Cooling conditions affect survival of *Bifidobacterium animalis* subsp. *lactis*, as a result of membrane fatty acid composition

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Production of fermented milks using *Bifidobacterium* species is a big challenge in dairy industry because of its grown requirements and its difficulty to survive at 4°C, as a result of low acid and cold tolerance. During cold storage, changes occur in bacterial membrane fatty acids profile, which depend on matrix composition, process and cooling conditions. In this work, we aim at demonstrating that kind of milk as well as cooling temperatures and durations may affect bacterial membrane fatty acids composition and survival of *Bifidobacterium animalis* subsp. *lactis* to cold storage at 4°C.

Fermented milks were prepared by using organic and conventional milks that were inoculated with *Bifidobacterium animalis* subsp. *lactis* BB12. At the end of the fermentation, different cooling temperatures (22°C, 25°C and 28°C) and durations (4, 8 and 12 hours) were applied. Cultivability and membrane fatty acid composition were measured and compared after fermentation and after 21 days of storage at 4°C.

Organic fermented milks showed superior cell counts at the end of fermentation and after storage, independently of cooling temperature and duration. Cultivability was higher when the cells were maintained at 28°C for 12 hours before being cooled to the final temperature of 4°C. After 21 days of storage at 4°C, survival was improved progressively according to the increase in cooling temperature and duration.

By considering membrane fatty acid composition, the cells that displayed the higher cultivability after 21 days of cold storage were characterized by lower relative contents of C10:0 and C12:0, but higher relative levels of C16:0, *cis*C18:1n-9 (oleic acid) and C18:3 (alpha-linolenic acid), this last one being more abundant in organic milk. These differences indicate that the cells adapted their membrane fluidity as a result of milk and cooling conditions.

Finally, this study demonstrates that survival of bifidobacteria during chilling is a result of the membrane fatty acid composition of the cells, which depends on the kind of milk and on cooling conditions.