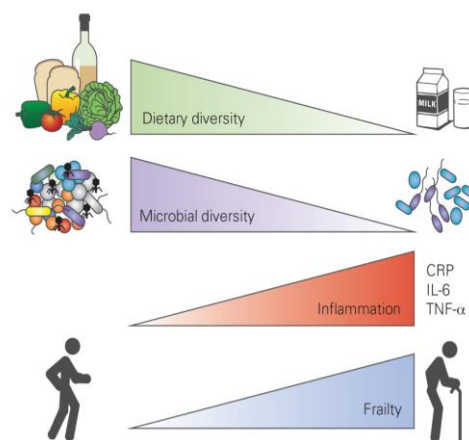


Project number: 6461
Funding source: DAFM/FIRM

Date: Aug 2018
Project dates: Nov 2012 – Aug 2018

ELDERFOOD

Novel food ingredients for the elderly consumer



Key external stakeholders:

DAFM, dairy and other functional and medical foods companies, medical profession.

Practical implications for stakeholders:

This project investigated the effect of dairy carbohydrate, and milk glycomacropeptide (GMP) on programming the gut microbiota, and how this impacts on consumer health. We compared lactose-free milk to whole milk to assess the influence of each in shaping the microbiota. We also assessed the prebiotic effects of GMP-enriched fractions on the gut microbiota of the elderly.

Main results:

The effect of dairy carbohydrate, and milk glycomacropeptide (GMP) on programming the gut microbiota was confirmed, and how this impacts on consumer health. We assessed the influence lactose-free milk compared with whole milk each in shaping the microbiota. We also demonstrated the prebiotic effects of GMP-enriched fractions on the gut microbiota of the elderly.

Opportunity / Benefit:

This project addressed two rapidly growing economic areas i) the lactose-free dairy sector and ii) the functional food market, with a view to their inclusion in targeted nutrition regimes for elderly subjects.

Collaborating Institutions:

UCC, Teagasc.

Teagasc project team:

Prof. Catherine Stanton (Project Leader, Teagasc)

External collaborators:

Prof. Paul O'Toole UCC (Overall PI and Coordinator)

1. Project background:

It has recently become clear that the intestinal microbiota is critical for general health and wellbeing. Moreover it is now clear that diet has a significant role in shaping the microbiota which in turn is associated with a wide range of health parameters. The ELDERMET project (finished 12/2013), showed that this variation in gut microbiota between individuals was driven by the diet. Significantly, we showed the existence of a strong diet-microbiota-health axis, whereby people with particular diets had greatest microbiota diversity, and healthiest scores in a range of clinical parameters including inflammation and measures of frailty (Claesson et al., 2012). We established a unique ELDERMET database from over 420 subjects, comprising interconnected data for dietary intake, microbiota composition, and extensive health measures. Thus we have a unique atlas for linking dietary intake to health via the microbiota.

2. Questions addressed by the project:

The aim of this project was to improve the intestinal health of older consumers by using a putative prebiotic, Glycomacropeptide (GMP). This project focussed on the effect of dairy carbohydrate, and milk glycomacropeptide (GMP) on programming the gut microbiota, and how this impacts on consumer health. Specifically, the project compared lactose-free milk to whole milk to assessed the influence of each in shaping the microbiota and the consequences thereof in terms of clinical readouts.

3. The experimental studies:

- Whey protein isolate (WPI) derived from sweet whey has been sourced through Kerry Group and used a starting point for the production of a GMP enrichment. GMP enrichment has been produced for *in vitro* trials. The composition of each batch has been analysed in terms of its overall protein content, using the Kjeldahl method, as well as its GMP, α -lactalbumin (α -la), β -lactoglobulin (β -lg) and lactose content.
- Bench scale trials have been conducted in order to establish the most efficient method of producing small quantities of GMP in house.
- Both commercial GMP and in house GMP have been subjected to an *in vitro* digestion model and MALDI TOP MS analysis has been used to analyse GMP enrichments following digestion. The particular digestion model applied to the GMP enrichments allowed for samples to be taken following a gastric phase of digestion as well as an intestinal phase. Samples analysed following gastric and intestinal digestion of both commercial GMP and in-house GMP revealed that GMP was digested.
- *In vitro* and *in vivo* preclinical studies were undertaken to determine the role of the dairy carbohydrate, and milk glycomacropeptide (GMP) on programming the gut microbiota, and how this impacts on consumer health.

4. Main results:

The potential prebiotic effect of GMP was accessed on a panel of 10 *Lactobacillus* and 10 *Bifidobacterium* strains isolated from the elderly intestinal tract by monitoring their growth curves compared to a panel of proven prebiotics. The results of the prebiotic effect of GMP on the *Lactobacillus* and *Bifidobacterium* strain were variable depending on the strains. These ranged from not promoting growth in some strains, to strongly increasing the growth of other specific strains. On three selected *Bifidobacterium* and *Lactobacillus* strains, GMP increased their growth more than other prebiotics that were tested in parallel, indicating that for such strains GMP displays a prebiotic effect.

Another aim of the project was to determine elderly Irish consumer attitudes and willingness to consume a GMP-enriched Functional Food. A panel group of 12 elderly Irish volunteers aged between 65-75 were recruited from the Mitchelstown Cohort to undergo an open-ended one to one questionnaire. Although participants knew little about GMP, and Functional Food, some of them showed strong interest and to no little concerns towards GMP enriched Functional Food. Although taste in the group panel varied, GMP-enriched dairy products, in particular milk, seemed to be the most popular. A GMP-enriched dairy product could be considered as a prebiotic of interest for an elderly population that could modify their gut microbiota through growth-promoting effects on specific *Bifidobacterium* and *Lactobacillus* strains leading to improved gut health.

5. Opportunity/Benefit:

This work is relevant to the food industry for development of functional and medical foods for elderly consumers.

6. Dissemination:

Main publications:

Ntemiri A, Ribière C, Stanton C, Ross RP, O' Connor EM, O' Toole PW. (2019). Retention of microbiota diversity by lactose-free milk in a mouse model of elderly gut microbiota. *Journal of Agricultural and Food Chemistry* 67, 2098-2112.

Ntemiri A, Chonchúir FN, O'Callaghan TF, Stanton C, Ross RP, O'Toole PW. (2017). Glycomacropeptide Sustains microbiota diversity and promotes specific taxa in an artificial colon model of elderly gut microbiota. *J Agric Food Chem*, 65(8):1836-1846.

Popular publications:

APC Microbiome Institute Symposium, Cork, 2016.

7. Compiled by: Catherine Stanton
