



# Cronobacter species in the dairy industry

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## What is Cronobacter ?

*Cronobacter* spp. (previously known as *Enterobacter sakazakii*) is a genus of Gram-negative, rod-shaped and non spore-forming bacteria of the family Enterobacteriaceae. The *Cronobacter* genus includes seven species viz: *C. sakazakii*, *C. malonaticus*, *C. turicensis*, *C. muytjensii*, *C. dublinensis*, *C. universalis* and *C. condimenti*. Of these, only strains from *C. sakazakii*, *C. malonaticus*, and *C. turicensis* have been associated with human infections. The predominant species from clinical sources is usually *C. sakazakii*. *Cronobacter* bacteria are widely found in the environment as well as in the digestive tracts of humans and animals. *Cronobacter* spp. have a growth range between 5.5 and 45°C, with an optimum of about 39°C. These microorganisms are sensitive to heat and are inactivated by pasteurisation. However, if contamination occurs post-pasteurisation, they can survive in dry environments, such as in powdered milk and powdered infant formula (PIF).

## Why are Cronobacter spp. important and who is at risk of Cronobacter infection?

The FAO/WHO expert meetings have identified all infants (<12 months of age) to be the population vulnerable to *Cronobacter* spp. infection. Of this group, neonates (<28 days), pre-term infants, low-birth weight babies (<2500 g), and immunocompromised infants (<2 months) are particularly at risk. While the number of *Cronobacter* spp. infections in infants is low, the consequences can be severe. Reported fatality rates of infections in infants vary considerably, with rates as high as 50% reported in one outbreak. In addition, surviving infants may suffer permanent disabilities such as mental retardation or other neurological conditions.

## Why is this relevant for dairy?

Outbreaks of *Cronobacter* spp. infections have been linked to PIF, especially in neonatal intensive care settings. *Cronobacter* spp. can be present at low concentrations in PIF because PIF is not a sterile food product. While the microorganism has been detected in other types of foods and environmental settings, only PIF fed to susceptible infants has been linked to outbreaks of disease. There are four possible contamination routes for *Cronobacter* spp.: 1) through the raw materials used to produce PIF, 2) through post-heat contamination from the processing environment, 3) through contamination after the package is opened by the consumer, and 4) through contamination and growth during or after reconstitution (mixing) of the formula with hot water prior to feeding.

## What is the dairy industry doing to manage the risk?

The dairy industry, in particular PIF producers, is very aware of the potential for *Cronobacter* spp. contamination from raw materials and post-pasteurisation contamination in dry processing areas (drying, blending and packaging areas). Even though PIF is not a sterile product, strict hygiene practices are followed at processing facilities in order to prevent post-pasteurisation contamination during production. Environmental monitoring programmes for Enterobacteriaceae (indicators for process hygiene) and *Cronobacter* spp., and control of end-products before marketing, are implemented in order to minimize the risk associated with *Cronobacter* spp. in PIF.

## What can I do?

The following FAO/WHO guidelines for the safe preparation, storage and handling of PIF are recommended in order to minimize the risk of illness for susceptible infants:

- use hygienic practices, e.g., clean hands, preparation surfaces and utensils.
- when reconstituting PIF, use water at no less than 70°C, if commercially sterile liquid formula is not available.
- use the reconstituted PIF immediately, or cool immediately to less than 5°C and use within 24 hours.

