



# How is dietary fibre metabolised by human small intestine microbiota?

## An *in vitro* study using small intestinal microbes obtained from ileostomists

**OUTCOME.** Our results showed breakdown of fructo-oligosaccharides DP4-8, and galacto-oligosaccharides DP>2 by 5 human small intestinal inocula within 5 hours (Figure 1), whereas iso-malto/maltopolysaccharides were degraded by only one human small intestinal inoculum after 7 hours (Figure 2C).

**CONCLUSION.** In this study, we provided experimental evidence of microbes with prebiotic dependent hydrolytic potential in the human distal small intestine. Observed breakdown was dependent on the individual, and on the type of dietary fibre. Efficient fermentation was achieved after inoculum activation, and fermentation times exceeding *in vivo* small intestine transit times.

**BACKGROUND.** There is limited knowledge on the capacity and functionality of human small intestinal (SI) microbiota with respect to dietary fibres. Dietary modulations of SI microbiota may impact various aspects of health, by affecting local and systemic processes in the host. Studying SI microbiota is complicated, because of difficult accessibility in healthy subjects. Therefore, effluent samples of ileostomy subjects (have a stoma bag attached to ileum), can be used to generate information about this compartment.

**HOW?** We targeted the small intestine in a screening based approach, to study the potential of small intestinal microbes to metabolize dietary fibres.

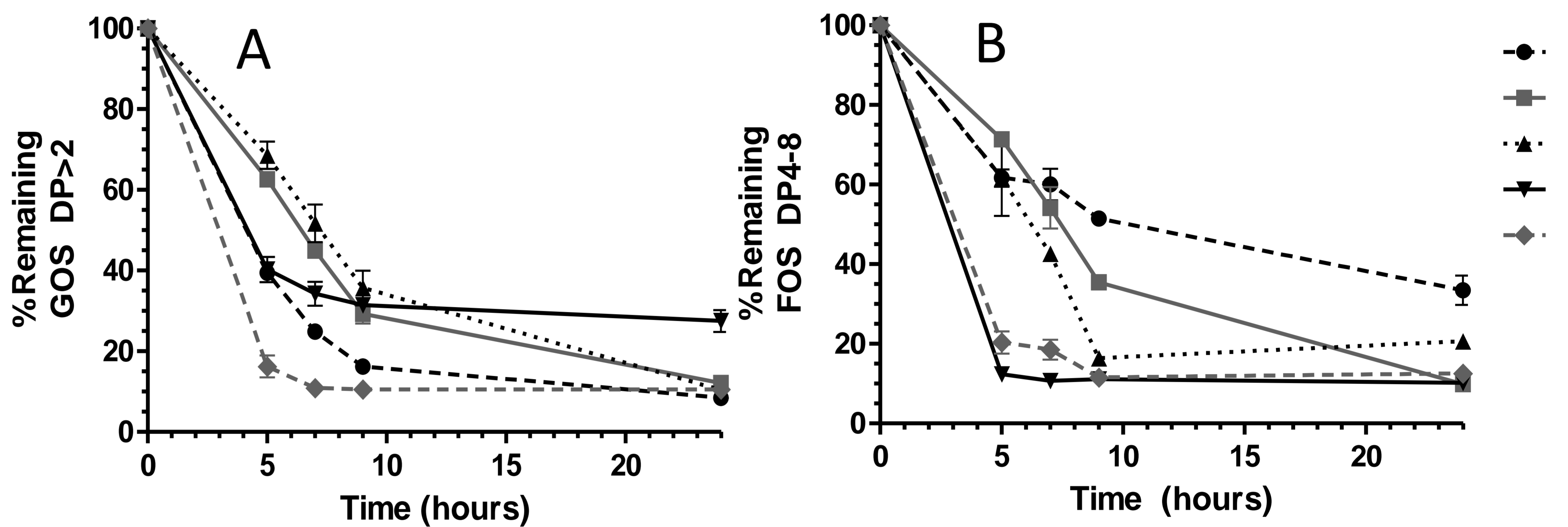


Figure 1. Degradation rate of GOS DP>2 (A) and FOS DP4-8 (B) at 0, 5, 7, 9, and 24 h, expressed as percentage from the initial oligomers present. The lines represent the individual human SI inocula (1 to 5).

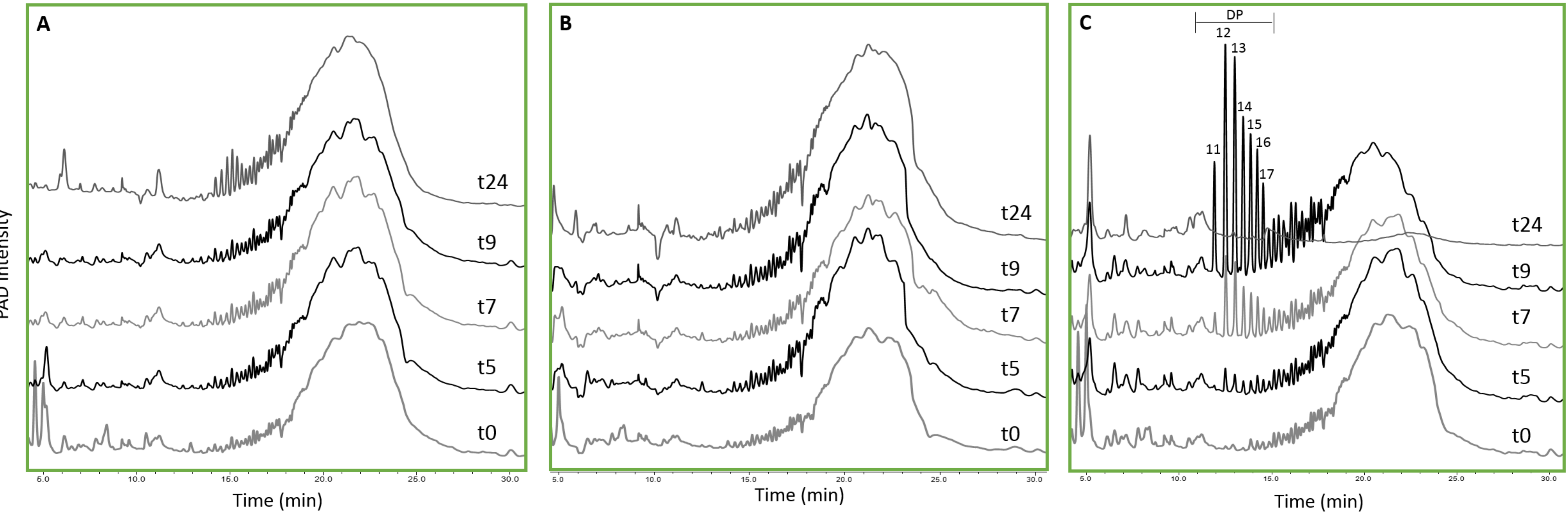
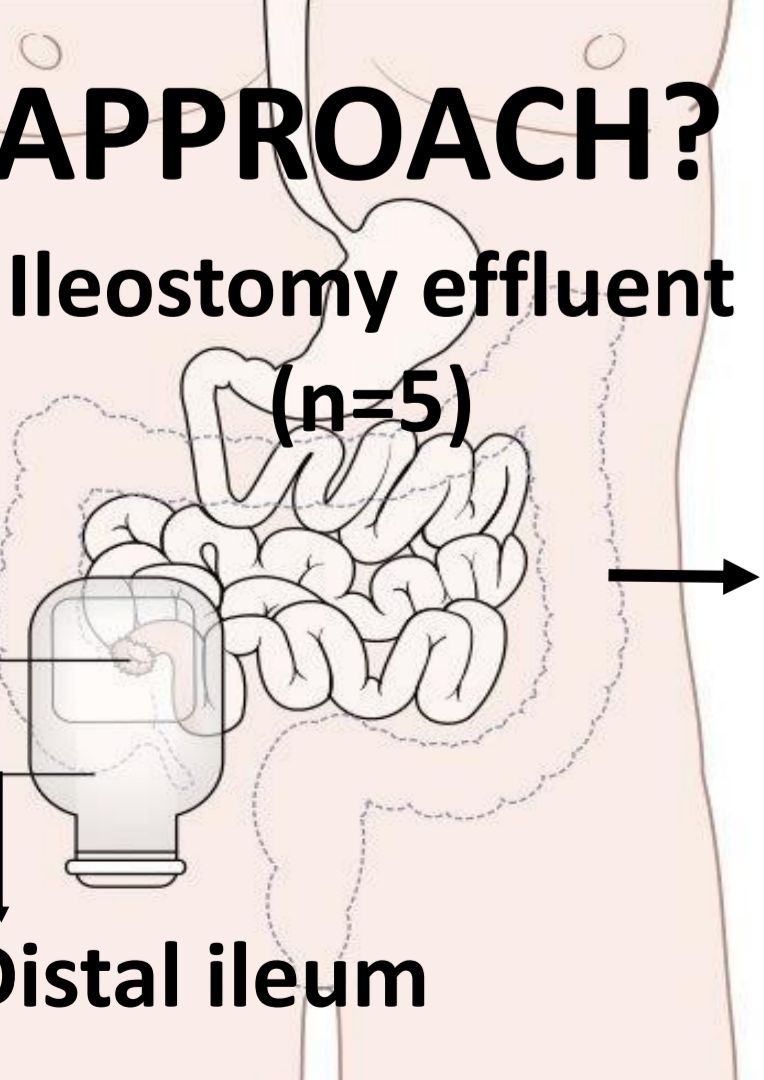


Figure 2. HPAEC elution profiles of iso-malto/maltopolysaccharides fermentation digesta, incubated with inocula 1 (A), inocula 2 (B), and inocula 3 (C) at 0, 5, 7, 9, and 24 h.



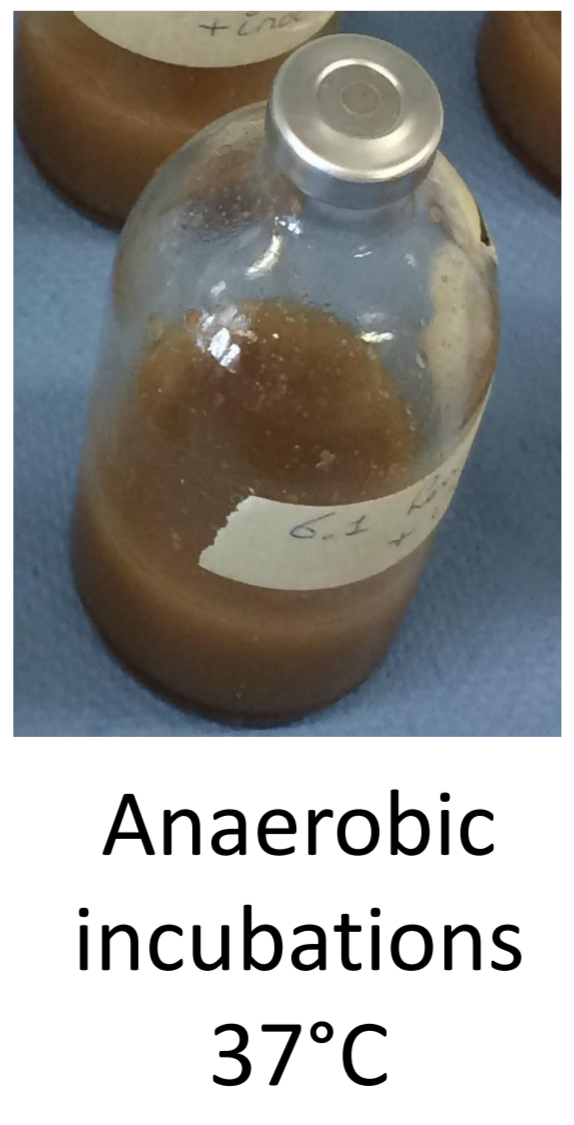
**APPROACH?**

Activation of inocula (15 h)

Batch *in vitro* fermentation

Added SIEM medium with:

- fructo-oligosaccharides
- galacto-oligosaccharides
- iso-malto/maltopolysaccharides



Sampling at 0, 5, 7, 9, 24 h

- Fibre degradation (HPSEC/HPAEC)
- Short chain fatty acids/organic acids
- 16S rRNA copy number

**PROJECT TEAM**

**Mara van Trijp**<sup>1</sup>, Madelon Logtenberg<sup>3</sup>, Christiane Rösch<sup>3</sup>, Melany Rios Morales<sup>2</sup>, Barbara Bakker<sup>2</sup>, Dirk-Jan Reijngoud<sup>2</sup>, Henk Schols<sup>3</sup>, Guido Hooiveld<sup>1</sup>

<sup>1</sup>Nutrition, Metabolism, and Genomics group, Division of Human Nutrition, Wageningen UR

<sup>2</sup>Liver, Digestive and Metabolic diseases, UMCG

<sup>3</sup>Laboratory of Food Chemistry, Wageningen UR