PROJECT FINAL REPORT

Project acronym: FibeBiotics

Project title: Dietary NPSs supporting Gut and Immune Function - From polysaccharide compound to health claim

Grant Agreement number: 289517
Funding Scheme: Collaborative project

Period covered: **from** 1 January 2012 **to** 31 June 2016

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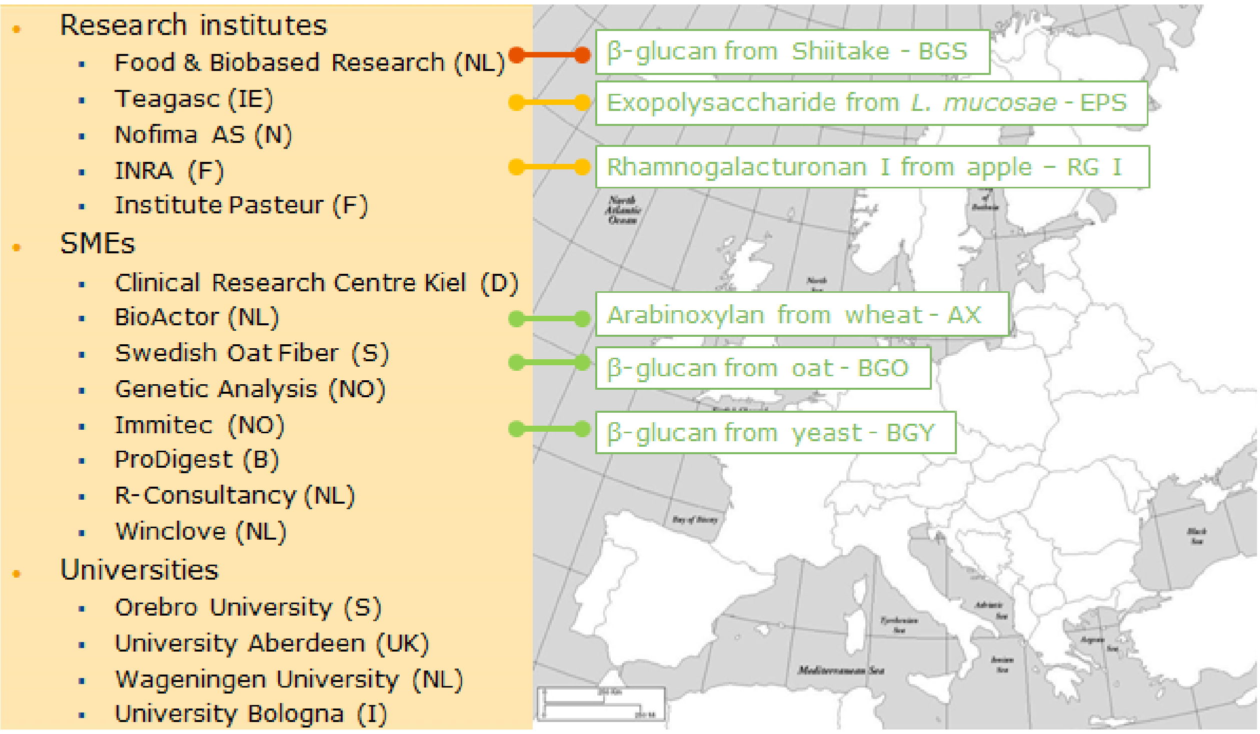

Figure 1. Overview of the consortium and the partners responsible for providing and preparing NPSs.

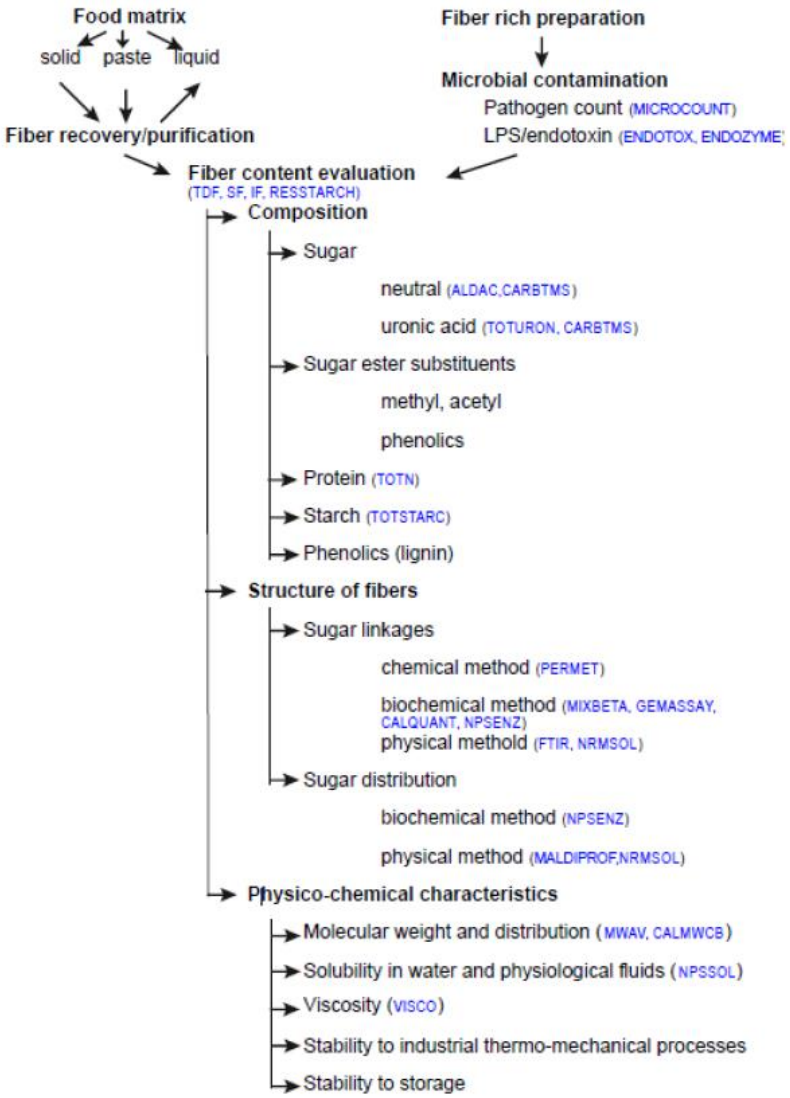

Figure 2. Schematic representation of the biochemical characterisation steps to be performed for analysing NPSs samples.

Table 1. Summarizing some of the biochemical analysis performed on these NPSs.

		BGY	RG-I	BGO	BGS	AX
Source		Yeast	Apple	Oat	Shiitake	Wheat
mono sugar composition	Rhamnose	0.5	4.4	0.5	0.3	0.2
	Fucose	0.0	0.7	0.0	0.9	0.0
	Arabinose	0.0	23.5	0.6	1.8	24.5
	Xylolse	0.0	1.8	0.7	0.4	29.5
	Mannose	0.0	0.3	0.0	4.6	1.2
	Galactose	0.0	18.5	0.0	4.0	11.8
	Glucose	93.1	1.4	88.2	59.0	9.2
	Uronic acid	1.0	29.7	1.1	1.6	1.0
Total sugar	percentage	94.6	80.3	91.1	72.6	77.4
Main basal structure		1,3/1,4 linked β-glucan	branched L-arabinan, type II arabinogalactan and probably linear L-arabinan side chains	1,3/1,4 linked β-glucan	β 1,3 Glc backbone and β 1,6 linkages Glc ramifications together with some starch β-1,4- and 1,4,6-glucose linkages	Mainly methylated alditols acetates from arabinoxylans and AGP together with some 1,3/1,4-linked β- glucans and β(1,4)-mannanes
MW	kDa	~17	~95 and ~14	~600	~21000	~95
Protein	percentage	0.5	10.0		16.2	7.7
Starch	percentage	0.8	0.3	0.5	8.6	0.6
Solubility		Soluble	Soluble	Soluble (after preheating)	Partly insoluble	Soluble
Endotoxin levels	ng/mg NDP preparation	<0.01	~10.0	~5.0	~100	~10.0

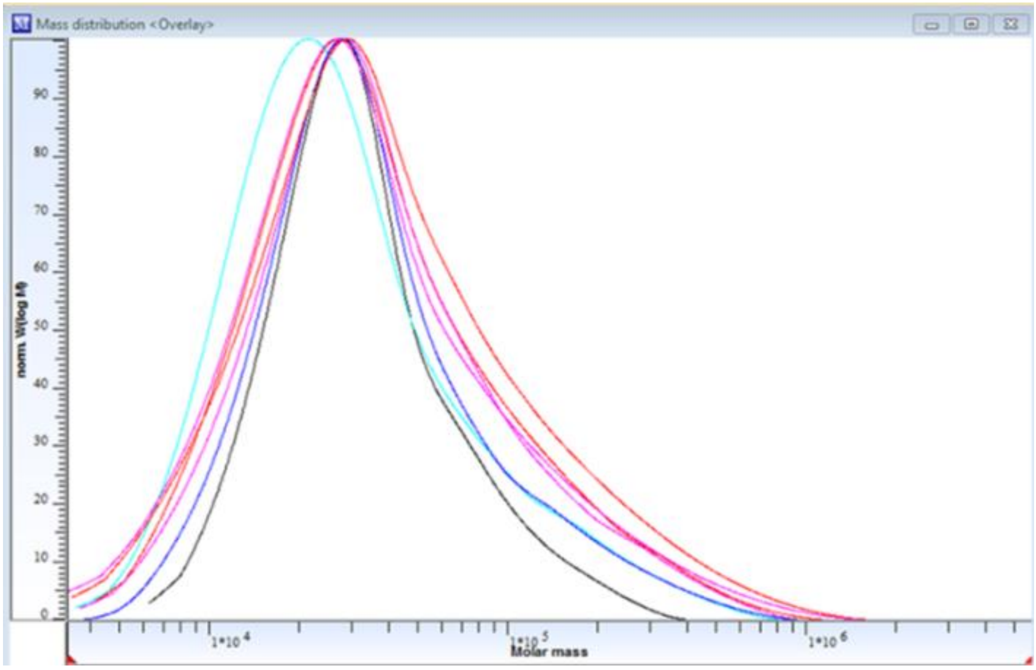

Figure 3 Molar mass profiles of samples from arabinoxylan (AX) treated with alkaline alcohol solutions to reduce LPS content.

Figure 4 Crips bread production at Nofima by a professional baker under food grade conditions.

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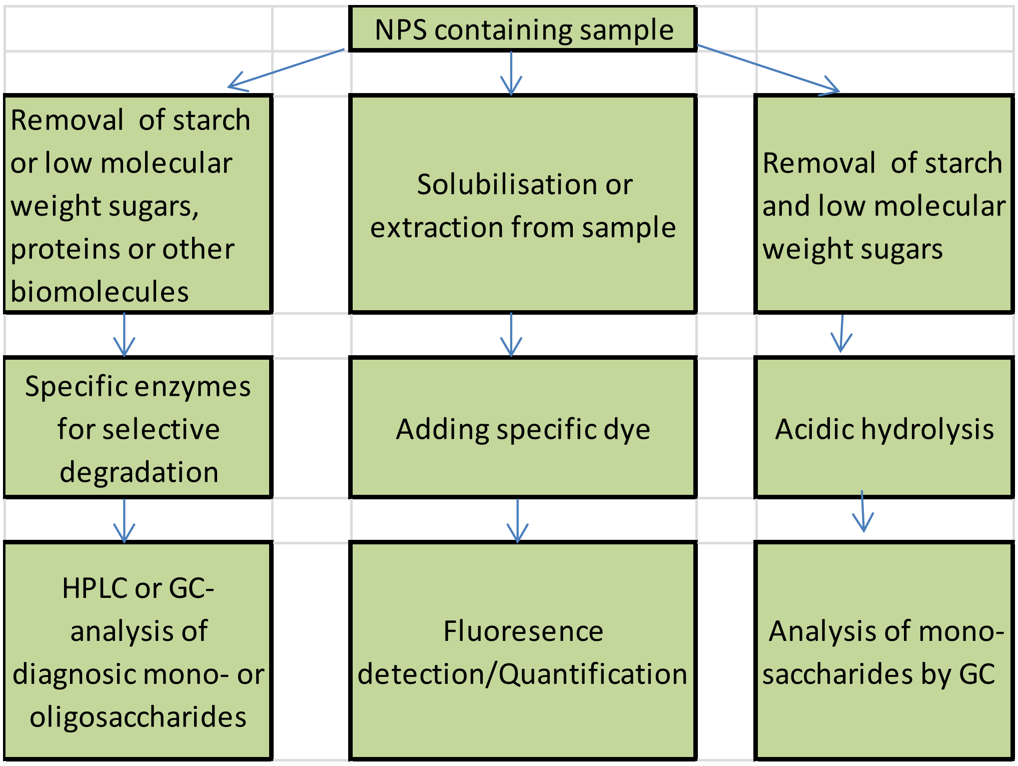

Figure 5 Different methodologies and strategies for analysing polysaccharides in a complex matrix

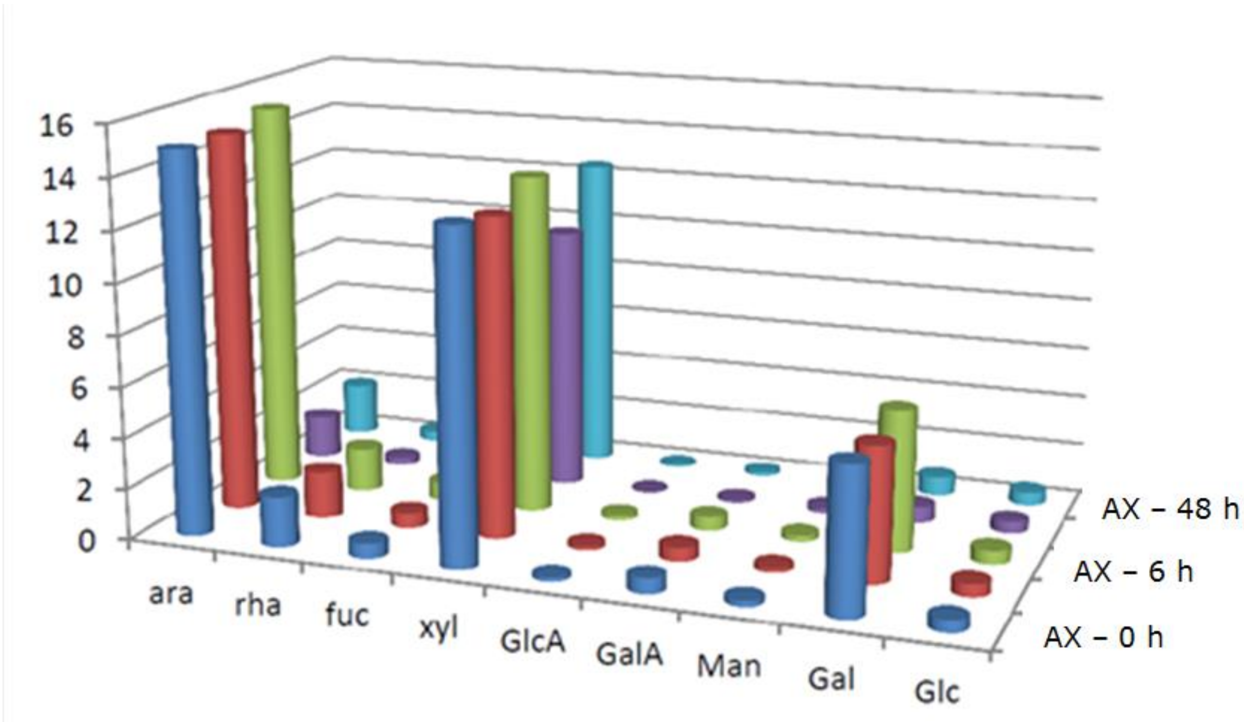

Figure 6. Result of a batch fermentation of NPS AX in which the remaining polysaccharides are precipitated by ethanol and analysed for its mono sugar composition after 0, 3, 6, 24 and 48 h incubation.

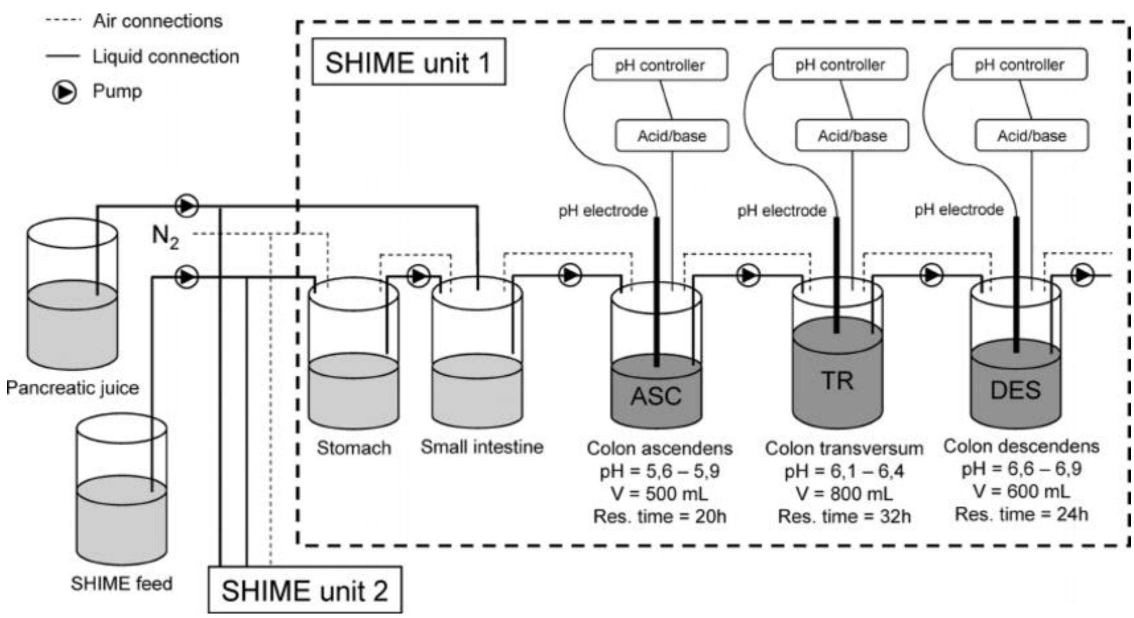

Figure 7. Schematic representation of the SHIME model used to study the effect of NPSs within the intestine to study fate of the NPSs, effects towards the microbiota and metabolites.

Figure 8. A real life image of the 4 MOS sensors, temperature sensor and humidity sensor developed to quantify SCFA on line inside the body or gut simulation models.

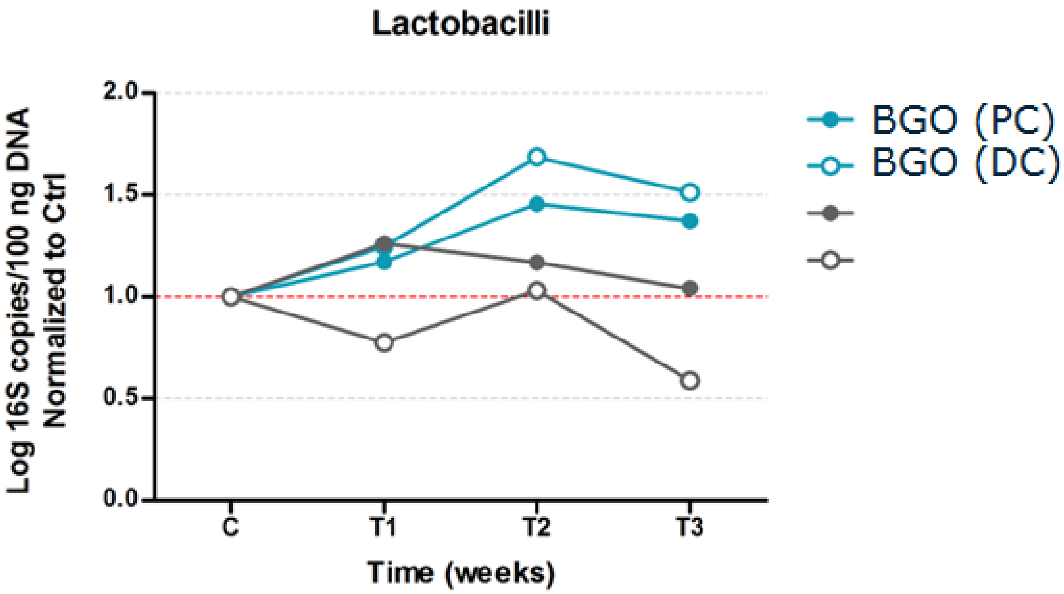

Figure 9. Effect of a SHIME experiment in which the starch was partly replaced by beta glucan from oat and resulted in a trend that relative more lactobacilli can grow in the proximal colon (PC) and distal colon (PC).

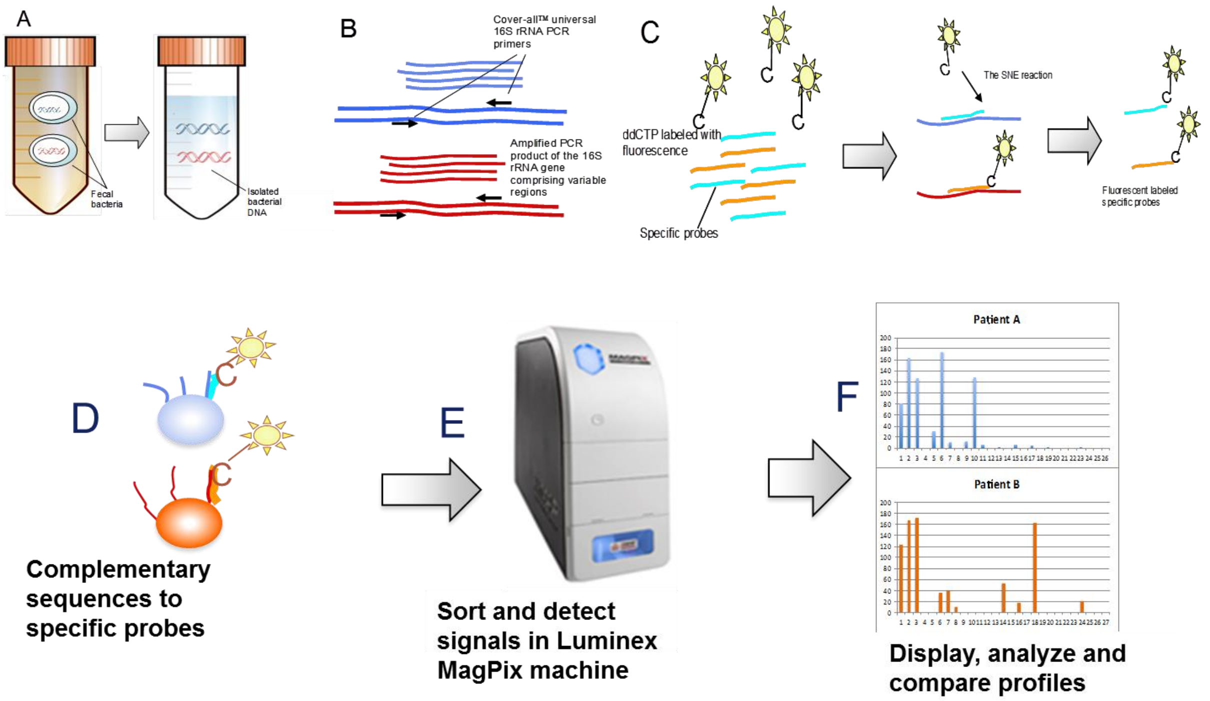

Figure 10. The GA-map™ technology platform as developed to efficiently study the changes in microbiota composition of faecal samples during human NPS intervention trials.

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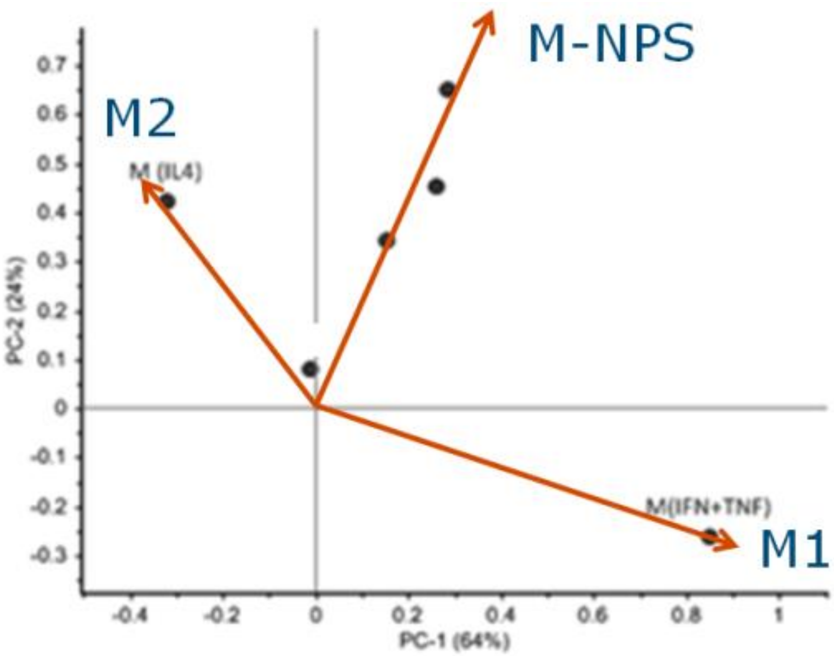

Figure 11. Principle Component Analysis of the responses of primary macrophages to NPS compared to classical stimulation towards M1 or M2 prototypic macrophages.

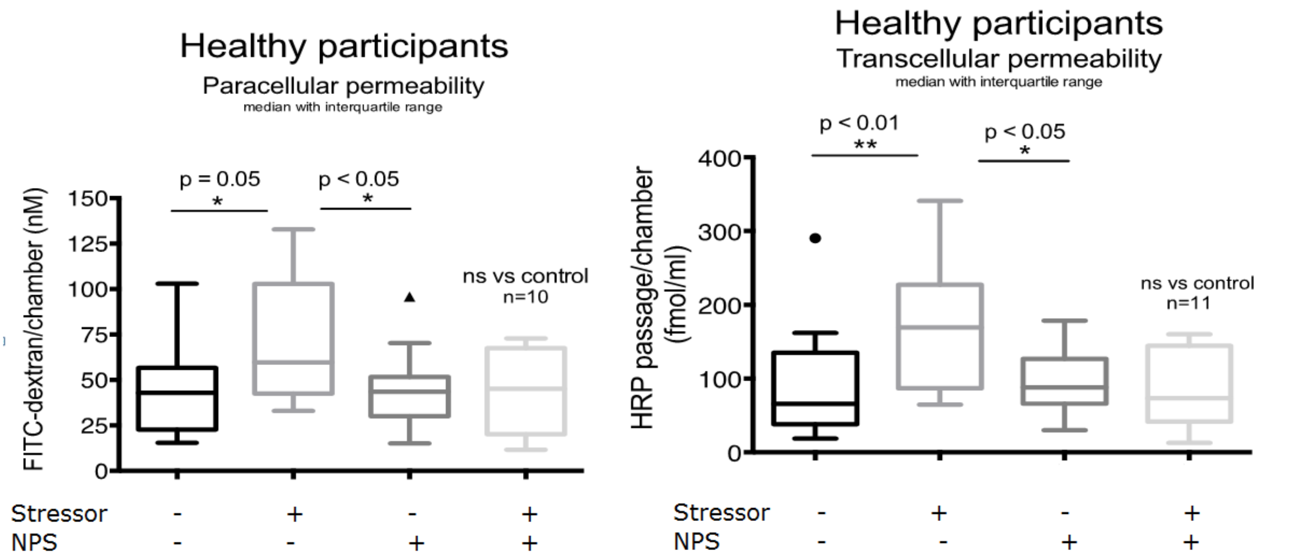

Figure 12. Experiments performed in young healthy subjects (n=14) in which biopsies were exposed to a NPS at 0.1 mg/ml and subsequently the paracellular (FITC labelled dextran) and transcellular (Horse Radish Peroxidase) passage determined.

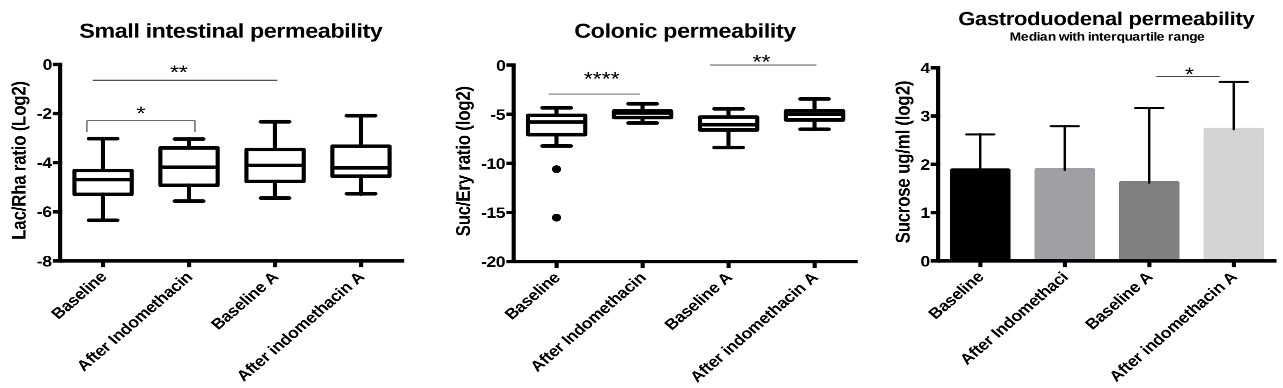

Figure 13: Logarithmic data on small intestinal, colonic and gastroduodenal permeability (n=20). Indomethacin significantly increased small intestinal and colonic permeability compared to baseline but no statistical improvement on permeability could be detected after a 6 weeks NPS intervention. Mann-Whitney U test was used for statistical analysis.

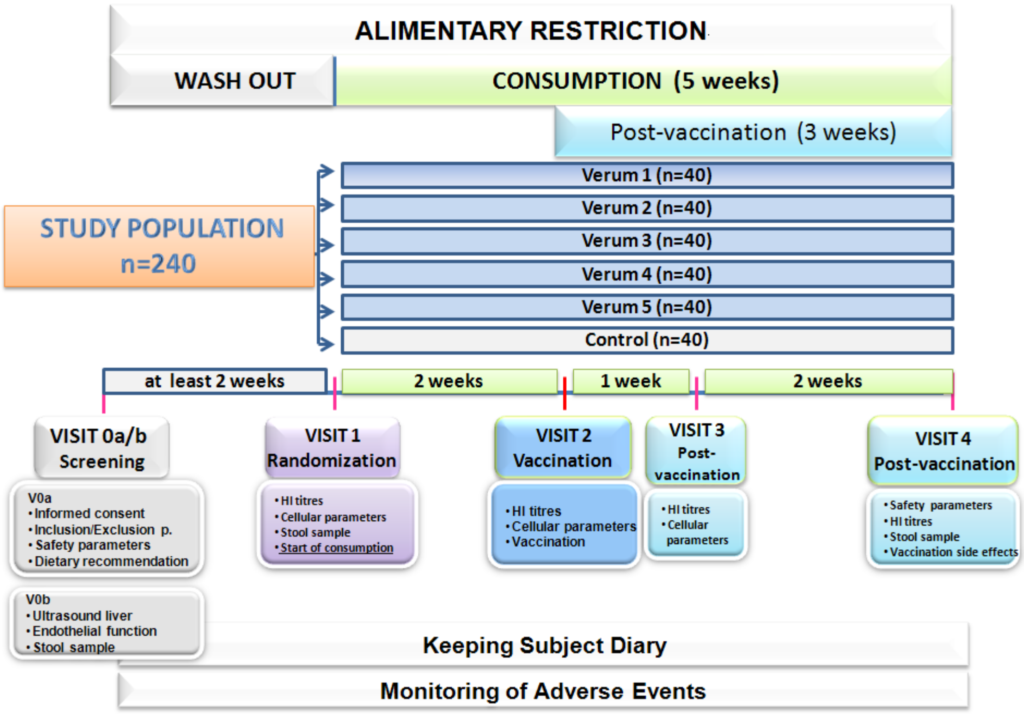

Figure 14. Schematic representation of the pilot trial.

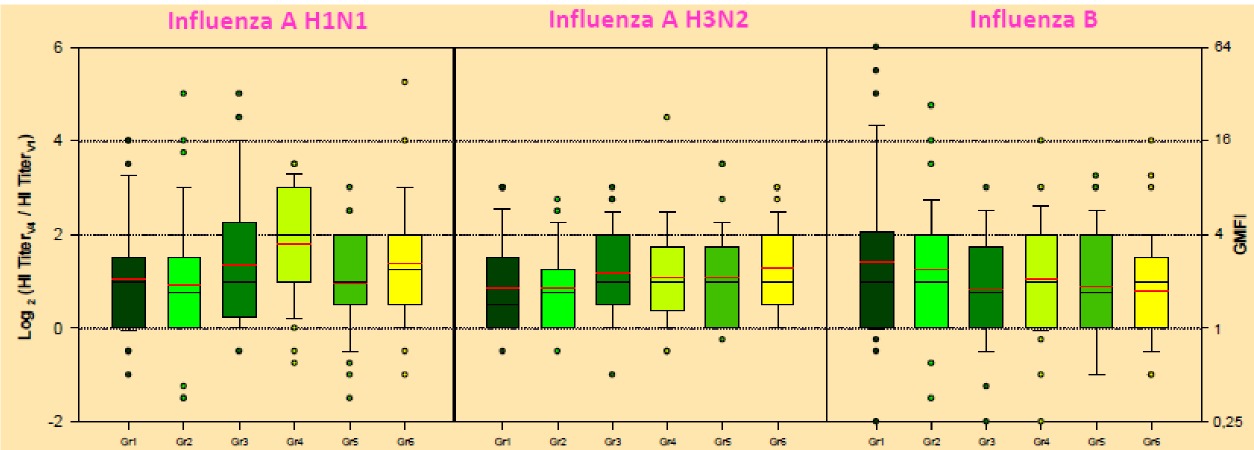

Figure 15. Geometric Mean Fold Increase from Visit 1 verses Visit 4 based on the HI titres for the three different vaccines and the 6 different intervention groups (5 NPS and 1 placebo group).

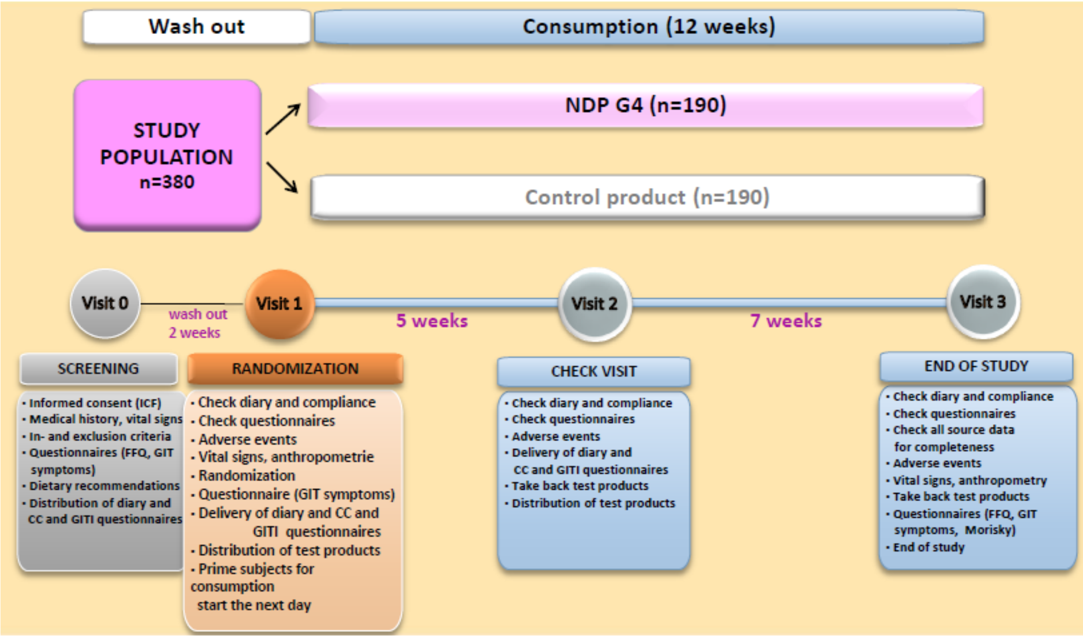

Figure 16. Study design of the pivotal trial

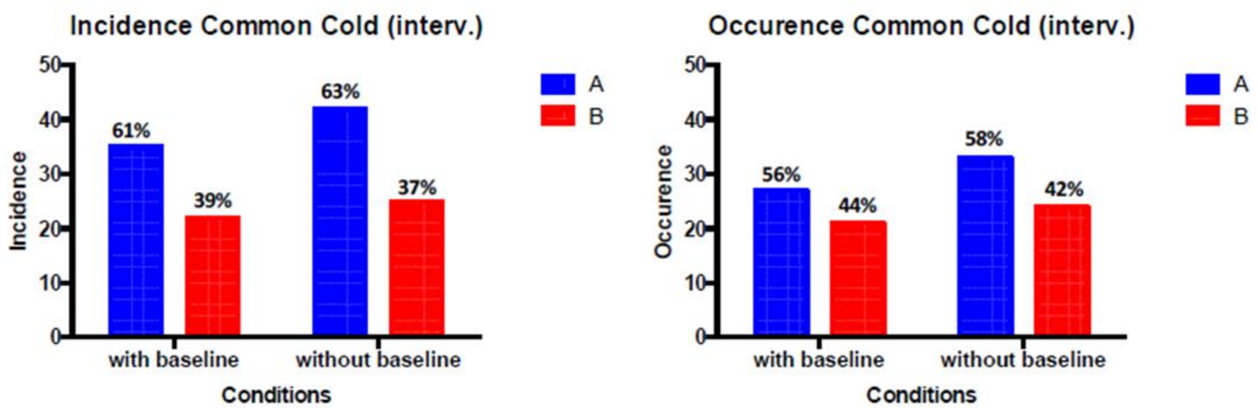

Figure 17. Results on incidences and occurrence of common cold in the pivotal trial in which the data are semi-blinded not knowing whether A and B are the NPS and the placebo arms of the trial or vice versa.

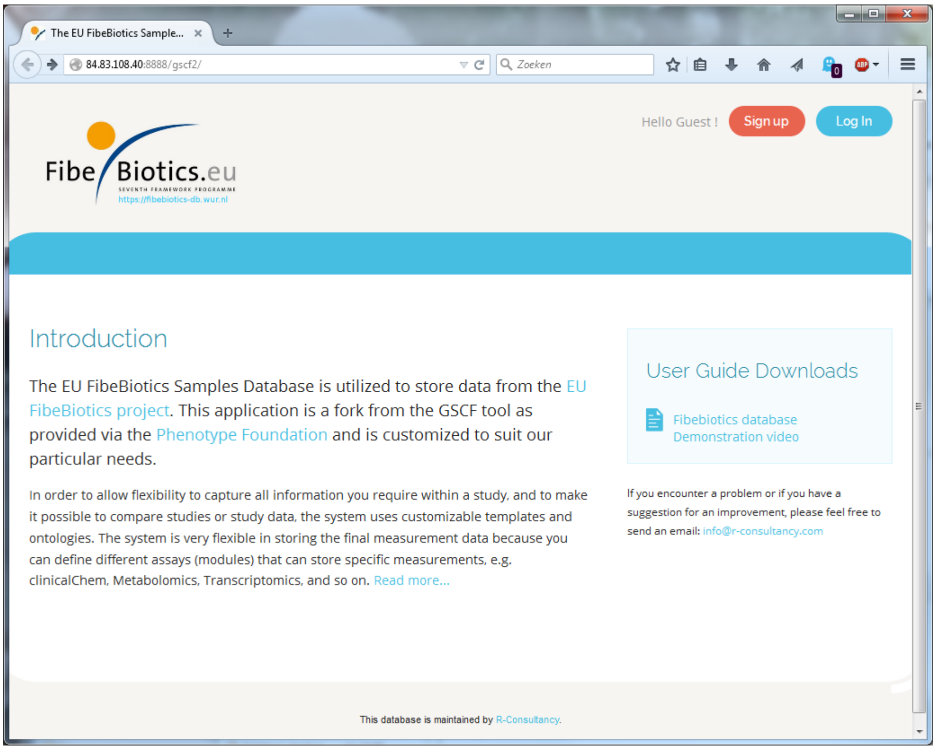

Figure 18. Start screen of the FibeBiotics database.

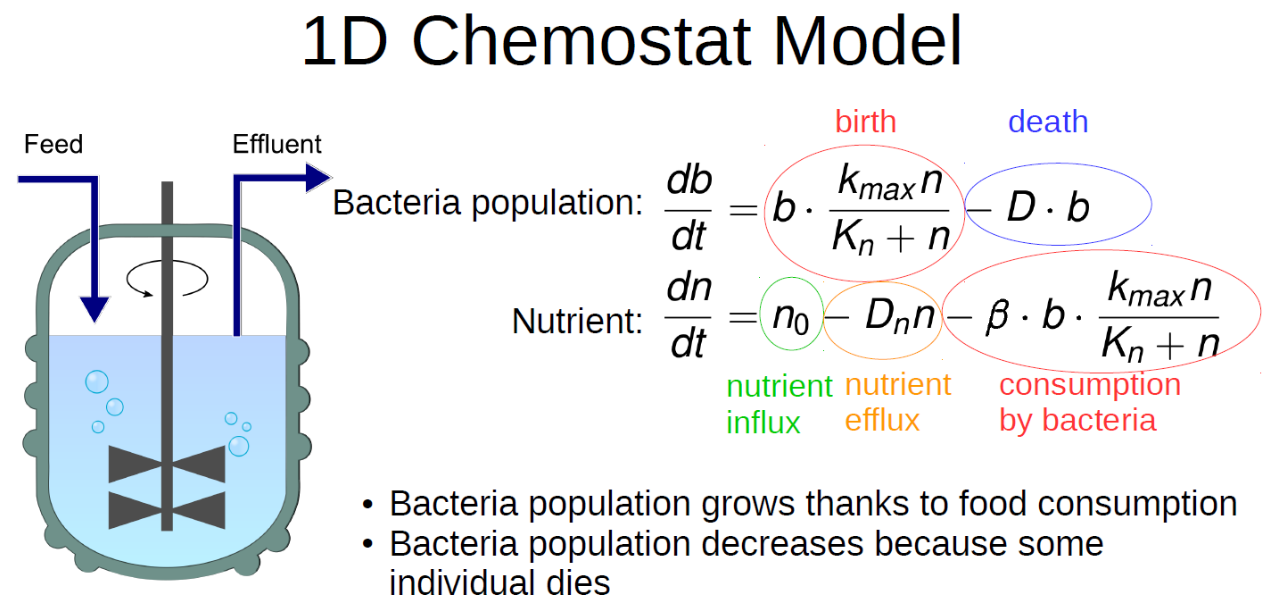

Figure 19. First step in the explanation of the equations used to analyse human gut microbiota.

Table 2. Current authorized claim for dietary fibres.

Fibre	Health claim	Article	Dose
Barley and oat beta-glucan	Lowering blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease	14(1a)	>3g/day; 1g/portion
Pectin	Reduction of post-prandial glycaemic response	13(1)	>10g per meal
	Maintenance of normal blood cholesterol concentrations	13(1)	>6g per day
Beta-glucan from oats and barley	Reduction of post-prandial glycaemic response	13(1)	>4g per 30g available carbohydrate
	Maintenance of normal blood LDL-cholesterol concentrations	13(1)	at least 1g/meal information about necessary daily dose of 3g/day
Hydroxypropyl methylcellulose (HPMC)	Reduction of post-prandial glycaemic responses	13(1)	>4g per meal
	Maintenance of normal blood cholesterol concentrations	13(1)	>5g per day
Resistant Starch (replacing digestible starch)	Reduction of post-prandial glycaemic responses	13(1)	14% total starch as resistant starch
Arabinoxylan from wheat	Reduction of post-prandial glycaemic response	13(1)	>8g (60% arabinoxylan) per 100g available carbohydrate
Chitosan	Maintenance of normal blood cholesterol concentrations	13(1)	>3g per dag
Glucomannan	Maintenance of normal blood cholesterol concentrations	13(1)	>4g per day
	Reduction of body weight	13(1)	>3g in 3 x 1g doses taken with water before meal
Guar Gum	Maintenance of normal blood cholesterol concentrations	13(1)	>10g
Alpha-Cyclodextrin	Reduction of post-prandial glycaemic responses	13(1)	5g/50g starch per portion
Oat and barley grain fibre	Increased faecal bulk	13(1)	At least 'high in fibre' (6g/100g)
Lactulose	Reduction in transit time	13(1)	10g/portion; once a day is enough
Rye Fibre	Maintains normal bowel function	13(1)	At least 'high in fibre' (6g/100g)
Wheat bran fibre	Increasing faecal bulk	13(1)	At least 'high in fibre' (6g/100g)
	Reduction in intestinal transit time	13(1)	>10g

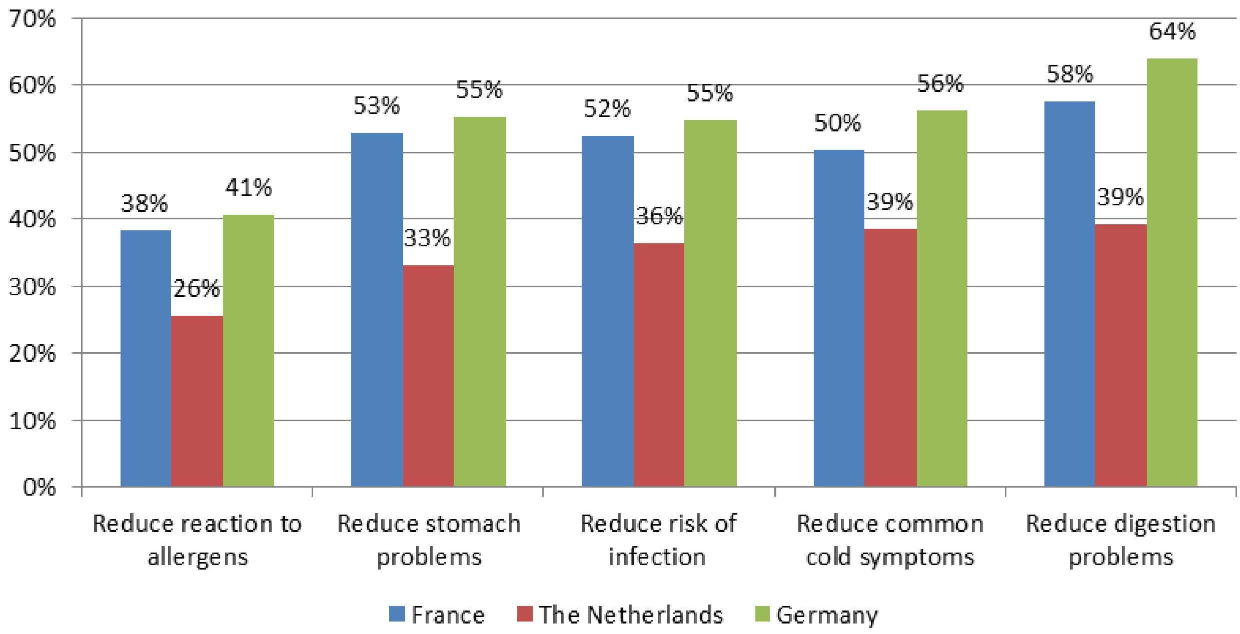

Figure 20. Percentage of respondents per country interested/very interested in health effects

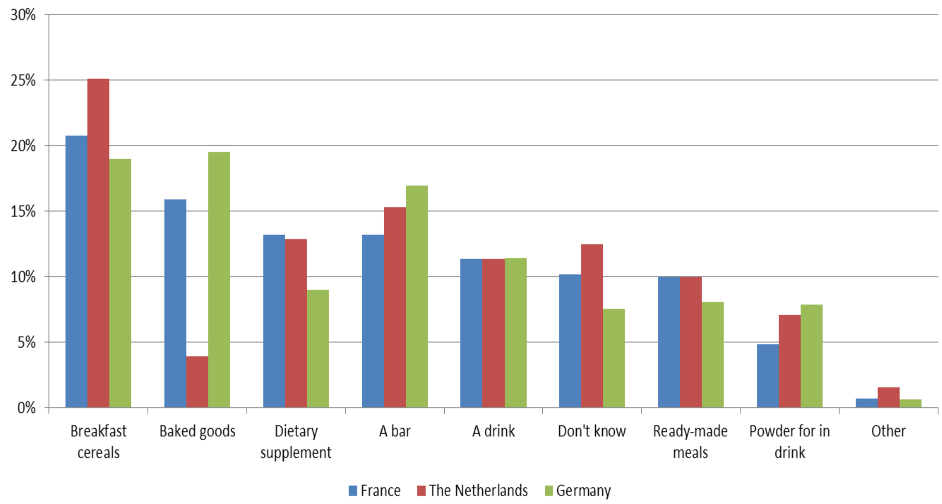

Figure 21 Preferred fibre enriched product carriers

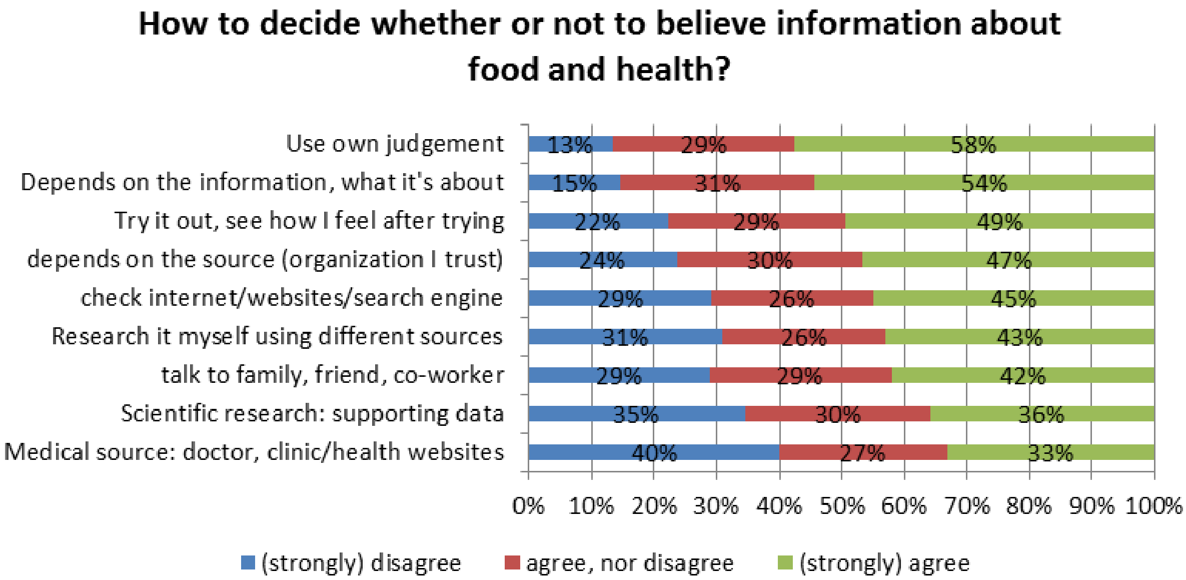

Figure 22. Aspects influencing consumers' decisions.