

## 1. *Bacillus cereus* food-borne illness

(Notifiable)

**Description:** *Bacillus cereus* is a gram positive rod shaped spore forming bacterium. It may lead to foodborne illness with two different clinical presentations depending on the toxin involved. It can cause quite extensive outbreaks of illness. *B. cereus* is ubiquitous in the environment and is frequently found in raw, dried and processed food. It is not infrequently found in asymptomatic subjects.

**Annual Numbers:** about one case per year, on average.

**Seasonal Distribution:** There is no seasonal pattern of incidence.

**Causative Agent:** *B. cereus* intoxication produces two distinct types of illness, an emetic type and a diarrhoeal type, caused by two distinct metabolites. *B. cereus* proliferation in food results in the release of one of two toxins; a heat-stable emetic toxin (*syn. cereulide*) that causes a short incubation vomiting syndrome and a heat-labile enterotoxin that produces a longer incubation diarrhoeal syndrome.

**Reservoir:** Worldwide; no human or animal sources. The organism is ubiquitous in the environment and is found at low levels in many fresh and processed foods. Fried rice is the food most notably associated with *B. cereus* infection but pasta, cream dishes, meatballs, poultry and baked meat dishes such as meatloaf have been implicated in outbreaks.

**Transmission:** It is almost exclusively a foodborne illness due to temperature abuse of cooked food prior to reheating. If temperature abuse occurs during cooling the spores that survived cooking germinate and multiply, leading to hazardous levels of vegetative cells and/or toxins in the food at the time of consumption.

- The emetic intoxication is due to the ingestion of preformed cereulide toxin in the food where the *B. cereus* levels exceeds 105 cfu/g. Cereulide toxin can withstand temperatures in excess of 120°C for 90 minutes and is not inactivated by re-heating food. The dose of enterotoxin required to produce human illness is relatively large.
- The diarrhoeal syndrome is due to inadequate reheating of food contaminated with *B. cereus* (at levels exceeding 106 cfu/g) and/or its heat-labile diarrhoeal enterotoxin. Large numbers of the bacteria are required to cause illness.

Poisoning with toxigenic *B. cereus* is best prevented by storing properly cooked foods at above 60°C or below 10°C before re-heating or consumption.

**Outbreak Potential:** *B. cereus* has moderate to high outbreak potential if transmitted through food.

**Incubation period:** In general, 2-3 hours (range 0.5-6hr) for the emetic form and 8-12 hours (range 6-24) for the diarrhoeal form.

**Period of communicability:** *B. cereus* is not a contagious pathogen.

**Epidemiology:** Incorrect food preparation, particularly temperature abuse, poor hygiene during canning or inadequate reheating (especially in congregate setting such as restaurants and schools) pose the greatest risk of causing illness. Outbreaks tend to have high attack rates (in excess of 50%).

**Exposure-prone groups:** Those exposed to contaminated foods, food handlers, residents in residential institutions.

### Clinical Features:

- The emetic form presents with vomiting, nausea, abdominal pain and occasionally late onset diarrhoea which can resemble *S. aureus* food poisoning in its symptoms and incubation period. This is usually mild, lasting less than 12 hours.
- The diarrhoeal form usually presents with abdominal pain, diarrhoea (often watery and profuse) and tenesmus occasionally followed after by mild nausea and diarrhoea. Symptoms generally subside after 24 hours. The diarrhoeal form may be difficult to distinguish from *Clostridium perfringens* foodborne intoxication.

**Clinical Management of Cases:** Rehydration and enteric precautions are all that are required. Information on enteric precautions should be provided by the attending physician. The case should be notified to the local Department of Public Health. It is important to determine if the case is aware of similar cases suggesting the possibility of an outbreak. Determine if case is in a risk category.

**Public Health Management of Cases:** Obtain a three day food history (particularly meals consumed out of the house and rice meals in particular) and determine if others may have consumed the same food. Determine if there are linked cases.

**Food Hygiene Implications:** Food hygiene re-education is necessary for food handlers.

**Public Health Management of Contacts:** Not applicable as it is not communicable from person to person.

**Exclusion:** Although secondary spread does not occur, it is prudent to exclude risk groups with diarrhoea or vomiting until 48 hours after recovery.

**Microbiological Clearance:** Not required.

**Notifiable:** to the local [Medical Officer of Health](#).