**Next-generation prebiotics: Oligosaccharides-protein Maillard-conjugates for selective targeting of proteins to probiotic bacteria in the colon**

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**Abstract**

Prebiotics consumption may promote gut-probiotics, and improve human-health. Current prebiotics are predominantly carbohydrates. However, great competition exists among gut-microbes for the scarce protein in the colon, as most consumed-protein is absorbed in the small-intestine. Still, no protein-containing-prebiotics are commercially-available. Here, we developed and evaluated *in-vivo* the next-generation of prebiotics: protein-containing-prebiotics, for selectively-targeted delivery of protein to colonic-probiotics, to boost their growth. The system is based on micellar-particles, made of Maillard-conjugates of 2’-Fucosyllactose (2’-FL) shell, engulfing protein (Lactoferrin or potato protein) peptic-then-tryptic hydrolysate (LFH or PPH, respectively). This core-shell structure lowers protein-core digestibility, while the prebiotic-glycans are hypothesized to selectively-target colonic-probiotics. In-vivo mice-study showed that the consumption of 2’-FL-LFH Maillard-conjugates significantly increased the colonic-concentration of short-chain-fatty-acids (SCFAs), compared to the unconjugated-components or to saline, by promoting SCFAs-producing bacterial-families and genera (Ruminococcaceae, Lachnospiraceae, Odoribacter and Prevotella). Plasma-levels of inflammatory lipopolysaccharides were significantly lower in the 2’-FL-LFH group compared to the unconjugated-components and the saline groups, indicating lower pathogen-induced gut wall permeability. We found that 2’-FL-LFH can serve as novel protein-containing-prebiotics, beneficially-modulating the composition and metabolic-activity of gut-microbes, thereby contributing to host-health more effectively than carbohydrate-only prebiotics. Varying the oligosaccharide or protein parts may allow targeting different probiotics and providing their essential amino-acids. These possibilities would enable tailoring the product for desired health-benefits or target consumer-populations.

**References**

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