

Combining Selected Immunomodulatory *Propionibacterium freudenreichii* and *Lactobacillus delbrueckii* Strains: Reverse Engineering Development of an Anti-inflammatory Cheese

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Introduction: Inflammatory bowel disease (IBD) constitutes a growing public health concern in western countries. More generally, inflammation is a key parameter involved in many non-communicable chronic diseases. Bacteria with anti-inflammatory properties are lacking in the dysbiosis accompanying IBD. Selected strains of probiotic bacteria with anti-inflammatory properties accordingly alleviate symptoms and enhance treatment of ulcerative colitis in clinical trials. Such properties are also found in (only) selected strains of dairy starters, including the *Propionibacterium freudenreichii* and *Lactobacillus delbrueckii* species, which are widely ingested. We thus investigated the possibility to develop a fermented dairy product, combining both starter and probiotic abilities of both lactic acid and propionic acid bacteria, designed to extend remissions in IBD patients.

Methods: We developed single-strain *L. delbrueckii*-fermented milk and a two-strain *P. freudenreichii* and *L. delbrueckii*-fermented experimental pressed cheese using strains previously selected for their anti-inflammatory properties. This cheese was made in fully mastered conditions and contained only the two selected strains. It was consumed daily by mice during five days before induction of acute colitis by trinitrobenzene sulfonic acid (TNBS). Outcomes of colitis induction were then monitored in mice consuming this cheese or a placebo dairy matrix.

Results: For the first time, consumption of a designer *P. freudenreichii* and *Lactobacillus delbrueckii* pressed cheese was shown to protect mice against experimental colitis, alleviating severity of symptoms, modulating local and systemic inflammation, as well as colonic oxidative stress and epithelial cell damages. As a control, the corresponding sterile dairy matrix failed to afford such protection.

Discussion: We eat more bacteria through daily consumption of fermented dairy products than through our consumption of functional food supplements. This offers a tremendous level to modulate the digestive tract through the intake of desired bacteria. This work reveals the probiotic potential of a mixture of lactic and propionic selected starters, in the context of fermented dairy products. A “two-in-one” ability is revealed for bacteria able both to produce a fermented dairy product and to modulate inflammation. Such an innovation opens new avenues for the reverse engineering development of anti-inflammatory fermented foods designed for target populations with IBD, and has provided evidences leading to an ongoing pilot clinical study in ulcerative colitis patients.

Biography:

Dr. Gwénaél Jan completed his Ph.D. at STLO (INRA-AgrocampusOuest), France. He did his Master degree at the University of Rennes, France. At present Dr. Gwénaél Jan is the Directeur de Recherche INRA-Agrocampus Ouest Rennes.