

***In vitro* reconstructed human gut microbiota as a new tool for bacterial interaction studies**

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Abstract: *In vitro* models resembling human gut fermentation represent a useful tool to study the impact of a given compound on the human gut microbiota and consequently on human health. The normal inhabitants of the gastrointestinal tract perform different essential functions. Consequently, bacterial interactions within the microbiota represent a network to be preserved and protected. The focus is on the shift of the core microbial groups and selected species together with their metabolites, assaying their diversity, richness, and abundance.

The presented work aims to establish a core gut microbiota composed of the representative bacteria of the most important phyla in the gut ecosystem (i.e. Firmicutes, Bacteroidetes, Proteobacteria, Actinobacteria) and monitor its shift after the challenge with probiotic bacteria (mainly *Lactobacillus* and *Bifidobacterium*), different kind of prebiotics, or both.

After the validation of the model with recognized prebiotics (i.e., FOS and inulin), preliminary results were obtained using *Grifola frondosa* (Maitake) mushroom extract as a source of prebiotic molecules because of the encouraging results obtained on a probiotic consortium and its impact on colorectal cell lines (De Giani et al. 2021). At 2% concentration, Maitake could be used as a carbon and energy source also by the basal community strains, while the prebiotic potential on the probiotics is confirmed, detecting propionic, lactic, and valeric acid as short-chain fatty acids, and registering a prebiotic index of 2.31. Community modulation analyses showed both synergistic and predation mechanisms established. The principal commensal strain was *E. coli*, while the levels of the other bacteria remained stable, while *L. plantarum* displayed the highest growth values among the probiotics.

Since the platform could be a valuable tool, Ginseng berries extract is now under investigation because of encouraging data collected on probiotic strains and colorectal cell lines in terms of protection from oxidative stress. Furthermore, the beneficial effects of Maitake secondary metabolites are deeply studied considering the effect not only on intestinal epithelial cells but on immune system's cells, to have a global view of the impact of bacterial prebiotic metabolism on human health.