Infectious Disease Epidemiology Section
Office of Public Health,
Louisiana Dept of Health & Hospitals
800-256-2748 (24 hr. number)
www.infectiousdisease.dhh.louisiana.gov

BACILLUS CEREUS TOXI-INFECTION

Revised 10/17/2013

Bacillus cereus causes a toxin-mediated food poisoning. *Bacillus cereus* is an aerobic and facultatively anaerobic, spore-forming, gram-positive bacillus. The emetic syndrome is caused by a preformed heat-stable toxin. The diarrhea syndrome is caused by in vivo production of a heat-labile enterotoxin.

Epidemiology

Bacillus cereus is found in about 25% of food products sampled, including cream, pudding, meat, spices, dry potatoes, dry milk, spaghetti sauces and rice. Contamination of the food product generally occurs prior to cooking. Vegetative forms can grow and produce enterotoxins over a wide range of temperatures from 25°C to 42°C (77°-108°F). Spores can survive extreme temperatures, and when allowed to cool relatively slowly, they will germinate and multiply.

Colonization: The natural environmental reservoir for *B. cereus* consists of decaying organic matter, fresh and marine waters, vegetables and fomites, and the intestinal tract of invertebrates, from which soil and food products may become contaminated, leading to the transient colonization of the human intestine.

Eating food containing preformed toxin, most commonly fried rice, may cause the emetic, short incubation syndrome. In some restaurants, boiled rice is allowed to "dry off" at ambient temperature, after which it may be stored overnight, before it is fried quickly with beaten egg. Spores originally present in raw rice survive. At ambient temperature, the spores germinate in the cooked rice, and there is rapid growth of vegetative bacteria. Levels of *Bacillus cereus* in foods incriminated in the emetic form of food poisoning have ranged from 1,000 to 50 billion colony-forming units (cfu)/gram; high numbers are also present in fecal samples from affected persons.

Eating food contaminated with *B. cereus* spores, which produce toxin in the gastrointestinal tract, is more commonly caused by contaminated meat or vegetables and results in the longer incubation period syndrome.

There is no evidence that human carriage of the organism or other means of contamination play a role in transmission. It is not known whether the ingested organisms multiply and make toxin in vivo or whether a preformed toxin is present in food.

It is an uncommon cause of food poisoning in Louisiana.

The incubation period for *B.cereus* depends on the form: six to 24 hours for the diarrheal form, one to six hours for the emetic form.

Clinical Description

There are two clinical syndromes caused by *Bacillus cereus* food poisoning:

- The diarrheal form of illness

-longer incubation (six to 24 hours) period similar to that of *Clostridium perfringens*
-watery diarrhea, moderate to severe abdominal cramps and vomiting in about one fourth of the patients
-duration of illness ranges from 20-36 hours, with a median of 24 hours
-associated with meat dishes

- The emetic form of illness:
  -short incubation period (one to six hours), similar to that of staphylococcal food poisoning
  -vomiting and abdominal cramps; diarrhea is present in only about a third of affected individuals.
  -duration of illness ranges from eight to ten hours, with a median of nine hours of illness
  -associated with rice dishes

- In both types fever is uncommon and disease is usually mild and self-limited.

Bacillus cereus also can cause local skin and wound infections, ocular infections, fulminant liver failure, and invasive disease, including bacteremia, endocarditis, osteomyelitis, pneumonia, brain abscess, and meningitis. Ocular involvement includes panophthalmitis, endophthalmitis, and keratitis.

Laboratory Tests

For foodborne illness, isolation of *B. cereus* in a concentration of 10^5 or more per gram of epidemiologically incriminated food confirms the diagnosis. Since the organism can be recovered from stool samples from some well persons, the mere presence of *B. cereus* in feces or vomitus of ill persons is not definitive evidence for infection.

Surveillance

B.cereus food poisoning is a reportable condition. *B.cereus* food is rarely diagnosed as an individual infection, it is usually diagnosed as part of a foodborne outbreak.

Case Management - Treatment

Persons with *B. cereus* food poisoning require only supportive treatment. Oral rehydration or, occasionally, intravenous fluid and electrolyte replacement for patients with severe dehydration is indicated. Antibiotics are not indicated.

In contrast, patients with invasive disease require antibiotic therapy and prompt removal of any potentially infected foreign bodies, such as catheters or implants. *Bacillus cereus* is usually susceptible in vitro to vancomycin, clindamycin, ciprofloxacin, imipenem, and meropenem.

Control Measures:

Proper cooking and storage of foods, particularly rice cooked for later use, will help to prevent foodborne outbreaks. Food should be kept at temperatures higher than 60°C (140°F) or rapidly cooled to less than 10°C (50°F) after cooking.

Isolation of the Hospitalized Patient: Standard precautions are recommended.

Hand washing and strict aseptic technique in caring for immunocompromised patients or patients with indwelling intravascular catheters are important to minimize invasive disease.