MetaBó-Bainne

Examination of the Irish milk metabolome for improved prediction of the milk processability and sustainability

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

School of Food and Nutritional Sciences

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University College Cork, School of Food & Nutritional Sciences[1], Chemistry[2], Pharmacy[3], BEES[4], Teagasc – The Irish Agriculture & Food Development Authority[5]
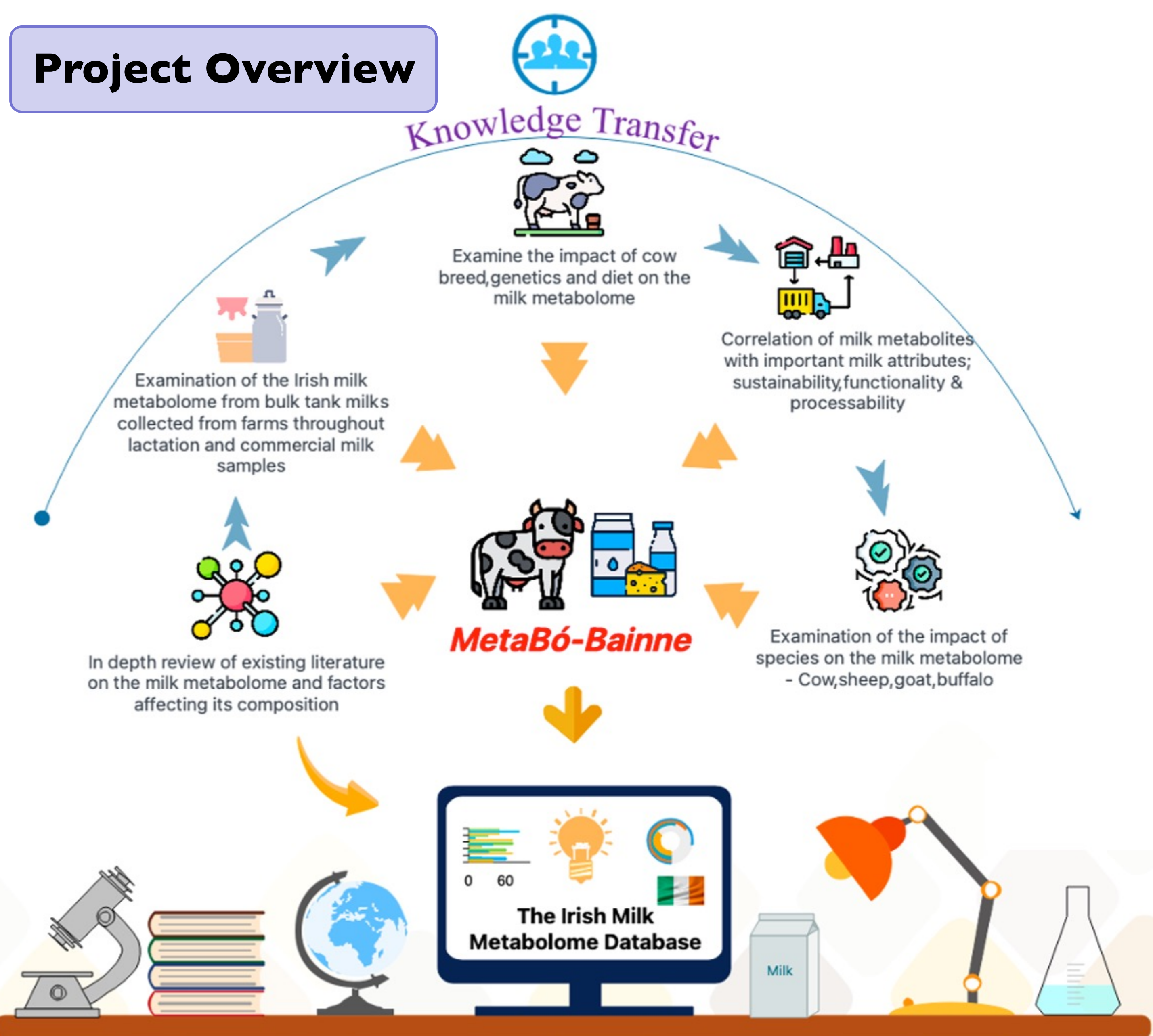
Presenter
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PhD candidate – 2nd Year

Abstract

The objective of MetaBó-Bainne is to characterize and understand the factors affecting and affected by the milk metabolome. Such factors include primary production practices like diet, seasonality and bovine genetics and their impacts on milk techno-functional characteristics such as gelation properties and heat stability. This project examines the potential for milk metabolites to be utilised as biomarkers for milk processability and methane production in an effort to improve the efficiency and sustainability of Irish dairy. The MetaBó-Bainne project will generate the "Irish milk metabolome database", an open access database containing the metabolites present in milk as determined by NMR and their concentrations throughout lactation.

Project Overview

Knowledge Transfer

Examine the impact of cow breed, genetics and diet on the milk metabolome

Correlation of milk metabolites with important milk attributes; sustainability, functionality & processability

Examination of the Irish milk metabolome from bulk tank milks collected from farms throughout lactation and commercial milk samples

In depth review of existing literature on the milk metabolome and factors affecting its composition

MetaBó-Bainne

Examination of the impact of species on the milk metabolome - Cow, sheep, goat, buffalo

The Irish Milk Metabolome Database

Materials and methods

Analysis 1. Functional properties

Gelation properties Rheometer

Heat stability properties Oil bath

Compositional analysis ProFoss – Teagasc

Analysis 2. Nuclear magnetic resonance (NMR) analysis

Sample collection

Sample preparation

NMR

MetaboAnalyst 5.0

CHENOMX NMR Mixture Analysis
Raghunath Pariyani - Postdoctoral Researcher

Statistical data analysis

Analysis of spectra

Preliminary Results

Weekly sample collections for Year 1 from on farm bulk tank and commercial samples

n=10/week   n=3/week

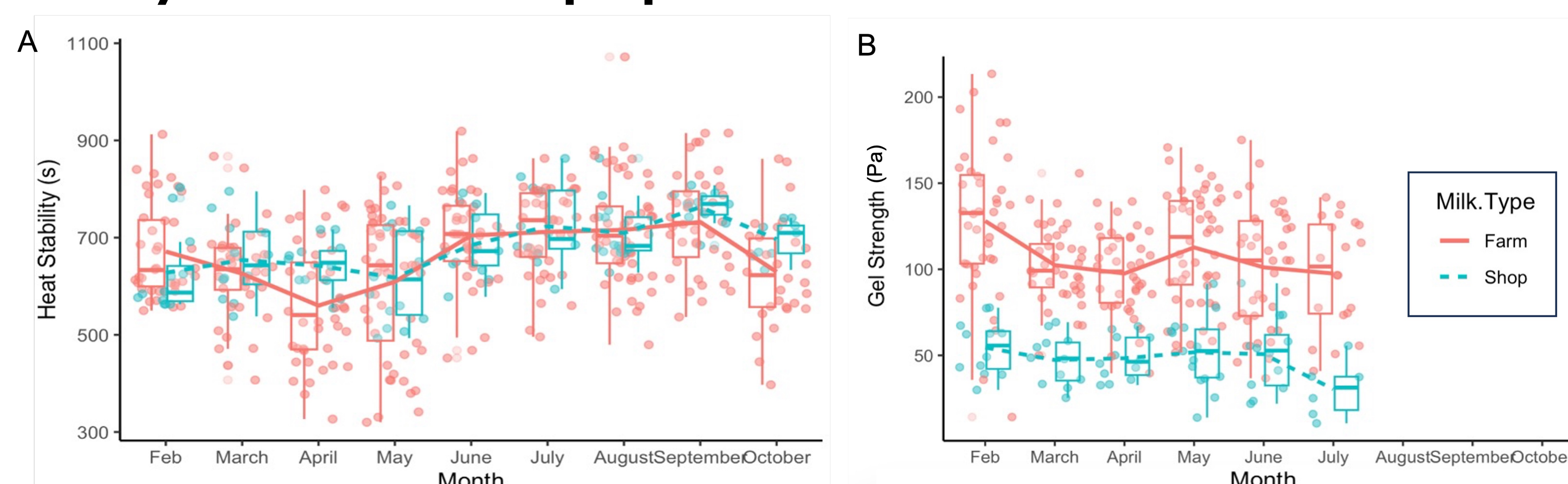= **533 samples collected (41 weeks)**

Analysis 1. Functional properties

Figure 2. Change in heat stability (A) and gel strength (B) throughout lactation Year 2023
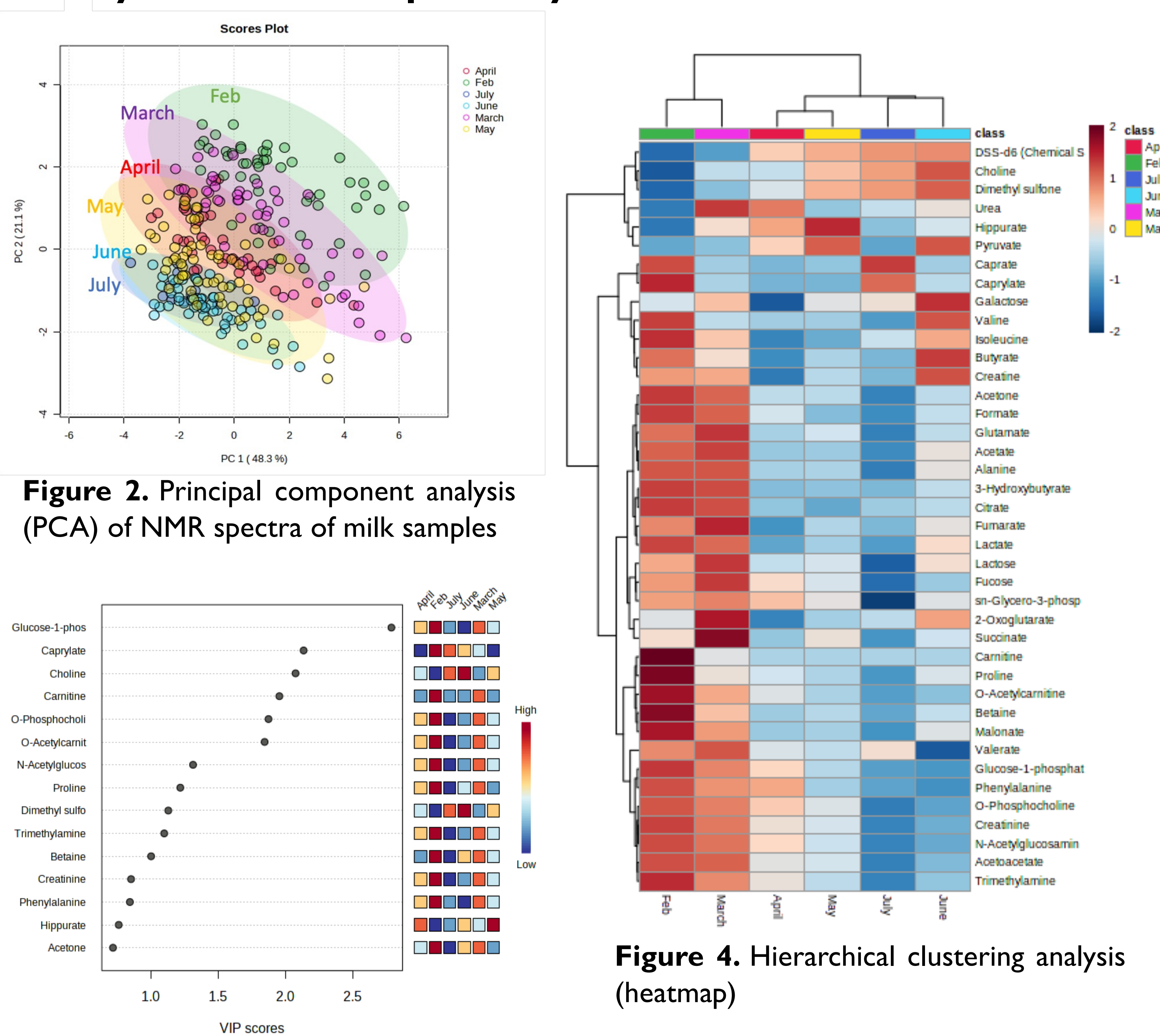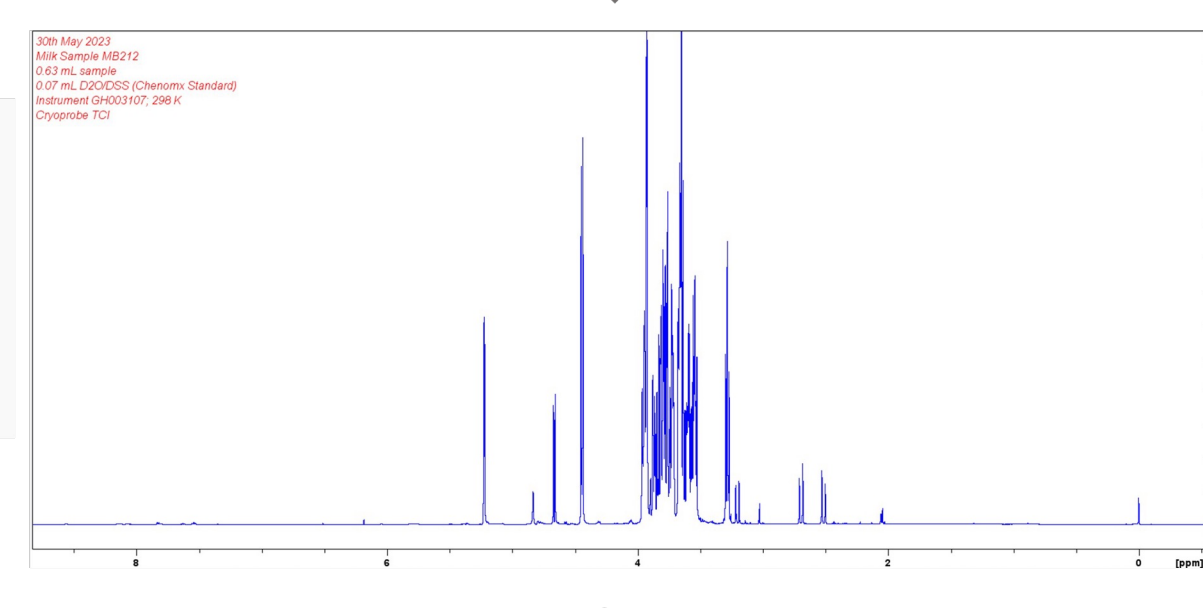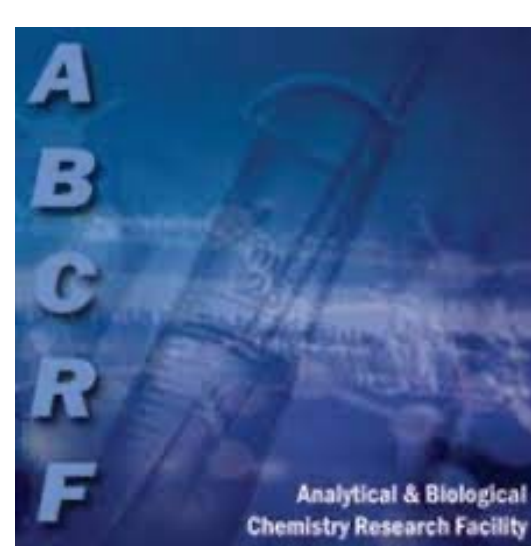
Analysis 2. Metabolic profile by NMR

Figure 2. Principal component analysis (PCA) of NMR spectra of milk samples

Figure 3. Variable importance plot (VIP) of metabolites

Figure 4. Hierarchical clustering analysis (heatmap)

Colaborators

Teagasc — Agriculture and Food Development Authority

ABCRF — Analytical & Biological Chemistry Research Facility

School of Pharmacy University College Cork

UCC — University College Cork, Ireland — School of Chemistry

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Funded by

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