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Bacteria and chocolate: A successful combination for probiotic delivery

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ABSTRACT

In this work, chocolate has been evaluated as a potential protective carrier for oral delivery of a microencapsulated mixture of *Lactobacillus helveticus* CNCM I-1722 and *Bifidobacterium longum* CNCM I-3470. A sequential *in vitro* setup was used to evaluate the protection of the probiotics during passage through the stomach and small intestine, when embedded in dark and milk chocolate or liquid milk. Both chocolates offered superior protection (91% and 80% survival in milk chocolate for *L. helveticus* and *B. longum*, respectively compared to 20% and 31% found in milk). To simulate long-term administration, the Simulator of the Human Intestinal Microbial Ecosystem (SHIME) was used. Plate counts, Denaturing Gradient Gel Electrophoresis and quantitative PCR showed that the two probiotics successfully reached the simulated colon compartments. This led to an increase in lactobacilli and bifidobacteria counts and the appearance of additional species in the fingerprints. These data indicate that the coating of the probiotics in chocolate is an excellent solution to protect them from environmental stress conditions and for optimal delivery. The simulation with our gastrointestinal model showed that the formulation of a probiotic strain in a specific food matrix could offer superior protection for the delivery of the bacterium into the colon. The chocolate example could act as a trigger for new research to identify new balanced matrices.

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