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Preparation and storage of bacteria used for a novel probiotic delivery system

Anders M. Torp¹, Pi W. Bondegaard¹, Priscila Guerra¹, Juliane F. Christfort², Khorshid Kamguyan², Line Hagner Nielsen², Anja Boisen², Tine R. Licht¹

¹National Food Institute, Technical University of Denmark
²Department of Micro- and Nanotechnology, Technical University of Denmark

Objective

In the MIMIO project (Microstructures, Microbiota, and Oral delivery), funded by The Novo Nordisk Foundation, we aim to investigate the application of a novel delivery system based on orally administered probiotic-filled microcontainers. Since loading of the microcontainers, including probiotic preparation and storage, represents a critical challenge in this project, systematic viability tests of bacteria were evaluated following various spray drying and storage conditions.

Method

The Gram-positive Lactobacillus rhamnosus GG (LGG) and Gram-negative Escherichia coli Nissle 1917 were spray dried at different settings using a BÜCHI Mini Spray Dryer, B-290. Additionally, a combination of trehalose and reconstituted skim milk (RSM) powder was added as protectant. Afterwards, the spray dried powder of LGG was stored at different conditions with variations in light exposure and temperature.

Results

For LGG, spray drying using an outlet temperature of 60°C and 10 w/w % trehalose and 10 w/w % RSM as protectants resulted in a fine powder with high cell viability, which could be stored for a prolonged period of time. However, spray drying of E. coli Nissle resulted in survival of less than 1 % at all tested conditions.

Conclusion

Spray drying with the addition of trehalose and RSM is a suitable technique to preserve LGG with a high cell viability. However, E. coli Nissle is more vulnerable to stress related to the spray drying procedure, possibly due to the sensitive Gram-negative cell wall structure. Therefore, we suggest using a different preparation method for this bacterium.
We would like only to present a poster at the Probiota conference.

**Contact information:**

Anders Meyer Torp,
National Food Institute, Technical University of Denmark
+45 22756015
amto@food.dtu.dk