

Prebiotics in human digestion



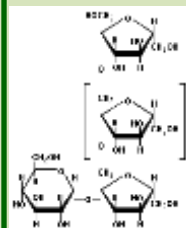
Folkert Faber, Monique Ebbelaar, Gert Hofstede, Jasper Geertsema, Kim de Lange, Jan-Peter Nap.

ALIFE, Institute of Life Science & Technology, Hanze University Groningen, University of Applied Sciences, Groningen, The Netherlands.

Introduction

Prebiotics are non-digestible food ingredients that are thought to stimulate the growth and/or activity of bacteria in the digestive system thought to be beneficial to human health. There is considerable industry interest in the development of prebiotics, such as FOS, GOS or inulin, and in appropriately establishing their health claims. Current methods for assessing the action and digestibility such molecules are generally tedious, expensive and require large amounts of material. This research aims to improve such methods.

Non-digestible polysaccharides



Inulin: (Fru)_n-(Fru)_n-Glu (β-1,2)

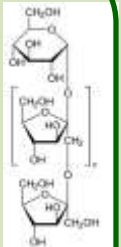
Principle: (Almost) no degradation in stomach and small intestine

Fructo-oligosaccharide (FOS):

(Fru)_n-Glu (β-2,1 and α-1,6)

Galacto-oligosaccharides (GOS):

(Gal)_n-Glu (β-1,4 and others)



Digestive tract:



Stomach
+
Small
intestine



Enzymatic degradation

Amyloglucosidase,
Amylase, etc.

Colon



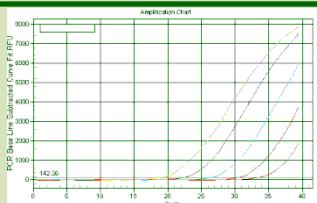
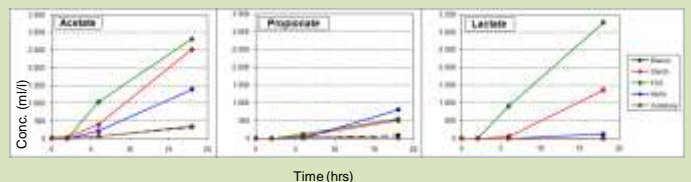
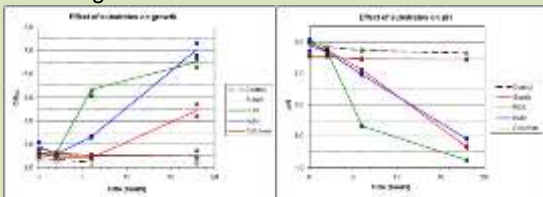
Bacterial degradation

Lactobacillus,
Bifidobacterium,
Clostridium,
Bacteroides
Total count

Results

- Growth on Starch, Inulin and FOS
- No growth in Control and Cellulose

- Mainly the formation of acetate, propionate and lactate is observed, but also traces of butyrate and formic acid.
- Traces of glucose and fructose are observed after 2 hours



Quantitative PCR analyses

(relative) amounts of bacterial species in the fecal slurry for *Lactobacilli*, *Bifidobacteria*, *Bacteroides* and *Clostridia*., data to be combined in the "prebiotic index".

Relative abundance*

Occurrence of bacterial species at T= 6 hrs compared to control T=0 hrs.

Species	Substrates			
	Control	FOS	Inulin	Cellulose
<i>Lactobacilli</i>	1,4	12,5	19,4	1,4
<i>Bifidobacteria</i>	2,0	28,0	11,0	1,1
<i>Clostridia</i>	0,5	0,6	0,7	0,5
<i>Bacteroides</i>	1,1	1,1	1,6	0,6

* Paffle-method to compare results

Conclusions

Analysis of the bacterial flora is important for the characterization of fermentation events. They help the further validation of the "prebiotic index" as fast and cost-effective screening of prebiotic action within individuals or selected populations.