

Effects of Prebiotics and Probiotics on Human Gut Microbiota and Related Immune System: A Study on Healthy and Elderly Subjects

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Abstract: The human gastrointestinal tract is inhabited by communities of microorganisms, which composition evolved to exploit beneficial tasks for the host, meanwhile thrives in sites providing a nutrient-filled habitat. Therefore, preserving gut microbiota through the administration of prebiotics, probiotics, or their combination known as synbiotic, represents a new strategy to improve human health. Hence, the aim of the project is the design of a new synbiotic formulation and the evaluation of its effect on the gut microbiota and on the general health state of healthy and elderly subjects.

A randomized, double-blind, three-arm parallel, placebo-controlled clinical study was conducted on 75 subjects that were assigned to receive the prebiotic formulation (FOS with DP 3-5 and DP 10), or the synbiotic (FOS with DP 3-5 and DP 10, plus *L. plantarum* PBS067, *L. acidophilus* PBS066, and *B. animalis* spp. *lactis* PBS075) or the placebo once daily for 28 days; then the subjects attended a 28 days follow-up period. At the time-points, the microbiota composition was evaluated, as well as the levels of selected clinical parameters.

The microbiota of the subjects treated with the synbiotic formulation showed the highest biodiversity, linked to the variation rate of seven beneficial taxa. The qPCR analysis on *L. plantarum*, *L. acidophilus* and *B. animalis* spp. *lactis* at the time-points confirmed the increasing trend in the synbiotic treatment group. Considering the treatment groups in terms of relative abundances across the time-points, the most represented ASVs in the synbiotic group are assigned to genera known to have beneficial effects on host gut metabolism. The efficacy in terms of Common Infectious Diseases (CID) symptoms amelioration was evaluated recording the episode daily. The collected data indicated the synbiotic effectiveness in reducing their incidence. Data regarding faecal markers (calprotectin and β -defensin 2) suggested that the innate gut immune system was positively stimulated by the treatments. Considering the salivary biomarkers (IgA and total antioxidant capacity), for the synbiotic group were registered values in line with the levels reported in elderly people.