlights the key control measures that can be used to minimise the likelihood of illness arising from the presence of pathogenic *Vibrio* spp. in seafood (Codex 2010).

### Approach by overseas countries

Many countries and regions, such as the United States, Canada and the European Union, have HACCP-based regulatory measures in place for production of this commodity.

### 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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