BACILLUS CEREUS SPP
FACTS AND IDENTIFICATION

What is it?

- *Bacillus cereus* is a Gram-positive, facultative anaerobic, endospore-forming, large-rod, widely distributed and which can cause consumer toxiiinfection.

- Biochemical Characteristics: Catalase +, ferments glucose, sucrose, salicin and glycerol. It does not ferment neither mannitol nor arabinose. It reduces nitrates to nitrites. It produces lecithinases.

- *B. cereus* can form spores – a survival mode in which they take on an inactive form that can exist without nutrition and that develops a very tough protection against the outside world – that grow more *B. cereus* bacteria at higher temperatures.

- This bacterium is widespread in the environment and is often isolated from soil and vegetation. The optimal growth temperature is 28°C to 35°C, with a minimum growth temperature of 4°C and a maximum of 48°C. Growth can occur in pH ranges from 4.9 to 9.3, and the organism tolerates 7.5% salt concentration.

- In general it only attains low levels of presence and only rarely will it cause someone who consumes it to become ill, although its capacity to form spores guarantees its survival throughout the food chain if optimum temperature and humidity conditions prevail to allow it to multiply.

What causes *Bacillus cereus* infection?

- This bacterium can cause two different types of illness. The first type occurs when contaminated food is eaten and the bacteria form a toxic substance in the small intestine. This can lead to diarrhea, cramps, and, sometimes, nausea (but usually not vomiting). The second type occurs if *B. cereus* produces a different kind of toxin in contaminated food. It most often affects rice and other starchy foods. It causes nausea and vomiting within a period of a half-hour to 6 hours, and usually clears up in about a day.

- Both kinds of illnesses generally go away by themselves, but can cause serious complications, although rarely in otherwise healthy people. As with all infections, people who have weak immune systems (because they have certain other diseases or take medications that weaken the immune system) are much more likely to suffer serious consequences.

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**How can we identify it?**

- *Bacillus cereus* is UNE EN ISO 7932:2004 – This International Standard specifies a horizontal method for the enumeration of presumptive *B. cereus* in foods.

- A variety of methods have been recommended for the recovery, enumeration, and confirmation of *B. cereus*. The most commonly used culture reference method is UNE EN 650:653 (1967) Bacillus cereus — Colony-count technique at 30 °C.

- The colony-count technique at 30 °C guarantees its survival throughout the food chain if optimum temperature and humidity conditions prevail to allow it to multiply.

**How can we prevent it?**

- Avoid storing raw materials and prepared foods for too long. For this purpose, rotations are necessary.

- To reduce the risk of contamination, it is of vital importance that kitchen utensils are clean.

- Refract the pH and water activity of prepared and finished products, below 7ºC.

- Preserve and handle raw materials, semi-finished and finished products, below 0.93.

- Reduce the pH and water activity of prepared food so that bacterial growth is limited. Bacteria will not grow with a pH below or a water activity below 0.93.

- Incubate during 24 ±2h at 30ºC.

- Incubate during 18-24 and 48 h at 30ºC.

- Keep the food mixture, such as sauces, puddings, soups, vegetables, and fish have been associated with the diarrheal-type of food poisoning. The vomiting-type outbreaks generally have been linked with food-poisoning outbreaks.

- In general it only attains low levels of presence and only rarely will it cause someone who consumes it to become ill, although its capacity to form spores guarantees its survival throughout the food chain if optimum temperature and humidity conditions prevail to allow it to multiply.

**Where can we find *B. cereus***?

- The most commonly used culture reference method is UNE EN 650:653 (1967) Bacillus cereus — Colony-count technique at 30 °C.

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**Results Interpretation**

- Some strains of *B. cereus* produce only little or no lecithinase. Colonies of these strains will not be surrounded by a precipitation zone. These colonies should also be subjected to confirmation tests.

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**Solid Product – No detected < 10 cfu/ml**

**Liquid Product – No detected < 1 cfu/ml**

**Growth Absence**

- N= Microorganisms number/g or ml of sample

- N= M x 1/D

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**References**


- Tamara K MartinoI; Virginia LeyvaII; Yamila PuigIII; Mayrin MachinIV; Rossy Carperv V. Contribution to the study of pathogen inocuidad de los alimentos. Parte I


- J Milk Food Technol. 1976;39:668-70

Where can we find B. cereus?

- A wide variety of foods, including meats, dairy, vegetables, and fish have been associated with the diarrheal-type of food poisoning. The vomiting-type outbreaks generally have been associated with rice products and other starchy foods, such as potato, pasta, and cheese products. Food mixtures, such as sauces, puddings, soups, casseroles, pastries, and salads, frequently have been linked with food-poisoning outbreaks.

How can we prevent it?

- Refrigerate warm uneaten food dishes as soon as possible, and no more than two hours after preparation, at 4°C. If not, they should be kept at 65°C until consumed.

- Preserve and handle raw materials, semi-finished and finished products, below 7°C.

- Reduce the pH and water activity of prepared food so that bacterial growth is limited. Bacteria will not grow with a pH below or a water activity below 0.93.

- To reduce the risk of contamination, it is of vital importance that kitchen utensils are clean.

- Avoid storing raw materials and prepared foods for too long. For this purpose, rotations are necessary.

How can we identify it?

- A variety of methods have been recommended for the recovery, enumeration, and confirmation of B. cereus in foods.

- The most commonly used culture reference methods world-wide for the detection of Bacillus cereus is UNE EN ISO 7932:2004 – This International Standard specifies a horizontal method for the enumeration of viable presumptive Bacillus cereus by means of the colony-count technique at 30°C.

Safety

- Pathogen in number of ≥10⁶ cfu/g of sample.

ISO UNE EN ISO 7932:2004

1. Colony counting in Selective isolation Bacillus Cereus Selective Agar Base (MYP) (Cat. 1343)

   Sow 0.1 ml of the initial and subsequent dilutions on Petri dishes with Bacillus Cereus Selective Agar Base, supplemented with Egg Yolk Emulsion (Cat. 5152) and Bacillus Cereus Supplement (Polymyxin) (Cat. 6021).

   Incubate during 18-24 and 48 h at 30°C.

   Count the presumptive B. cereus colonies on each plate. The presumptive colonies are large, pink (indicating that mannitol fermentation has not occurred) and generally surrounded by a zone of precipitation (indicating the production of lecithinase)*.

2. Confirmation in Blood Agar Base Nº2 (Cat. 1328)

   Select 3 isolated colonies and inoculate in depth and surface on Blood Agar Nº2 plates prepared with 5-7% sterile defibrinated blood.

   Incubate during 24 ±2h at 30°C

   Complete hemolysis surrounding the colonies indicates that it is B. cereus, since this bacteria synthesizes hemolysin, which creates a Lysis area around the colony.

*Some strains of B. cereus produce only little or no lecithinase. Colonies of these strains will not be surrounded by a precipitation zone. These colonies should also be subjected to confirmation tests.

3. Results Interpretation

- Liquid Product – No detected < 1 cfu/ml
- Solid Product – No detected < 10 cfu/ml

BIBLIOGRAFÍA

Internacional Standard ISO 7932 Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of presumptive Bacillus cereus — Colony-count technique at 30°C.


Tamara K Martino; Virginia Leyva; Yamila Puig; Mayrin Machin; Yaumara Ferrer Bacillus cereus and its implication in the inocuidad de los alimentos. Parta I 


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