

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

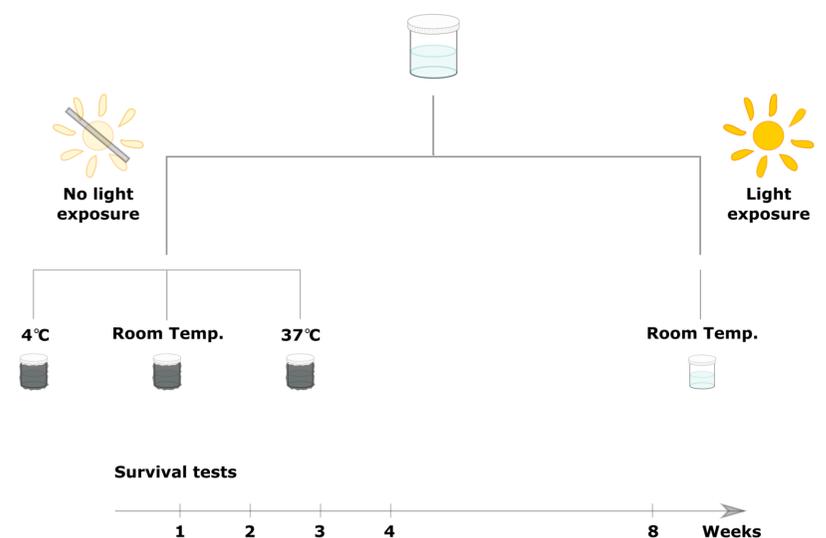
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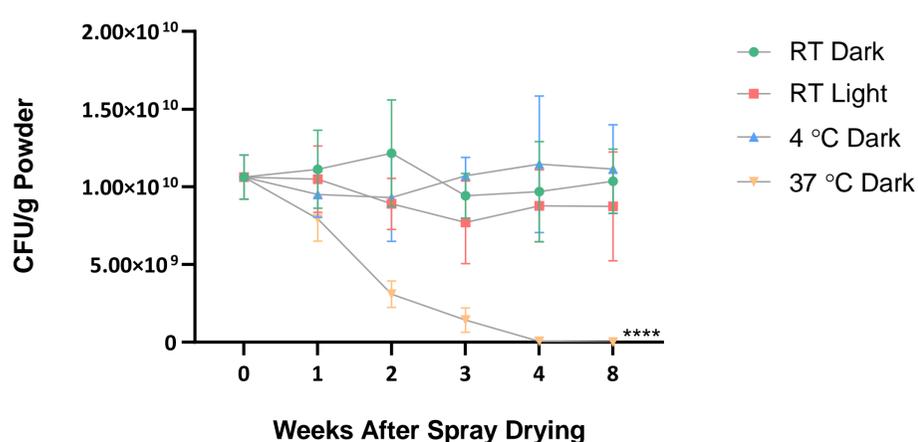
**Background.** In the MIMIO project, we aim to investigate the application of a novel delivery system based on orally administered probiotic-filled microcontainers. Since probiotic preparation and storage represents a critical challenge in this project, systematic viability tests of bacteria are being evaluated following various spray drying and storage conditions.

**Methods.** The Gram-positive *Lactobacillus rhamnosus* GG (LGG) and Gram-negative *Escherichia coli* Nissle 1917 were spray dried at different settings. A combination of trehalose and reconstituted skim milk (RSM) powder was added as protectant followed by storage of the spray dried powder at different conditions with variations in light exposure and temperature.



**Figure 1.** Schematic representation of the bacterial powder stored at different conditions.

## Storage Test For LGG Powder



**Figure 2.** Survival of spray dried LGG during storage at different conditions. At 37°C, the slope in a linear regression was significantly non-zero with a p-value of <0.0001.

**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 at 4°C and room temperature. However, spray drying of *E. coli* Nissle resulted in survival of less than 1 % at all tested conditions and, therefore, further tests were discontinued.

**Conclusion.** Spray drying with the addition of trehalose and RSM is a suitable technique to preserve high cell viability of LGG. However, *E. coli* Nissle is more sensitive to being spray dried suggesting that a different preparation method for this bacterium should be used.

## About MIMIO:

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The MIMIO project (Microstructures, Microbiota, and Oral Delivery) is a cross-disciplinary effort involving DTU Food and DTU Nanotech. The overall aim of the project is to combine nanotechnology, biotechnology, and microbiology to develop and characterize microfabricated containers for targeted oral administration of microbes to the gut environment. The devices will be developed at DTU Nanotech and tested in mice at DTU Food.