346. Optimizing spray-drying conditions for encapsulation of the next generation probiotic *Akkermansia muciniphila* DSM 22959

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Objectives: Probiotics are defined as “live microorganisms that, when administered in adequate amounts, confer a health benefit on the host” [1]. Among those, *Akkermansia muciniphila* is one of the most promising candidates proposed as a next generation probiotic. This commensal bacterium has a high potential to be incorporated into foods or pharmaceutical formulations, due to its demonstrated relevant biological effects in several metabolic conditions [2, 3]. For its commercialisation as a probiotic, *A. muciniphila* must be successfully incorporated into a deliverable formulation. However, its anaerobic nature becomes important to develop a matrix that can confer them protection during the usually aerobic storage [4]. Among the several encapsulation methodologies, spray-drying is one of the most popular due to appealing characteristics in terms of operation, scale-up, costs and efficiency [5].

The present work aims to i) establish a suitable procedure to encapsulate *A. muciniphila* DSM 22959 using a spray-dryer, without prior encapsulation treatments, by optimizing the spray-drying settings and matrices; and ii) evaluate spray-dried *A. muciniphila* viability during storage under aerobic conditions at different temperatures.

Results: The most suitable matrix for *A. muciniphila* encapsulation by spray-drying was skim milk. Adequate conditions for spray-drying processing were established, considering inlet and outlet temperatures, to ensure maximum viability upon processing. Skim milk encapsulated *A. muciniphila* cells also showed high stability during storage for 30 days, under aerobic conditions, both at 22 ºC and, specially, at 4 ºC.

Conclusions: Spray-drying seems to be a promising technique to encapsulate *A. muciniphila*, particularly using skim milk as encapsulating matrix, ensuring bacterial cells viability (above the minimum required threshold) up to one month under common shelf-life conditions.

Significance/Impact of the work: This work presents spray-drying using skim milk matrix as a technological solution for delivering the probiotic strain *A. muciniphila* and this formulation could be promising therapeutic/prevention option in metabolic disorders. Furthermore, this

strategy can possibly be extended to other next-generation probiotics and facilitate the incorporation of such probiotic bacteria into food bases, suitable for human consumption.

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References

[1] Hill et al. (2014). https://doi.org/10.1038/nrgastro.2014.66

[2] Andrade et al (2020). https://doi.org/10.3389/fbioe.2020.00550

[3] Yang et al (2020). https://doi.org/10.3390/microorganisms8091413

[4] Palmer et al (2007). https://doi.org/10.1371/journal.pbio.0050177

[5] Chávez and Ledeboer. (2007). https://doi.org/10.1080/07373930701438576