Model of abstract to submit:

☒Oral presentation ☐Poster

☐ 2nd year PhD student ☒3rd year PhD student

Positive interactions between lactic acid bacteria promoted by nitrogen-based nutritional dependencies

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Abstract:

Lactic acid bacteria (LAB) interactions are often studied in association with yeasts or propionibacteria in various fermented food products and the mechanisms underlying their interactions are being quite well characterized. Concerning interactions between LAB, which are responsible for the sanitary, organoleptic, and health properties of most fermented products, they have mainly been investigated to test antagonistic interactions. Understanding how they can positively interact could be useful in multiple food-related fields: production of fermented food products with enhanced functional properties or fermentation of new food matrices. Nutritional dependencies, especially those regarding nitrogen sources, govern numerous microbial positive interactions. As for LAB, such positive interactions, have previously been studied between yogurt bacteria. However, they have never been exploited to create artificial co-cultures of LAB that would not necessarily coexist naturally, i.e from different biotopes. The objective of this study was to promote LAB positive interactions based on nitrogen dependencies in co-cultures to increase acidification rates, carbohydrate consumption, and volatile compound production. The strategy was to exploit both proteolytic activities and amino acid auxotrophies of LAB. A chemically defined medium was thus developed to specifically allow the growth of six LAB strains used, three proteolytic and three non-proteolytic. Each of the proteolytic strains, *Enterococcus faecalis* CIRM-BIA2412, *Lactococcus lactis* NCDO2125, and CIRM-BIA244, was co-cultured with each one of the non-proteolytic LAB strains: *L. lactis* NCDO2111, *Lactiplantibacillus plantarum* CIRM-BIA465 and CIRM-BIA1524. Bacterial growth was monitored using compartmented chambers to compare growth in mono- and co-cultures. Acidification, carbohydrate consumption and volatile compound production was evaluated in direct co-cultures. Each proteolytic strain induced different types of interactions: either strongly positive, weakly positive, or no interactions, with *E. faecalis* CIRM-BIA2412, *L. lactis* NCDO2125 and *L. lactis* CIRM-BIA244, respectively. Strong interactions were associated with higher concentrations in tryptophan, valine, phenylalanine, leucine, isoleucine, and peptides. They led to faster acidification rates, lower final pH, higher raffinose utilization, and higher concentrations in five volatile compounds.