Prebiotic properties exploration of various insoluble fibers using the *ex vivo* SIFR® technology

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Dietary fibers are classified either as "soluble fibers" that are fermented by the gut microbiota, or as "insoluble fibers" that are not or poorly fermented. Using the SIFR® technology, prebiotic properties of various insoluble fibers were compared to two well-known soluble prebiotics (NUTRIOSE® and inulin). The SIFR® technology (Systemic Intestinal Fermentation Research), a novel *ex vivo* bioreactor-based technology, owing to its throughput, allowed to evaluate the impact on the gut microbiota of 6 human adults, a key aspect given the importance of interpersonal differences on the response to interventions.

All samples underwent an oral, gastric and small intestinal digestion procedure, followed by an absorption simulation and colonic fermentation. Fundamental fermentations parameters (pH, gas, SCFA/bCFA) and microbial composition (quantitative 16S rRNA gene profiling) were analyzed at 0/6/48h.

Within as short as 48h, both soluble fibers (NUTRIOSE® and inulin) displayed prebiotic properties in line with recently published clinical data, both in terms of metabolic activity and microbial population shifts (e.g. stimulation of *Parabacteroides* sp. by NUTRIOSE®). While some insoluble fibers exerted minor effects, fibers from pea or potato origin markedly increased propionate and especially acetate and butyrate. Interestingly, in contrast to soluble candidates, all insoluble fibers (except one) significantly increased health-related *Bifidobacteriaceae*. A substrate specificity was demonstrated showing *B. longum* or *B. adolescentis* stimulation depending on the vegetal origin of the fiber, underlying structural and chemical preference of some bacterial strains.

Altogether, we not only confirmed the prebiotic potential of the established fiber NUTRIOSE® but also revealed insoluble fibers can exert prebiotic effects. Finally, findings obtained with the SIFR® technology within as short as 48h corresponded to observations made *in vivo* after weeks of repeated administration, altogether positioning the SIFR® technology as a novel discovery and characterization engine.