Project number: 6727
Funding source: Enterprise Ireland
Date: June 2020
Project dates: Dec 2014 – Mar 2020

New protein fractions for nutritional, medical, and therapeutic applications prepared by innovative separation technology

Key external stakeholders:

Dairy industry,
Dairy ingredient manufacturers,
Infant formula manufacturers,
Food manufacturers.

Practical implications for stakeholders:

Development of an innovative separation platform using membrane filtration for the isolation of high value protein ingredients or liquid systems can be exploited by various dairy processors to boost their competitiveness in the dairy sector. These value added protein fractions are highly applicable in the development of nutritional, medical, or therapeutic beverages and food products. The current assumption is that membrane filtration technologies have yet to achieve its maximum capability in the dairy industry. It is strongly expected that correct manipulation of these technologies can not only improve the production efficiency of existing liquid formulations but also advance methods in the isolation of milk components that have yet to see full market potential. Therefore, this highlights the potential of a more efficient method for commercial-scale production of value added milk protein products through the use of cascade membrane filtration with or without other existing technologies.

Main results:

- Isolation of glycomacropeptide (GMP also known as caseinomacropeptide or kappa-casein glycomacropeptide); a high value protein present in sweet or rennet whey from cheese-making by a cascade microparticulation and membrane filtration process (microfiltration and ultrafiltration) was assessed.
    - This technology gave highly purified GMP in commercial quantities as well as a high-value microparticulated whey protein incidental stream. The process has been fully developed and validated at pre-commercial scale.

Opportunity / Benefit:

This technology provides a simple and straightforward process for commercial-scale production of high-purity GMP that requires low capital investment compared to reported technologies that utilised ion-exchange resin. The capital expenditure, operational expenditure, and subsequent expenditure too are more favourable. The process also gave valuable incidental protein streams that were considered as waste in other GMP-isolation technologies.

Collaborating Institutions:

DPTC

Contact John Tobin Email: john.tobin@teagasc.ie.

Teagasc project team: Dr. John Tobin
Dr. Aaron Lim

External collaborators:

1. Project background:

The objective of this project was to develop a new streamlined filtration/demineralisation process platform to generate a macro and micro nutritionally balanced formulations from bovine milk. The project had the following objectives:

- Process for isolating Glycomacropeptide (GMP) through functionalisation of whey protein

2. Questions addressed by the project:

- The availability of a simple and straightforward process to produce high purity GMP in commercial quantities

3. The experimental studies:

1. Pre-commercial scale work completed in Moorepark Technology Limited (MTL) using microparticulation, microfiltration, and ultrafiltration, followed by reverse osmosis, evaporative concentration and spray drying of the streams produced by the process.

4. Main results:

Study 1 major findings:

- The process has been developed and was able to be replicated and validated at pre-commercial scale on multiple occasions.
- All streams produced from this technology were able to be spray dried successfully and were subsequently characterised.
- This technology gave GMP isolate powders with GMP of up to 86% (w/w) of the total native whey protein.
- Microparticulated whey protein retained by the microfiltration step was collected as well and was in its own right a valuable incidental stream.

5. Opportunity/Benefit:

- Utilisation of cost-effective equipment and consumables for GMP isolation.
- No requirement for pH adjustment, buffering solvent or the use of ion exchange chromatography.
- The process gave no waste streams and microparticulated whey protein was a valuable incidental stream.

6. Dissemination:

Main publications:

7. Compiled by: Aaron Lim/John Tobin

Contact John Tobin Email: john.tobin@teagasc.ie.