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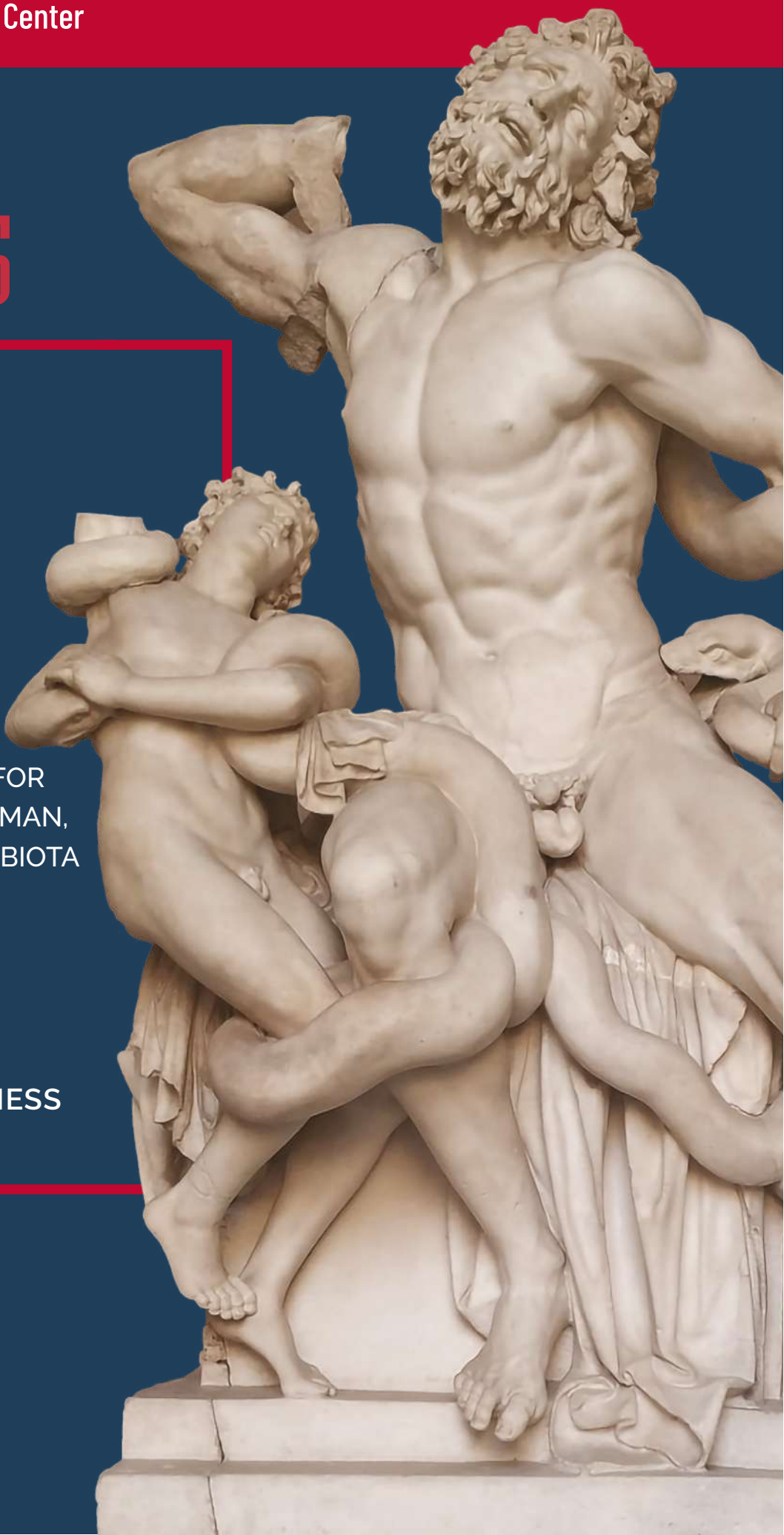
NUTRACEUTICALS, BOTANICALS & PHYTOCHEMICALS FOR NUTRITION AND HUMAN, ANIMAL AND MICROBIOTA HEALTH

4TH SCIENCE & BUSINESS SYMPOSIUM



O.C. 107_133 | ENCAPSULATION OF AKKERMANSIA MUCINIPHILA IN CALCIUM-ALGINATE MATRIX: A LIVE BIOTHERAPEUTIC STRATEGY FOR GUT MICROBIOTA MODULATION AND INTESTINAL INFECTION MITIGATION

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Objective: Akkermansia muciniphila is a next-generation probiotic recognized for improving gut barrier function and metabolic health. However, ensuring its viability during processing, storage, and gastrointestinal transit remains a challenge. This study investigated calcium-alginate encapsulation as a strategy for enhancing the stability of A. muciniphila during refrigerated aerobic storage and gastrointestinal passage as well as biological validation in an in vitro fecal model.

Methods: A. muciniphila was encapsulated using an extrusion technique with 2% (m/v) sodium alginate and 4% (m/v) calcium chloride. Viability of free and encapsulated cells was assessed over 28-days of refrigerated aerobic storage. Gastrointestinal stability was evaluated using the INFOGEST protocol. In vitro colonic fermentation was conducted in healthy and Escherichia coli O157:H7-infected fecal samples. Microbial composition was analyzed via metagenomic sequencing, while microbial metabolism was assessed by ammonia quantification and short-chain fatty acids (SCFA) profile analysis.

Results: Encapsulation achieved a 60% yield and preserved high probiotic viability (at levels around 8-log CFU/g) during 28-days of storage. Moreover, encapsulated cells exhibited higher survival when exposed to gastrointestinal conditions compared to free cells. In fecal fermentation assays, encapsulated A. muciniphila enhanced microbial diversity, reduced Escherichia genus abundance, and modulated SCFA profile. Furthermore, an increasing trend in ammonia production until the 30-hour mark, followed by a decline suggests potential ammonia assimilation by the probiotic.

Conclusions: Calcium-alginate encapsulation is a promising delivery strategy to improve the viability and functionality of A. muciniphila, supporting its use as a live biotherapeutic agent for modulating gut microbiota and intestinal infections mitigation.

O.C. 108_141 | DEVELOPMENT OF FUNCTIONAL CHOCOLATE INCORPORATING AKKERMANSIA MUCINIPHILA: THE ROLE OF CACAO POWDER

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Objective: This study evaluated the feasibility of using chocolate as a food matrix for delivering Akkermansia muciniphila, a next-generation probiotic known for improving gut barrier function and metabolic health. The research assessed the viability of A. muciniphila in three different chocolate formulations, characterised the chocolate's biological characteristics, and evaluated the potential prebiotic and biological activities of cocoa powder.

Methods: The viability and stability of A. muciniphila DSM 22959 in three chocolate matrices (33.6%, 54.5% and 70.5% w/w cocoa) were evaluated over 28 days of aerobic storage. Total phenolic content was measured (Folin-Ciocalteu assay), and antioxidant (ABTS) and antidiabetic properties were assessed. Cocoa powders samples (30%, 90% and 100%) were also evaluated for antioxidant and antidiabetic properties, as well as prebiotic potential for supporting A. muciniphila (via viable cell counts) and acidification through pH monitoring and HPLC analysis of organic acids.

Results: Chocolate containing 54.5% (w/w) cocoa emerged as the most suitable matrix for preserving A. muciniphila viability (above 106 CFU/g) during storage. The 70.5% (w/w) cocoa chocolate exhibited higher levels of total phenolic compounds, as along with good antioxidant (349916.87 µmol of Trolox equivalent per g of sample) and antidiabetic (100%) properties. Cocoa powders with 90% and 100% (w/w) cocoa not only showed elevated phenolic content and antioxidant activity but also promoted A. muciniphila growth, as evidenced by a decrease in pH and increased production of short-chain fatty acids after 48 hours of fermentation.

Conclusions: Chocolate matrixes demonstrated to have favourable biological characteristics acting as a suitable vector for A. muciniphila DSM 22959.