Risks for public health related to the presence of *Bacillus cereus* and other *Bacillus* spp. including *Bacillus thuringiensis* in foodstuffs

EFSA Panel on Biological Hazards (BIOHAZ)

Abstract

The *Bacillus cereus* group, also known as *B. cereus sensu lato*, is a subdivision of the *Bacillus* genus that consists of eight formally recognised species: *B. cereus sensu stricto*, *B. anthracis*, *B. thuringiensis*, *B. weihenstephanensis*, *B. mycoides*, *B. pseudomycoides*, *B. cytotoxicus* and *B. toyonensis*. The current taxonomy of the *B. cereus* group and the status of separate species mainly rely on phenotypic characteristics. *Bacillus thuringiensis* strains display a similar repertoire of the potential virulence genes on the chromosome as *B. cereus sensu stricto* strains and it has been shown that these genes can also be actively expressed in *B. thuringiensis* strains. *Bacillus cereus* and *B. thuringiensis* strains are usually not discriminated in clinical diagnostics or food microbiology. Thus, the actual contribution of the two species to gastrointestinal and non-gastrointestinal diseases is currently unknown. Most cases of food-borne outbreaks caused by the *B. cereus* group have been associated with concentrations above $10^5$ CFU/g. However, cases of both emetic and diarrhoeal illness have been reported involving lower levels of *B. cereus*. The levels of *B. cereus* that can be considered as a risk for consumers are also valid for *B. thuringiensis*. There is no evidence that *B. thuringiensis* has the genetic determinants for the emetic toxin cereulide. The Panel has recommended the application of whole genome sequencing to provide unambiguous identification of strains used as biopesticides and the detailed characterisation of outbreak strains allowing discrimination of *B. thuringiensis* from *B. cereus*. Data gaps include: dose–response and behavioural characteristics of *B. cereus* group strains and specifically of *B. thuringiensis*. Field studies after application of *B. thuringiensis* biopesticides are needed to enable the establishment of pre-harvest intervals.

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