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El microbioma humano: de la investigación a la clínica

SEMiPyP
SOCIEDAD ESPAÑOLA DE MICROBIOTA, PROBIÓTICOS Y PREBIÓTICOS

MEDITERRANEAN-BASED FERMENTED FOODS AND HUMAN GUT MICROBIOTA WITHIN THE FRAMEWORK OF THE INNOSOL4MED PROJECT

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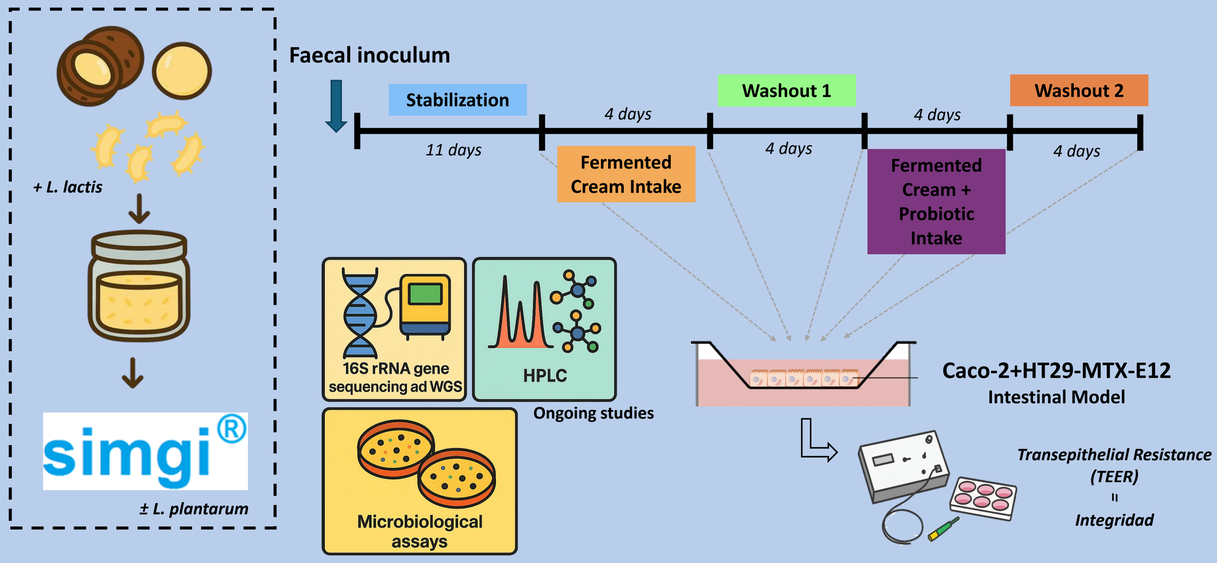
INTRODUCTION AND OBJECTIVE. The Mediterranean diet is presented as a benchmark for its nutritional, functional and cultural value due to its potential beneficial impact on human health, responding to the search for innovative technological solutions for the food industry, as well as strengthening socio-cultural ties. This is the context for the European **Innosol4Med Project**, in which certain food extracts have been generated and characterized during the initial phases, considering composition, stability and shelf life extension, among other factors. Based on these results, the project is now moving towards the creation of new foods, designed from these ingredients selected for their biofunctionality.

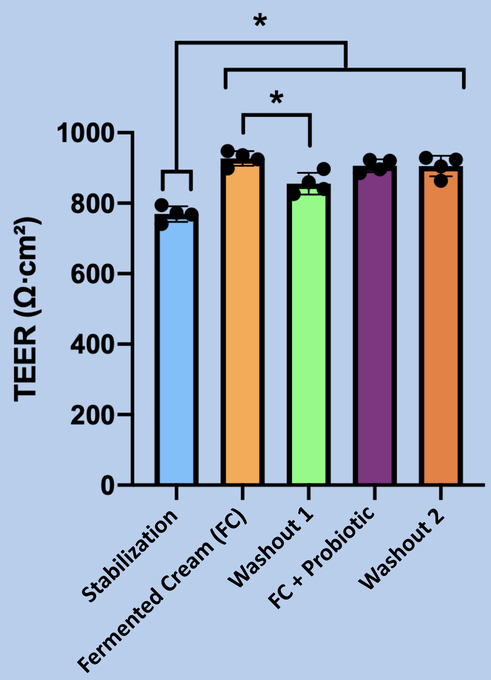
The current work focuses on three complementary areas: (i) Evaluation of the bioactive improvement of **fermented foods** made from cashews and macadamia nuts, through the action of a *Leuconostoc lactis* isolate, both under basal microbiota conditions and in combination with a probiotic, with the aim of exploring microbial synergies between primary fermentation and *in vitro* colonic fermentation with human faecal communities; (ii) *in vitro* study of the potential beneficial effects on the gut microbiome of a **vegetable pâté** enriched with bioactive extracts of astaxanthin from prawns and yellow onion skin; (iii) **folic acid biosynthesis capacity** of bacteria isolates, including basal persistence and food matrices such as milk and yoghurt, as well as the interaction of these strains under different conditions with intestinal microbial communities.

METHODS. The **simgi® system** was used to evaluate digestibility, bioaccessibility, and gut microbiota-food matrix interactions. It is a versatile model that can operate in static and dynamic modes and simulate different regions of the gastrointestinal tract, also simulation the feeding of food products and selected microorganisms. Following the simulations, determinations were made for an in-depth study of the effects on the gut microbiome and human health: 16S rRNA metataxonomic analyses, faecal metabolome (target and un-target), and the use of advanced human cell models.

1. MACADAMIA AND CASHEW NUT CREAM FERMENTED WITH *L. LACTIS* ON A HEALTHY MICROBIOTA MODEL WITH PROBIOTICS



RESULTS: Assessment of improvements in intestinal integrity



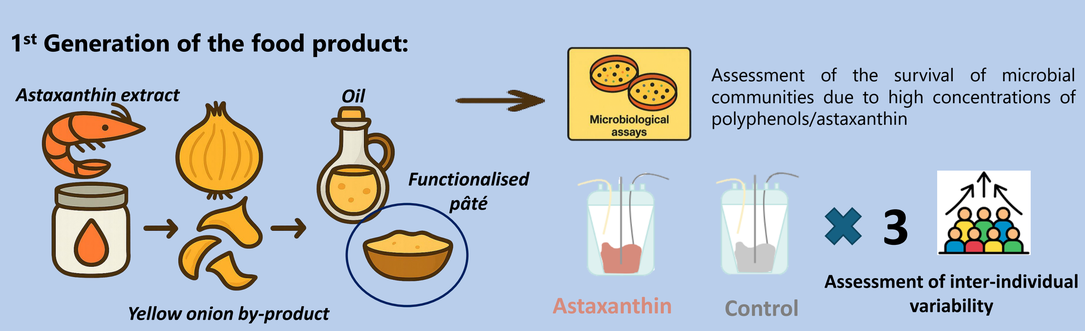
After exposing the supernatants obtained at the end of each simulation stage to an in vitro intestinal model (Caco-2/HT-29-MTX-E12), an improvement in the integrity of the overall epithelial barrier was observed compared to the microbiota stabilization phase:

- The intake of cream fermented with *L. lactis* (FC) promoted this effect, but it was attenuated during the washing phase (Washing 1), reaching intermediate levels of integrity.
- When *L. lactis* fermented cream was administered together with the probiotic *L. plantarum*, the improvement was similar (FC+Probiotic) and was guaranteed to be maintained even after washing.

These results suggest not only a beneficial effect on the host linked to the microbial metabolism induced by the fermented cream, but also the existence of synergistic interactions with the probiotic that prolong this effect. Genomic analysis of both strains is currently being carried out to clarify the molecular basis of these interactions.

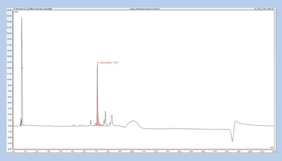
2. FUNCTIONALISATION OF PÂTÉ WITH BIOACTIVE EXTRACTS OF AXTASANTIN AND YELLOW ONION SKIN

1st Generation of the food product:



2. Optimisation of the analysis of astaxanthin and potential metabolites degraded by intestinal microbial communities *in vitro* (carotenoids) (UPLC-MS)

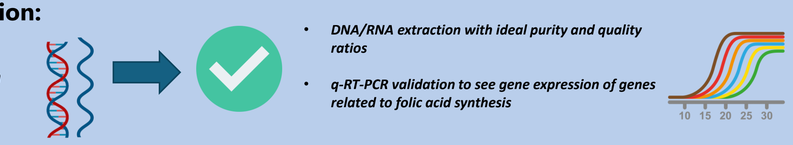
- Lutein
- β-carotene
- α-carotene
- γ-carotene
- All-trans-retinoic acid



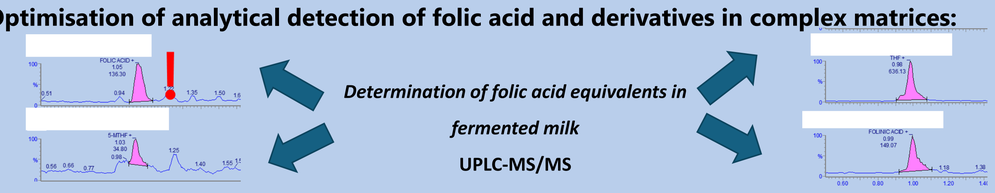
3. BIOSYNTHESIS OF FOLIC ACID FROM MEDITERRANEAN DIET BACTERIA STRAINS

S. thermophilus was selected as the model microorganism, given that its genome contains genes for the synthesis or biodegradation of folic acid.

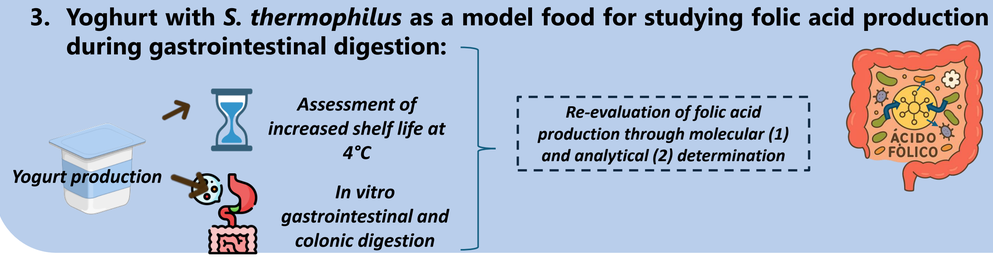
1. Molecular determination:



2. Optimisation of analytical detection of folic acid and derivatives in complex matrices:



3. Yoghurt with *S. thermophilus* as a model food for studying folic acid production before and during gastrointestinal digestion:



CONCLUSIONS. After delving into the link between food components and microbial isolates derived from the Mediterranean diet and the microbiome, new products are being developed with the potential to respond to the growing demand for ready-to-eat products, while also generating knowledge that promotes consumer health.

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Some of the graphic material in this poster has been generated using artificial intelligence tools (Microsoft Copilot).