Student Competition Sponsored by

University of Otago
Te Whare Wānanga o Otāgo
New Zealand

Department of Food Science
Te Tari Pūtaiao Kai

NZIFST Annual Conference Poster Abstracts

Collaboration
Building New Zealand Inc.

NZIFST Conference 2022
5 - 7 July, Rotorua

Massey University Student Poster Competition Index

Name	Number	Authors	Title
Abdul Halim Farawahida	S03	**Abdul Halim Farawahida**, Jon Palmer, Steve Flint	Characterization of fungal growth of Monascus spp. isolates on Coconut Cream Agar and citrinin production
Akshay Bisht	S23	**Akshay Bisht**, Kelvin Goh, John Monro, Lara Matia-Merino	Physical modification of a bio-polysaccharide from Cyathea medullaris.
Aylin Sen	S14	**Alyin Sen,** Harjinder Singh, Aiqian Ye, Alejandra Acevedo-Fani	A novel plant-based emulsifier: OBMMs
Brian Thong	S22	**Brian Thong**, Phil Bremer, Sheila Skeaff, Miranda Mirosa	Exploring potential uses of upcycled bread flour in food (pasta) recommended for a healthy diet
Catherine Maidment	S07	**Catherine Maidment**, Assoc/Prof Aiqian Ye, Dr Siqi Le, Dr Jessica Gathercole, Dr Anita Grosvenor	Protein differences in the simulated gastrointestinal digestion of milk from different species
Chi Hou Lo	S10	**Chi Hou Lo**, Kelly Wade, Kate Parker, Tanya Poipoi Davy, Anthony N Mutukumira	Sustainable Paper-based Packaging from Hemp Hurd Fibres for Thermoformed Moulded Packaging
Chuanjie Chen	S12	**Chuanjie Chena**, Guantian Lia, Yacine Hemarb, Harold Corkec, Fan Zhu	Physicochemical properties of lotus seed starch
Crystal van Gorp	S21	**Crystal van Gorp**, Graham T. Eyres, Andrea Warburton and Pat Silcock	*What volatile compounds are present in flavoured e-cigarette liquids sold in New Zealand?*
Elizabeth Cunliffe	S24	**Elizabeth Cunliffe**, Phil Bremer, Miranda Mirosa	The Insights into Upcycling from a Manufacturer's Perspective. Including the Challenges, Barriers, and Opportunities Upcycling Presents.
Emma Roberts	S29	**Emma Roberts**, Miranda Mirosa, Phil Bremer, Erin Young	How does the marketing of an upcycled product effect consumer preference?
Haroon Qazi	S28	**Haroon Jamshaid Qazi**, Aiqian Ye, Alejandra Acevedo-Fani, Harjinder Singh	Impact of fortified reconstituted milk systems on gastrointestinal fate of curcumin nanoemulsion
Hien Truong	S02	**Hien Thi Dieu Truong**, Mahmoud Al-Sarayreh, Pullanagari Reddy, Marlon M Reis, Richard Archer	Using Hyperspectral Imaging Combined with 1D-CNN to Evaluate Quality of Mānuka Honeys Before Extraction
Jiecheng Li	S13	**Jiecheng Li**, Zhi Yang, Xiaoling Lin, Sinong Wu, Guantian Li, Na Li, Don otter, Fan Zhu, Christian Hartinger, Harold Corke, Yacine Hemar	In-flow SAXS investigation of whey protein isolate hydrolysed by bromelain
Ladie Conde	S15	L**adie Anne Conde**, Biniam Kebede, and Indrawati Oey	Impact of high hydrostatic pressure and hydration level on the starch related properties of cassava flour

Name	Number	Authors	Title
Lance Aya	S31	**Lance Aya,** Miranda Mirosa, Phil Bremer, Erin Young	Consumer Reactions to the Packaging of a Health Positioned Upcycled Food: A Biometric Methods Approach.
Li Ying Jessie Lau	S20	**Li Ying Jessie Lau**, Kang Huang and Siew Young Quek	An exploratory study of the beneficial effects of probiotics and phenolic compounds
Linda Nezbedova	S19	**Linda Nezbedova,** Tony McGhie, Mark Christensen, Julian Heyes, Noha Ahmed Nasef, Sunali Mehta	Impact of processing on the phytochemical profile of NZ heritage apple cultivar 'Monty's Surprise' and their cancer management properties.
Manasweeta Angane	S05	**Manasweeta Angane,** Janesha Perera, Simon Swift, Kang Huang, Christine A. Butts, Siew Young Quek	Synergistic antimicrobial interaction of plant essential oils and extracts against food-borne pathogens
Mariero Gawat	S09	**Mariero Gawat,** Lovedeep Kaur, Raul Cruz, Jaspreet Singh, and Mike Boland	Microwave technology for meat processing: its impact on quality and ultrastructure
Merit Mathew	S04	**Merit Mathew**, Qun Chen, Jim R. Jones, Richard H. Archer	Rate Controlling Mechanisms in Atmospheric freeze-drying
Molly Goodisson	S17	**Molly Goodisson,** Phil Bremer, Miranda Mirosa	An Investigation of the Capabilities and Capacity of Central Otago Fruit Processors to Upcycle the Region's Surplus Fruit
Nilushika Thambugala	S18	**Nilushika Thambugala,** Anna Miles, Meng Wai Woo, Anu Gnanavinthan, Siew Young Quek	Sensory-rheology correlation of texture-modified food in the context of swallowing safety
Parise Adadi	S16	**Parise ADADI,** Alastair HARRIS, Pat SILCOCK, Phil BREMER, Austen GANLEY, Tim JOWETT, Andrew JEFFS, Graham EYRES	Effects of sound applied during beer fermentation on yeast growth, fermentation duration, and volatile compounds
Patrick Nolan	S32	**Patrick Nolan,** Dominic Agyei, Alaa El-Din Ahmed Bekhit, Ruchita Rao Kavle	Nutrient and health-promoting components of edible insects: More than meets the eye
Ramandeep Kaur	S11	**Ramandeep Kaur,** Lovedeep Kaur, Tanushree B. Gupta and John E. Bronlund	The antimicrobial and antioxidant efficacies of mānuka oil vary in low- and high-fat meat paste systems
Shaina Ebron	S30	**Shaina Ebron,** Miranda Mirosa, Phil Bremer, Erin Young	Investigating the impact of sustainability communications of an upcycled oat bar on consumer preference.
Sian Menson	S25	**Sian Menson,** Graham Eyres and Phil Bremer	Valorisation of spent hops from brewing and potential reuse
Stella Henderson	S26	**Stella Henderso**n, Patrick Janssen, Sam Rodgers, Anna Williams and Lara Matia-Merino	Developing a model UHT whipping cream system to investigate fat crystal modifying emulsifiers on functionality

Name	Number	Authors	Title
Subha Sasidharan Nair	S27	**Subha Sasidharan Nair,** Iresha Matiwalage, Philip Winscomb, Caren Meyn Alvarez, Keegan Burrow, Maneesha S Mohan	Interaction of green tea polyphenols with milk proteins
Suchima Gonapinuwala	S08	**S.T. Gonapinuwala**, S. Kirk, J.R. Jones, M.D.S.T. de Croos and J.E. Bronlund	Effect of treatment conditions on extracting fish collagen for biomedical applications
Wenwen Yu	S06	**Wenwen Yu,** Jaspreet Singh, Indrawati Oey	Development of low glycaemic bread containing navy bean cotyledon cells

S2

Using Hyperspectral Imaging Combined with 1D-CNN to Evaluate Quality of Mānuka Honeys Before Extraction

Authors: **Hien Thi Dieu Truong,** Mahmoud Al-Sarayreh, Pullanagari Reddy, Marlon M Reis, Richard Archer

New Zealand mānuka honey is mainly derived from *Leptospermum scoparium* nectar. The potent antibacterial activity of mānuka honey comes principally from methylglyoxal (MGO), in addition to the hydrogen peroxide and other lesser activities present in all honeys. MGO is formed from dihydroxyacetone (DHA) unique to *L. scoparium* nectar. Mānuka honey also has an idiosyncratic phenolic profile useful as a chemical maker. Authentic mānuka honey is highly valuable but almost all honeys are formed from natural mixtures of nectars harvested by a hive over a time period. Once diluted by other nectars, mānuka honey irrevocably loses value. We aimed to apply hyperspectral imaging to honey frames before bulk extraction to minimise dilution of genuine mānuka by other honeys and ensure authenticity at source. This technology is non-destructive and suitable for an industrial setting. Partial Least Squares and Support Vector Machine showed limited efficacy in interpreting chemical footprints due to large non-linear relationships between predictor and predictand in a large sample set, likely due to honey quality variability across geographic regions. Therefore, one-dimensional convolutional neural networks (1D-CNN) were investigated for analysing hyperspectral data for extraction of biochemical information from honeys. The 1D-CNN model showed superior prediction of honey quality (R^2 = 0.74, RMSE = 2.201) to PLS (R^2 = 0.66, RMSE = 2.607) and SVM (R^2 = 0.67, RMSE = 2.559). Classification of mono-floral manuka honeys from multi-floral and non-manuka honeys exceeded 90 % accuracy for all models tried. This study reveals the potential of 1D-CNN modelling for evaluating honey authenticity.

Affiliations: Massey University, AgResearch, Riddet Institute

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S3

Characterization of fungal growth of Monascus spp. isolates on Coconut Cream Agar and citrinin production

Authors: **Abdul Halim Farawahida,** Jon Palmer, Steve Flint

Monascus spp. are usually used as a fungal starter to produce red fermented rice. The objective of the study was to compare the growth of *Monascus* spp. isolates on Coconut Cream Agar (CCA) as a rapid method for indicating their citrinin (CIT) production. Two *Monascus* spp. isolates were isolated from RFR (MF1 and MS1), inoculated on CCA, and incubated at 30°C for 9 days. The fungal growth (the size of colonies, light blue fluorescence zone from upright side (ZU) and reversed side (ZR), the mass of fungi, and CIT production of these isolates were recorded after 4-9 days of incubation. Ultraviolet light was used to observe the size of ZU and ZR as an indicator of CIT production. High-performance liquid chromatography with a fluorescence detector was used to confirm CIT production. Both *Monascus* spp. isolates started producing ZR at day 4, with zone size increasing over time. The maximum size of the ZU and CIT production for MF1 and MS1 were achieved after 6 and 7 days of incubation, respectively. After 9 days of incubation, both *Monascus* spp. isolates produced the same amount of CIT (385 ng/g) even though the size of the colony and ZR, and mass of fungi of MF1 was greater than MS1. The fungal growth of MF1 and MS1 on CCA can be characterized based the size of their colonies, ZU, ZR, and mass of fungi. However, only the size of the ZU of *Monascus* spp. on CCA has a linear relationship with CIT production.

Affiliations: School of Food and Advanced Technology, Massey University.

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S4

Rate Controlling Mechanisms in Atmospheric freeze-drying

Authors: **Merit Mathew**, Qun Chen, Jim R. Jones, Richard H. Archer

Atmospheric freeze-drying (AFD) can be considered as a cost-effective alternative to vacuum freeze-drying (VFD), but the very slow drying rates limit industrial scale adoption. Nevertheless, there are applications, particularly with thin sections such as in leaves and petals, where the rate of AFD is relatively high. It is important to understand the rate-controlling mechanisms in AFD and how they are affected by the structure of the herbage. Such understanding will help identify the bottlenecks of the process and thus the steps that may be taken to overcome them. This project has developed a heat and mass transfer model for AFD by considering the intrinsic material and structural properties and the sublimation kinetics of ice.

The model has been validated against experimental data using pure ice and hops. Because the study needed high-quality continuous in-situ weight loss data, a new experimental apparatus has been developed. The model predicts the process with very high accuracy. Results suggest that the AFD of pure ice is an external mass transfer limited and the AFD of hops is an internal mass transfer limited process. This model will also help the end-users to run simulations of the AFD for different products and arrive at the best drying strategies to achieve faster drying rates.

Affiliations: School of Food and Advanced Technology, Massey University & FIET

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S5

Synergistic antimicrobial interaction of plant essential oils and extracts against food-borne pathogens

Authors: **Manasweeta Angane,** Janesha Perera, Simon Swift, Kang Huang, Christine A. Butts, Siew Young Quek

As the market becomes aware of the additives in food, there is an increasing demand for natural ingredients. Essential oils (EOs)/extracts from plants have demonstrated inhibitory activity against a range of pathogenic bacteria. In the present study, the antimicrobial activity of commercially available peppermint, thyme, lavender EOs and laboratory-derived feijoa EOs (leaf and peel) and ethanol extract (leaf and peel) were evaluated against food-borne pathogens (*Escherichia coli* and *Listeria monocytogenes*). The antimicrobial activity was determined as sensitive (<5%), moderately sensitive (5-10%) and tolerant (≥10%) based on the inhibitory concentration. The minimum bactericidal concentration (MBC) for Gram positive *L. monocytogenes* ranged from 1.25-3.12% (v/v). MBC values for Gram negative *E. coli* ranged from 0.6-5% (v/v). To improve antimicrobial potency, combination of EOs and ethanol extract were made and tested in checkerboard assays to calculate the fractional inhibitory concentrations (FIC) to define synergistic (< 0.5), additive (>0.5-1), indifferent (>1-4) and antagonistic (>4) interactions. Results showed that amongst all the combinations tested peppermint/thyme, peppermint/lavender and peppermint/feijoa peel extract exhibited synergistic interactions against *E. coli* and *L. monocytogenes*. The synergistic combinations were further investigated by performing time-to-kill kinetics. Synergistic combination of peppermint/thyme and peppermint/feijoa peel extract eradicated *E. coli* within 30 minutes, while it took 240 minutes to eradicate *L. monocytogenes*. Using these synergistic combination, the mechanism of action was then evaluated by monitoring the leakage of nucleic acids, adenosine triphosphate (ATP) and changes in membrane potential. This work highlights the potential of combinations of EOs and extracts as natural alternatives in food preservation.

Affiliations: University of Auckland, The New Zealand Institute for Plant & Food Research Limited

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S6

Development of low glycaemic bread containing navy bean cotyledon cells.

Authors: **Wenwen Yu,** Jaspreet Singh, Indrawati Oey

There is an increasing consumer's demand for low-glycaemic foods since the rise in obesity and type 2 diabetes globally. White bread as a popular staple, has high glycaemic index due to very high content of digestible starch. Reducing the glycaemic response is a challenge for starchy products. Navy bean cotyledon cells are a novel ingredient, in which the starch granules are tightly embedded in a protein matrix surrounded by the intact cell walls. Several studies have explored the cotyledon cells properties, but rarely have focused on food product development with low glycaemic index. In the present study, we have studied the influence of partial substitution of wheat flour with isolated cotyledon cells on physico-chemical characteristics, quality (volume, texture and colour) and starch hydrolysis kinetics and digesta characteristics during oral, gastro-small intestinal digestion in vitro models. Selected samples of the bread were evaluated for their glycaemic indices through in vivo (human) trials. SEM observation evidenced that integrity of cell wall in bread was preserved in baked bread as well as digesta, and this led to a ~34% reduction in vitro digestibility compared to white bread when 50% of the wheat flour was replaced with intact cells. Similar trend was observed during in vivo (human) studies. This study is expected to propose an optimized process suitable for commercial production of cotyledon cells from legumes and their application to develop low GI baked products such as bread.

Affiliations: Riddet Institute, Massey University

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S7

Protein differences in the simulated gastrointestinal digestion of milk from different species

Authors: **Catherine Maidment,** Assoc/Prof Aiqian Ye, Dr Siqi Le, Dr Jessica Gathercole, Dr Anita Grosvenor

Milk is a highly nutritious food source that has been an important component of the human diet since approximately 8000 BC. It provides a valuable source of proteins, fats, vitamins and energy. Although cow's milk is the most frequently consumed, milk from other species such as goat, sheep and even deer are becoming more prevalent in the market either for specialised products or as a less allergenic alternative. Prior to consumption, milk is processed either to kill microbes, preserve its shelf life or prepare it for further production. During digestion, milk proteins are hydrolysed into absorbable peptides and amino acids. Various factors such as species, breed, lactation stage and processing treatments have been shown to influence milk composition and structure, affecting how milk proteins are digested and consequently how the nutrients are absorbed. This study investigates how commercial processing treatments affect the protein structure and digestion of milks from ruminant species. The knowledge generated will provide a better basis for developing easily digestible milk products. To investigate this, milk obtained from several species and processing variants will undergo *in vitro* dynamic digestion and be characterised using LC-MS/MS proteomic analysis. It is expected that differences between species and/or processing will be discovered regarding peptide sequences, cleavage location and post-translational modifications.

Affiliations: Riddet Institute; AgResearch

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S8

Effect of treatment conditions on extracting fish collagen for biomedical applications

Authors: **S.T. Gonapinuwala,** S. Kirk, J.R. Jones, M.D.S.T. de Croos and J.E. Bronlund

Fish skin contains type-I collagen and can be potentially used as an alternative to mammalian collagen for the biomedical industry, due to its excellent bioactive properties. The main challenge in extracting fish collagen for biomedical applications as compared to mammalian collagen is the preservation of native triple-helical structure due to its poorer stability caused by low contents of proline, hydroxyproline and hydroxylysine. This can be overcome by designing extraction processes based on a clear understanding on how extraction conditions affect the quality of collagen. Therefore, for tarakihi, a cold-water fish species, different treatment times (30 min, 1 h, 2 h, 5 h, 8 h) and weight to volume ratios (1:10, 1:15. 1:20, 1:25) were tested for hydrochloric acid extraction. Low treatment times (30 min, 1 h, 2 h) and low weight to volume ratios (1:10, 1:15) resulted in lower solubility of collagen. Collagen yield was ~70% (dry weight basis) for the other treatments. The absorbance ratio, calculated from Fourier Transform Infra-Red spectroscopy, was ~0.86, which indicates the presence of native structure. Also, circular dichroism spectroscopy showed the collagen was non-denatured. This study revealed that longer extraction times up to 8 h were able to preserve the native collagen structure. However, to be cost and time effective, the 5 h treatment time at 1:20 ratio can be used to produce collagen extracts with similar properties and yields.

Affiliations: School of Food and Advanced Technology, Massey University; Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka; Medical Collagen New Zealand Ltd

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S9

Microwave technology for meat processing: its impact on quality and ultrastructure

Authors: **Mariero Gawat,** Lovedeep Kaur, Raul Cruz, Jaspreet Singh, and Mike Boland

Advance microwave technology known as Coaxially induced microwave pasteurisation and sterilisation (CiMPAS) has found application in food preservation. The system uses industrial microwave frequency (915 MHz) and consists of pressure vessel with circulating water at a controlled temperature, providing a rapid heating process. In this study, CiMPAS was used to investigate the effects of microwave processing on the structure and quality of goat and lamb ***biceps femoris muscles.*** The quality of the meat subjected to microwave heating for 5 min was compared to the sous-vide cooked muscles. The changes in the meat ultrastructure were examined using Transmission Electron Microscopy (TEM). The results showed that the microwave process led to a rapid rise in the internal temperature of up to 120 °C for lamb and 110 °C for goat meat. The process produced meats with texture (Warner-Bratzler Shear Force) equivalent to their control sous vide cooked counterparts (cooked at 60 °C for 9 h). However, the microwave processed meat had higher cook loss and its color characteristics significantly different from the sous vide cooked meat. Pronounced ultrastructural damage, such as lateral and longitudinal shrinkage of myofibrils and disintegration and widening of Z disks, was seen in the former, which could explain the cooked meat-like tenderness achieved within a short duration microwave treatment. The results highlight how rapid and high-temperature heating by CiMPAS leads to changes in the meat ultrastructure. Experiments on how these changes affect the digestibility of processed meat will be carried out in the near future.

Affiliations: Riddet Institute; School of Food and Advanced Technology, Massey University

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S10

Sustainable Paper-based Packaging from Hemp Hurd Fibres for Thermoformed Moulded Packaging

Authors: **Chi Hou Lo,** Kelly Wade, Kate Parker, Tanya Poipoi Davy, Anthony N Mutukumira

Hemp hurd fibre, a low value waste stream from the hemp industry has potential downstream applications. In the food industry, hemp waste can be used as an alternative material to non-renewable plastics to manufacture food service ware. In this investigation, prototypes made from pulped hemp hurd, mixed in varying ratios with radiata pine pulp were developed and tested. Hemp hurd was chemically pulped (Soda Cooking), whereas pine wood chips were mechanically pulped (Bleached Chemical Thermomechanical Pulping). Handsheets prototypes were characterised using several mechanical property tests including tensile, tearing, bursting, short-span compression, ring crush, Gurley, contact angle and Cobb testing. Hemp hurd handsheets had promising mechanical properties due to the physical nature of the pulped fibres. Handsheets were also thermoformed using various processing conditions (Temperature: 150-200 ˚C; Time: 100-300 seconds; Pressing Force: 50-200 kN) to improve their properties. Thermoformed handsheets made from hemp fibre (100%) had the highest mechanical properties and barrier performance due to their increased fibrous densities, as well as their stronger fibre-fibre bonding from denser fibrous network. A 3-D prototype was made from hemp hurd pulp using a simulated thermoforming moulding process.

Affiliations: School of Food & Advanced Technology, Massey University, Auckland; Scion; Koa Holdings Limited

University of Otago Te Whare Wānanga o Otāgo New Zealand
Department of Food Science Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S11

The antimicrobial and antioxidant efficacies of mānuka oil vary in low- and high-fat meat paste systems

Authors: **Ramandeep Kaur,** Lovedeep Kaur, Tanushree B. Gupta and John E. Bronlund

The research studies on the influence of food composition, especially fat content, on the antimicrobial and antioxidant efficiencies of essential oils have rarely been reported; however, it is an essential factor to be studied. In this study, the antioxidant and antimicrobial effect of New Zealand mānuka oil with 25 % triketone content (*Leptospermum scoparium*) was tested in two different meat pastes having low (3 %) and high (12 %)-fat content prepared from the normal and wagyu beef tenderloins, respectively during storage for one week at 4 °C. The effects of this oil were compared against commonly used preservatives sodium nitrate and rosemary oil. In low and high-fat meat pastes, the mānuka oil showed a higher antimicrobial effect against gram-positive microbes than the gram-negative ones, and this effect was greater than the rosemary oil and sodium nitrate-containing pastes and controls (with no added preservatives). However, the rosemary oil inhibited the growth of gram-negative microbes more effectively. The antimicrobial effect of mānuka oil was higher in low-fat meat paste than in high-fat meat paste, which may be due to more solubility of mānuka oil in meat fat, thereby protecting the targeted microbes in the meat pastes. On the other hand, mānuka oil showed more antioxidant effects in high-fat meat pastes than low-fat meat pastes to inhibit lipid oxidation. Improvement in colour values was also noticed by adding mānuka oil in both meat pastes.

Affiliations: School of Food and Advanced Technology, Massey University; Riddet Institute, Massey University; AgResearch Ltd., Hopkirk Research Institute, Massey University

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S12

Physicochemical properties of lotus seed starch

Authors: **Chuanjie Chen,** Guantian Li, Yacine Hemar, Harold Corke, Fan Zhu

The seeds of lotus (*Nelumbo nucifera* Gaertn.) have high starch content. Little is known about the diversity of lotus seed starch properties. Twenty-two lotus seed samples were collected from different locations in China. The physicochemical properties of the lotus seed starches (LSs) were analyzed and compared with those of potato and maize starch. Most of the LSs were similar in morphology and particle size distribution. The apparent amylose contents (AAM) (41.6–48.8%) of LSs were higher than their true amylose contents (25.1–29.9%). Variation was found in their thermal, swelling, solubility, and rheological properties. Diversity in the gelatinization peak temperature (73.7–75.3 °C) of LSs was small, while the onset temperature (64.3–71.0 °C) and conclusion temperature (78.5–83.1 °C) varied significantly. Correlation analysis and principal component analysis indicated that AAM is of importance to the LS's physicochemical properties (e.g. swelling power and yield stress). Significant correlations were found between the AAM and SP of LSs and the latitudes of seed origins. The physicochemical properties of LSs were significantly different to those of conventional potato and maize starches. The high AAM, high gelatinization temperature, low amylose leaching, and quick retrogradation of LSs are noteworthy. LS might found applications in biomaterial fabrication such as food 3D-printing filler.

Affiliations: School of Chemical Sciences, University of Auckland; Institute for Advanced Study, Shenzhen University; Department of Biotechnology and Food Engineering, Guangdong Technion Israel Institute of Technology

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S13

In-flow SAXS investigation of whey protein isolate hydrolysed by bromelain

Authors: **Jiecheng Li,** Zhi Yang, Xiaoling Lin, Sinong Wu, Guantian Li, Na Li, Don otter, Fan Zhu, Christian Hartinger, Harold Corke, Yacine Hemar

In-flow small angle X-ray scattering (SAXS) was used to probe in real-time (typically every second) the hydrolysis of whey protein isolate (WPI) by bromelain. SAXS showed that the average size of WPI molecules was about 20 Å and that even at the completion of the enzymatic reaction some intact molecules of similar size remained. SAXS allowed us to monitor the hydrolysis course through the calculation of the power-law exponent (P) and the Guinier scale factor (G) using a theoretical unified model fitting. The fitting exercise also indicated that bromelain hydrolysis transforms the globular WPI molecules into Gaussian polypeptides. The hydrolysis of WPI was confirmed by the degree of hydrolysis and turbidity measurements and by SDS-PAGE, which showed that bromelain has a broad specificity. This study demonstrates that SAXS is a powerful method to monitor in situ and real-time protein hydrolysis and can offer insights into protein structural changes that occur.

Affiliations: School of Chemical Sciences, The University of Auckland; School of Food and Advanced Technology, Massey University; Department of Biotechnology and Food Engineering, Guangdong Technion Israel Institute of Technology, National Centre for Protein Science Shanghai, Chinese Academy of Sciences; Department of Food Science and Microbiology, School of Science, Auckland University of Technology; Faculty of Biotechnology and Food Engineering, Technion Israel Institute of Technology; Institute for Advanced Studies, Shenzhen University

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S14

A novel plant-based emulsifier: OBMMs

Authors: **Alyin Sen,** Harjinder Singh, Aiqian Ye, Alejandra Acevedo-Fani

Plants store triacylglycerols in the form of oil bodies (OBs) as an energy source for germination and subsequent seedling growth. The interfacial biomaterials from these OBs are called OB membrane materials (OBMMs) and they have several applications in foods e.g., as emulsifiers. The OBMMs are preferred in food applications as emulsifiers over their synthetic counterparts because they are natural, i. e. suitable for clean label, and may stabilize bioactives during storage. This project mainly focuses on the extraction technologies for plant OBMMs, the functionality of these materials, and the interaction of OB membranes with other food components. Different sources of OBs will be evaluated and the challenges during the extraction and use of these OBMMs for food applications will be addressed.

Affiliations: Massey University

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S15

Impact of high hydrostatic pressure and hydration level on the starch related properties of cassava flour

Authors: **Ladie Anne Conde,** Biniam Kebede, and Indrawati Oey

Starch modification through high hydrostatic pressure processing (HPP) has garnered scientific interest due to its chemical-free and non-thermal approach. It has been shown that this technique could change the native starch properties without granular disintegration and shift the properties for a certain type of flour depending on the pressure level as well as the hydration level. So far very few studies were dedicated to flour and none that of starch rich cassava flour. The objective of this research was therefore to study the effect of pressure (300 - 600 MPa) and flour concentration (10, 20, and 30%) on starch related properties of cassava flour. Microstructural integrity, thermal properties, and starch susceptibility to digestive enzymes were determined. Results showed no difference between untreated and treated samples at 300 to 500 MPa with different flour concentrations. Microstructural integrity was however significantly (p<0.05) reduced at 600 MPa, as an impact of induced gelatinization. This was observed in the decreased relative crystallinity, birefringence, and gelatinization enthalpy. These changes at 600 MPa contributed to the enhanced susceptibility of cassava starch to digestive enzymes. This research implies the possibility of using HPP to modify starch in cassava flour.

Affiliations: Department of Food Science, University of Otago; Riddet Institute, PhilRootcrops, Visayas State University, Baybay City, Leyte, Philippines

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S16

Effects of sound applied during beer fermentation on yeast growth, fermentation duration, and volatile compounds

Authors: **Parise ADADI,** Alastair HARRIS, Pat SILCOCK, Phil BREMER, Austen GANLEY, Tim JOWETT, Andrew JEFFS, Graham EYRES

The use of sound to augment fermentation processes has attracted more marketing attention than rigorous scientific research. This study was designed to assess the impact of audible sound frequency and intensity on yeast, fermentation rate, and composition of volatile organic compounds (VOCs) of beer. Specific sound frequencies and intensities were delivered using vibration from linear actuators (LA) to ferments in reinforced laminated barrier film wine bags. Ferments not exposed to sound served as controls. Apparent Brix and yeast in suspension were used to monitor the progress of fermentation and modelled using a sigmoidal Gompertz function to evaluate the rate and time to terminal gravity (end of fermentation). Headspace solid-phase microextraction coupled with gas chromatography-mass spectrometry was used to measure the VOCs at the end of fermentation (144 h). Ferments with the sound treatment (LAT) had higher yeast cells in suspension than the control with significant differences ($p < 0.05$) at 36 h and 78 h. LAT samples showed a rapid decline in gravity (apparent Brix) and reached terminal gravity 30 h earlier than the controls. Treatment with LA had minimal effects on the abundance of VOC, with no significant effects ($p > 0.05$) on monoterpenes, 7 out of the 8 higher alcohols, and 20 out of 29 esters. This study demonstrates that the application of a sound/vibration treatment with LA can significantly enhance the rate of fermentation without significantly altering the abundance of VOCs, and hence the use of LA may be a way to enhance production throughput.

Affiliations: Department of Food Science, University of Otago; School of Biological Sciences, University of Auckland; Department of Mathematics and Statistics, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S17

An Investigation of the Capabilities and Capacity of Central Otago Fruit Processors to Upcycle the Region's Surplus Fruit

Authors: **Molly Goodisson,** Phil Bremer, Miranda Mirosa

One quarter of all food produced is wasted. This wasted food has a significant social, economic, and environmental cost as it could feed over 1 billion people, required significant time, money, and energy to be produced and is responsible for 8-10% of human caused carbon emissions. New Zealand's horticulture industry is no stranger to food loss and waste, with an estimated annual fruit loss of 6,100 tonnes in Central Otago alone.

The Central Otago District Council (CODC) growers and processors are on a collective journey to reduce the amount of fruit loss in Central Otago. In October 2021 CODC released the Understanding Fruit Loss in Central Otago report that quantified the fruit that is produced but not used in the region. With this, the region is now seeking solutions to add value to their waste streams.

Upcycling is an exciting solution that holds promise with recent market trends shifting towards more sustainable responsibility from food businesses. CODC have identified that through utilisation of Central Otago fruit processors' equipment, capacity, capability and interest in upcycling, a solution could be created.

To investigate this, an equipment stocktake, as well as qualitative semi-structured interviews, are being conducted with 10-12 fruit processors across the Central Otago region to understand the barriers and opportunities of upcycling fruit waste. The interviews will inform ways for growers and processors to work together to collaboratively upcycle their waste into value added products. It is hoped that this approach will inspire other regions to develop similar strategies

Affiliations: Department of Food Science, University of Otago; Upcycled Food Lab, Food Waste Innovation, University of Otago

NZIFST Conference 2022
5 - 7 July, Rotorua

S18

Sensory-rheology correlation of texture-modified food in the context of swallowing safety

Authors: **Nilushika Thambugala,** Anna Miles, Meng Wai Woo, Anu Gnanavinthan, Siew Young Quek

Even though sensory analysis is considered the gold standard for determining food sensory texture, there are many solid reasons for using instruments to measure texture. Instrument readings are cheaper and quicker, provide numerical and reproducible results and offer the potential for setting international standards for textural properties. Historically, sensory measures have correlated with instrumental measurement to predict the consumer acceptance of food. In recent years, this correlation has been branched off to understand the swallowing function in the context of dysphagia management. However, a thorough piece of work correlating instrumental measurements with sensory assessment has not yet been performed for a range of dysphagia texture-modified food. Therefore, the main objective of this research is to compare and correlate the textural properties perceived by a sensory panel with rheological data for a range of "International Dysphagia Diet Standardization Initiative" (IDDSI) Level 4 Puree food. Both small and large deformation tests were conducted using a controlled stress rheometer to imitate the food's oral behaviour. We are in the progress of conducting sensory evaluation with three groups of participants consisting of healthy young (n=10), healthy older (n=10), and dysphagia (n=10). The results of rheological tests demonstrated that despite all the samples belonging to the same IDDSI level, there were significant variations in their rheological properties depending on composition. The rheological data will be correlated with sensory data to evaluate the reliability, compatibility and true extent of each parameter contributing to the swallowing function.

Affiliations: University of Auckland; The Pure Food Company; Riddet Institute, New Zealand Centre of Research Excellence in Food Research.

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S19

Impact of processing on the phytochemical profile of NZ heritage apple cultivar ‘Monty’s Surprise’ and their cancer management properties.

Authors: **Linda Nezbedova,** Tony McGhie, Mark Christensen, Julian Heyes, Noha Ahmed Nasef, Sunali Mehta

Apple consumption is associated with improved health and reduced risk of cancer which is attributed to their phytochemical content. However, it has been difficult to study health benefits of apple phytochemical as their concentration and composition vary across apple tissue type and is affected by cultivar and processing.

This project systematically investigates the phytochemical patterns, health benefits and cancer preventative effects of a New Zealand (NZ) heritage apple cultivar known as ‘Monty’s Surprise’. This apple has been widely planted around NZ and contains high concentration of health beneficial phytochemicals. However, this heritage apple has a short shelf-life; therefore, processing is necessary to preserve it for long-term consumption.

Aim of this study was to develop a standardized ‘Monty’s Surprise’ apple product using simple household processing techniques (puree and air-dehydration) for long-term storage with minimal effect on the composition of apple phytochemicals. Concentrations of phenolics and triterpenoids in the ‘Monty’s Surprise’ puree and air-dehydrated samples were determined using liquid chromatography and mass spectrometry (UPLC-QTOF-MS). Our findings suggest that air-dehydration reduces phytochemical content of ‘Monty’s Surprise’ apple compared to pureeing. Additionally, pureeing appears to be a suitable technique to preserve this apple while retaining its phytochemical content and composition.

Findings from this study will identify simple household processing technique for long term storage and consumption of ‘Monty’s Surprise’ apple. From this work, we have developed a uniform apple product which will be used for the human bioavailability study and inform cell culture studies in the subsequent phases of this project. In the future, this project has the potential to include ‘Monty’s Surprise’ apple to improve long term strategies for cancer management.

Affiliations: School of Food and Advanced Technology, Massey University; The New Zealand Institute for Plant and Food Research Limited, PN; Heritage Food Crops Research Trust, Whanganui; Riddet Institute, Massey University; Pathology Department, Dunedin School of Medicine, University of Otago; Maurice Wilkins Centre for Biodiscovery, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S20

An exploratory study of the beneficial effects of probiotics and phenolic compounds

Authors: **Li Ying Jessie Lau,** Kang Huang and Siew Young Quek

The effect of phenolic compounds from plant extracts of feijoa (Anatoki, Kakariki and Apollo cultivars) peels and leaves, *Cyclocarya paliurus* leaves, *Camellia sinensis* leaves and selected pure phenolic compounds on the viability of probiotics was investigated. The antimicrobial activity of the extracts was tested against pathogenic bacteria (*Bacillus cereus* and *Escherichia coli*) and probiotic strains (*Lactobacillus acidophilus*, *Lactobacillus paracasei* and *Lactobacillus reuteri* DPC16) at 0.3125 mg/ml to 80 mg/ml. The growth of probiotic strains was tested *in vitro* and the metabolites from the phenolic plant extracts were quantified by LC-MS. Results showed that Kakariki peel extracts and *Cyclocarya paliurus* leaf extracts suppressed the growth of *B. cereus* and *E. coli* with MIC value of 0.625 mg/ml and 1.25 mg/ml, respectively. The MIC values of three *Lactobacillus* strains varied from 10 mg/ml to 80 mg/ml, higher than the MIC values of pathogenic bacteria. The growth of *L. reuteri* DPC 16 was significantly induced by the Kakariki peel and *Cyclocarya paliurus* leaf extracts by 6-fold growth stimulation in the final concentration of 80 mg/ml. Among all tested probiotics, the growth of *L. reuteri* DPC16 was the most stimulated by the plant extracts in the concentration range of 1.25 mg/ml to 80 mg/ml. Interestingly, phenolic compounds from plant extracts can selectively inhibit the growth of pathogens without affecting the viability of probiotics studied. These findings support the hypothesis that phenolic compounds from plant extracts and probiotics might mutually enhance their benefits at the intestinal level, which could be used in future nutritional strategies.

Affiliations: Food Science, School of Chemical Sciences, The University of Auckland

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S21

What volatile compounds are present in flavoured e-cigarette liquids sold in New Zealand?

Authors: **Crystal van Gorp,** Graham T. Eyres, Andrea Warburton and Pat Silcock

Tobacco smoking causes more deaths than any other product, yet it is still one of the most successful economic enterprises. E-cigarettes are electronic devices for nicotine delivery that mimic the characteristics and exposure of smoking. These are promoted as an alternative to smoking to help users quit cigarette smoking. Instead of inhaling smoke, e-cigarette users inhale an aerosol produced by heating an e-liquid, which is composed of carrier solvent, nicotine and flavourings. There are a vast array of e-liquid flavours falling under a variety of flavour categories, including fruit, dessert, beverages, tobacco, and menthol. E-cigarettes in New Zealand are controlled under the Smokefree environments and Regulated products Regulations 2021, which have introduced limits around the permitted ingredients and concentrations in e-liquids, with certain chemicals, such as diacetyl (2,3-butanedione), 2,3- pentanedione and acetaldehyde. However, there is currently little data on the composition of eliquids in the New Zealand market. The objective of this study was to characterize the composition of a selection of 40 e-liquids and quantify the concentration of selected target compounds using gas chromatography mass spectrometry (GC-MS). Results will be important for further study on the volatile organic compounds that are generated during the vaporization, which will then be used to determine the health risks of current use of e-liquids in New Zealand.

Affiliations: Department of Food Science, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S22

Exploring potential uses of upcycled bread flour in food (pasta) recommended for a healthy diet

Authors: **Brian Thong,** Phil Bremer, Sheila Skeaff, Miranda Mirosa

Food waste is a growing issue, with a third of food produced worldwide wasted. Food waste brings about significant economic, environmental, and social implications that can be avoided. The impacts of food waste warrant a global response to solve the issue. Of the current solutions, upcycling food is rapidly becoming a desirable way to repurpose food that otherwise would have been wasted for human consumption. Upcycled foods or ingredients have two main beneficial outcomes : (1) They reduce the amount of new raw materials needed for food production, for example, wheat flour; and (2) potentially wasted nutrients, for example, iodine, are reintroduced into the food supply. However, many of the upcycled foods currently produced are considered discretionary foods (i.e., energy-dense but nutrient-poor), such as baked goods (e.g., biscuits, cakes), snacks or drinks (e.g., alcoholic and non-alcoholic). Given this, there is a gap in the market to use upcycled ingredients to produce foods that are recommended for a healthy diet. Therefore, this study's focus is on the feasibility of producing pasta using upcycled bread flour. Due to the changes that wheat flour undergoes during bread baking, the study investigates how the characteristics (e.g., bread variety, particle size, moisture content) and amount of upcycled bread flour substituted in place of flour influences the textural and eating qualities of the resulting pasta. It is hoped that this research will provide fundamental knowledge that will lead to the greater adoption of upcycled bread flour into a wider variety of upcycled foods.

Affiliations: Department of Food Science, University of Otago; Department of Human Nutrition, University of Otago;

Upcycled Food Lab, Food Waste Innovation, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S23

Physical modification of a bio-polysaccharide from Cyathea medullaris.

Authors: **Akshay Bisht,** Kelvin Goh, John Monro, Lara Matia-Merino

The New Zealand black tree fern (*Cyathea medullaris*) is a native fern grown across the Pacific islands. This fern encapsulates a novel water-soluble long-chain (3-4x10^3 kDa) anionic glucuronomannan biopolymer, which was previously reported to exhibit a unique and complex rheological behaviour, as Newtonian, shear-thickening, and shear-thinning responses were observed depending upon concentration and applied shear. Natural polysaccharides are usually modified—by physical, chemical, or enzymatic methods—to improve their techno- and bio-functionality. Physical modifications including thermal, mechanical, and thermo-mechanical processes are often more attractive as the use of chemicals is avoided. However, physical modification of biomacromolecules as a consequence of processing may be undesirable in many occasions, limiting the polysaccharides applications. Thus, in this study, the sensitivity of the Black Tree Fern Polysaccharide towards high shear and temperature treatments was investigated through its rheological and structural properties. Both, shear and temperature treatments caused a reduction in viscosity. Thermal treatment caused breakdown of glycosidic bonds in the polymer backbone, while no structural changes were observed in the sheared-treated samples.

Affiliations: School of Food and Advanced Technology, Massey University; New Zealand Institute for Plant and Food Research

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S24

The Insights into Upcycling from a Manufacturer's Perspective. Including the Challenges, Barriers, and Opportunities Upcycling Presents.

Authors: **Elizabeth Cunliffe,** Phil Bremer, Miranda Mirosa

Food waste is a global problem. Shockingly one-third of all food produced annually is wasted. Of this, an estimated 1.3 billion tonnes is calculated to be perfectly edible for human consumption. Disappointingly, this waste occurs despite food insecurity being still prevalent within Aotearoa New Zealand, and the rest of the world. Economically, global food waste accounts for approximately 2.6 trillion USD and its burden on the environment is colossal, as 8-10% of all global greenhouse gasses are generated from wasted food.

Food waste occurs throughout all stages of the supply chain including, production, manufacturing, distribution, retailer, and consumer. One strategy, to help to prevent food from being wasted is the process of 'Upcycling' which is the transformation of edible food waste within the supply chain into value-added products. While the economic and environmental potential of upcycling is significant, little is known regarding the challenges and opportunities this emerging product category poses to food manufacturers.

To address this lack of knowledge, semi-structured qualitative interviews are being conducted with a range of food manufacturers, including those currently producing upcycled products, those interested in producing upcycled products, and those who have little knowledge regarding upcycling. The interviews will provide relevant information to stakeholders within the food manufacturing sector on the opportunities and challenges upcycling presents. Therefore empowering them to make more informed decisions on the feasibility of engaging in upcycling and ultimately it is believed that this research will help in the development of a more sustainable and circular food system.

Affiliations: Department of Food Science, University of Otago; Upcycled Food Lab, Food Waste Innovation, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S25

Valorisation of spent hops from brewing and potential reuse

Authors: **Sian Menson,** Graham Eyres and Phil Bremer

Waste generation and its disposal poses a significant challenge for the brewing industry owing to its impact on yield, disposal costs and environmental impacts. The major food waste streams from brewing are spent grain, spent yeast, and spent hops. While the utilisation of spent grain and spent yeast have garnered the most attention due to the quantity produced and the presence of established products in the market, the upcycling potential of spent hops has not been explored. Hops are an expensive ingredient used to add the characteristic bitterness and flavour to beer. As brewers seek to brew more hop focussed beers, dry hopping has become a common process in which hops are added during or post-fermentation to add extra aroma. However, the utilisation of flavour and bittering compounds during dry hopping is inherently inefficient, which represents an economic loss as valuable components remain in the spent hops and in beer loss owing to absorption by the hop material. The spent hops also present an environmental impact through their disposal into wastewater or onto land.

By analysing the composition of the spent hops recovered from dry hopping, the feasibility of potential applications for their use will be able to be assessed. This research will hence add value to what is currently considered a waste product, potentially lead to the development of new products / processes and help to reduce food waste and disposal costs associated with spent hops.

Affiliations: Department of Food Science, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S26

Developing a model UHT whipping cream system to investigate fat crystal modifying emulsifiers on functionality

Authors: **Stella Henderson,** Patrick Janssen, Sam Rodgers, Anna Williams and Lara Matia-Merino

Whipping cream is a complex food system composed of three immiscible phases: air, fat and water. Air bubbles are stabilized by a network of partially coalesced fat globules induced by mechanical forces, in the presence of proteins and surfactants. Solid fat content and polymorphic changes of milkfat play a critical role in influencing cream functionality and stability. However, there are limited methods to evaluate crystal polymorphs without NMR—an expensive and time-consuming method. The aim of this research was to develop a model cream system and explore characterising techniques to evaluate formulation levers for UHT whipping creams. The objective was to improve UHT whipping cream functionality through crystal-modifying ingredients.

A model system was developed to reflect commercial UHT whipping cream, comprising of AMF, sodium caseinate and emulsifiers. The model system was used to investigate the influence of crystal-modifying emulsifiers on polymorphic changes and how they impact functionality. Emulsions were evaluated by physical and functional properties including differential scanning calorimetry (DSC) and whipping properties.

Early results showed significant differences in whipping time and overrun between emulsions prepared with two types of fat-soluble food emulsifiers. Emulsifier A samples exhibited high overrun and low whipping time, compared to emulsifier B samples which did not reach a firm peak. The DSC method established, was able to identify changes to the onset of β' crystal nucleation and the quantity of α-crystals caused by emulsifier addition. Fat globule agglomeration and strong foam structure is promoted by α-crystals, whereas β'-crystals are associated with foam softness and aeration.

Affiliations: Massey University, Synlait Milk Ltd.

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S27

Interaction of green tea polyphenols with milk proteins

Authors: **Subha Sasidharan Nair,** Iresha Matiwalage, Philip Winscomb, Caren Meyn Alvarez, Keegan Burrow, Maneesha S Mohan

Green tea polyphenols have proven antioxidant activities and many health benefits. Milk proteins are known to be protective delivery systems for polyphenol in the gut. Our study evaluates the interactions of green tea polyphenols with different milk proteins. Freeze dried powders of green tea extract, and green tea extract combined with whey protein concentrate, sodium caseinate, and skim milk were evaluated at different polyphenol to protein ratios (protein alone, 5:40 and 10:40), for polyphenolic profile, loading efficiency of polyphenols in different samples and antioxidant activity. Tea-casein sample (5:40 ratio) had the highest concentrations of catechin (2.7 mg/g) and epigallocatechin gallate (116.34 mg/g tea extract) when compared to other samples ($P<0.05$). The loading efficiency of epicatechin in tea-casein samples was significantly lower than tea-milk or tea-whey samples, indicating higher polyphenol interactions with caseins ($P<0.05$). Tea-milk samples (0.23 for 5:40 and 0.16 for 10:40) exhibited lower absorbance values compared to milk alone (0.37 for 0:40) samples on measuring the absorbance associated with the ABTS ions not reduced by the polyphenols. The results indicated that all protein based green tea samples exhibited higher antioxidant activity than the protein alone samples, and among these tea-casein samples had the highest antioxidant activity. Our findings indicate that casein proteins interact with green tea polyphenols to a greater extent than whey proteins and when a mixture of these proteins (skim milk) were used. This study further emphasizes the need to investigate the binding and interactions between molecule, for designing a milk-based delivery system for polyphenols.

Affiliations: Department of Wine, Food and Molecular Sciences, Faculty of Agriculture and Life Sciences, Lincoln University; Yilli Innovation Centre, Oceania; Department of Dairy and Food Science, South Dakota State University

University of Otago Te Whare Wānanga o Otāgo New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S28

Impact of fortified reconstituted milk systems on gastrointestinal fate of curcumin nanoemulsion

Authors: **Haroon Jamshaid Qazi,** Aiqian Ye, Alejandra Acevedo-Fani, Harjinder Singh

Fortification of milk-based products with bioactive compounds has become an attractive strategy to boost their health-enhancing attributes. The properties of skim milk powder used in food, nutraceutical and paediatric formulations to achieve desired proteins/solids contents and textural properties varies, which depend on the nature of the pre-heat treatment carried out during processing. Though many of these physicochemical modifications have been thoroughly investigated, little is known about their impact on digestion behaviour and release of bioactive compounds. Herein, we sought to incorporate curcumin nanoemulsions into food systems prepared with low-heated (MLH), medium-heated (MMH) and high-heated (MHH) skim milk powders to understand the impact on the digestion and the curcumin bioaccessibility. Results showed that although all the recombined milk systems formed a curd during dynamic in vitro gastric conditions, but distinct characteristics of their curds significantly reduced the gastric emptying of protein and entrapped emulsified nano oil droplets loading curcumin. The open fragmented curd formed by MHH in gastric chamber, due to modification in casein whey protein complexes formed during pre-heat treatment, resulted in higher proportion of protein and oil emptying compared to the low-heated samples. This variability in compositional profile of the gastric digesta was further linked to the different rates of free fatty acids release and the associated bioaccessible fraction of the curcumin during intestinal digestion. Thus, this study highlights how various food ingredients can govern the fate of added health promoting compounds, which significantly affect the functionality and application of the supplements claimed by the manufacturers.

Affiliations: Massey University, Riddet Institute

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S29

How does the marketing of an upcycled product effect consumer preference?.

Authors: **Emma Roberts,** Miranda Mirosa, Phil Bremer, Erin Young

Upcycling is a new, innovative response to food waste, which works alongside food waste reduction methods. The concept involves utilising by-products and food that would otherwise be wasted to create new products. By reducing food waste, there are many different benefits including working towards a more sustainable future. The issue with upcycled food products is consumer acceptance about the health and safety of such products. Consumers also feel a need for these products to cost less than conventional products as they believe they should be cheaper to make.

In order to increase consumer acceptance of these products, the marketing of them, specifically the position, packaging and promotion, should be researched. The current study is investigating the importance of these marketing aspects, specifically from a 'value for money' perspective. An upcycled oat bar will be used alongside a conventional product. The bar will be made from oat pulp, the by-product of oat milk production. Biometric methods, including eye tracking and automated facial expression analysis will be used to understand consumer responses to the upcycled vs a conventional packaged product, marketed as a value for money option. This research will provide a better understanding of consumers' opinions and preferences which can lead to a better understanding of marketing strategies to increase consumers' willingness to purchase upcycled products.

Affiliations: Department of Food Science, University of Otago; Upcycled Food Lab, Food Waste Innovation, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S30

Investigating the impact of sustainability communications of an upcycled oat bar on consumer preference.

Authors: **Shaina Ebron,** Miranda Mirosa, Phil Bremer, Erin Young

Food waste is a symptom of an unsustainable food production and consumption system and is associated with a significant loss of resources including water, land, and energy. Nearly one-third of all food produced for human consumption is lost or wasted.

The upcycling of food that would have otherwise been wasted presents a great opportunity to help solve the problem of food waste. Upcycled foods are beginning to appear in markets worldwide, including New Zealand, where a select number of upcycled products can now be purchased at supermarkets.

The communication of product attributes is an important strategy for marketing new products. Particularly, packaging communications, positioning and promotion tactics are key factors in driving consumer sales. Given increased consumer interest in environmental issues and sustainability, a focus on evaluating which appropriate environmental cues to communicate in relation to an upcycled food product is particularly important for this product category.

To investigate the effects of how marketing strategies influence consumer preference, at least 45 participants aged 18-25 will be recruited. Biometrics data from eye-tracking and analysis of facial expression will be used to track consumer responses to control (non-upcycled) and experimental (upcycled) oat bar products. The upcycled product will be promoted as being made using oat pulp as the main ingredient, obtained as a by-product of oat milk production thereby helping to reduce the environmental impacts of food waste. Consumers' attitudes to food upcycling and the environment will be collected through post-task survey questions to evaluate if their opinions influence product preferences.

Affiliations: Department of Food Science, University of Otago; Upcycled Food Lab, Food Waste Innovation, University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

S31

Consumer Reactions to the Packaging of a Health Positioned Upcycled Food: A Biometric Methods Approach.

Authors: **Lance Aya,** Miranda Mirosa, Phil Bremer, Erin Young

Food waste is a destructive global challenge that has environmental, economic, and social impacts. In light on these issues, upcycled food products have been created as an exciting, innovative solution to fight food waste. This consumer product-based approach is of great value to the consumer, as they are contributing to reducing food waste, and to businesses, as they can turn their waste streams into value-added products.

Research on upcycled foods and consumer preferences is still very new. Even more so with a focus on a health positioned product. Understanding consumer preferences is important in order to know how to best tailor or position a product to meet market expectations.

Packaging is regarded as the most way in which a company can communicate a products attribute. Attributes such as colour, fonts and labelling must be considered to signal what type of product is being marketed.

Biometric methods such as eye tracking and facial expression analysis can provide insights into a consumer's subconscious behaviour and decision making during the purchasing process, making it an ideal way to measure consumer's preferences.

The current project will investigate preferences and reactions to both a health positioned upcycled bar, and a control non-upcycled oat bar using eye tracking and facial expression analysis alongside preference tasks. Findings will be used to inform users of the University's Upcycled Food Lab, and to help researchers and product developers in better positioning their products in the upcycled market.

Affiliations: Department of Food Science, University of Otago; Upcycled Food Lab, Food Waste Innovation, University of Otago

NZIFST Conference 2022
5 - 7 July, Rotorua

S32

Nutrient and health-promoting components of edible insects: More than meets the eye

Authors: **Patrick Nolan,** Dominic Agyei, Alaa El-Din Ahmed Bekhit, Ruchita Rao Kavle

Edible insects have been predominantly considered as a nutrient-dense alternative to conventional plant-based and animal products. These insects have been found to contain high levels of protein (33.5-67.2%), fat (22.5%-49.8%), vitamins (for A, B, D, E, K), and minerals (Mg, P, Ca, Zn, Mg, Fe). However, with edible insects, there is far more than meets the eye. Edible insects have been found to contain high levels of chemical compounds known to promote health. Many of these compounds are found in insects due to their predominantly plant-based diets.

This observation leads us to propose that insect-derived phytochemicals could exhibit similar bioactivity to those compounds found in plants. An analysis of the minor health-promoting compounds that were reported in the literature has shown the presence of bioactive compounds polyphenols, alkaloids, terpenes, and phytosterols in common crickets. These compounds are known to exhibit bioactive functions such as antioxidant, cardioprotective, antimicrobial, neuroprotective and anti-inflammatory effects. Edible insects are also excellent sources of the polymer, chitin. Chitin and its derivatives have many bioactive functions including anti-tumour, antioxidant, anti-microbial and drug excipients.

The objective of this presentation is therefore to examine the minor bioactive components of edible insects and their effects on health. Attention will be given to the presence, concentration, and health properties of edible insect-derived compound classes such as phytochemicals (polyphenols, alkaloids, terpenoids, and sterols), as well as chitin and its derivatives.

Affiliations: Department of Food Science University of Otago

University of Otago
Te Whare Wānanga o Otāgo
New Zealand
Department of Food Science
Te Tari Pūtaiao Kai
Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

Professional Poster Index

Name	Number	Authors	Title
Callum Lambert	G04	**Callum Lambert**, Rebecca Edgar, Bikiran Pardesi, Alessandro Pisaniello, Roland Schaap, Millie Maddocks, Sam Stevenson, Lindsey White, Kendall Clements, Paul Rose	Metagenomics Used to Characterise and Replicate Fish-gut Microbiome
Candice Gu	G06	Kevin Mitchell, Andrew Lewis, Rosemary Webby, **Candice Gu**, and Andrew MacKenzie	Analysis of Trimethylamine N-oxide and Trimethylamine in marine oils by NMR
Carolina Realini	G02	**Carolina E. Realini**, T. Driver, R. Zhang, M. Guenther, S. Duff, C.R. Craigie, C. Saunders, M.M. Farouk	Meat consumption and consumer attitudes – a New Zealand perspective
Dawn Scott	G05	**Dawn Scott**, Candice Gu, Kirill Lagutin and Andrew MacKenzie	Rapid extraction of green shell mussel and fish flesh for high throughput lipid analysis.
Fan Zhu	G01	**Fan Zhu,** Noor Ariefandie Febrianto	Bioactive components and flavor volatiles of diverse cocoa genotypes
Lovedeep Kaur	G08	**Lovedeep Kaur**, Amrutha Elamurugan, Feng Ming Chian, Xianqian Zhu, and Mike Boland	Pasture-Raised Beef, Grain-Finished Beef, and a Plant-Based Meat Alternative: A comparison of protein and lipid digestion
Mustafa Farouk	G03	**Mustafa M. Farouk**, Renyu Zhang, Katherine Tozer, Tracy Baylis, R. Greenfield, Noby Jacob, Michael Agnew, Steven Howarth	Impact of regenerative farming on meat quality
Sravani Gupta	G07	**Sravani Gupta**, Kathiravan Krishnamurthy, Roland Taylor, Graham C. Fletcher and Mohammed M. Farid	Rapid inactivation of Listeria monocytogenes on apples and salmon using Pulsed UV light

P1

Bioactive components and flavor volatiles of diverse cocoa genotypes

Authors: **Fan Zhu,** Noor Ariefandie Febrianto

Theobroma grandiflorum, *T. bicolor* and *T. subincanum* represent underutilized genetic resources for cocoa quality. The bioactive components and flavor volatiles of different bean genotypes of these species were profiled and compared with those of *T. cacao*. *T. grandiflorum* and *T. bicolor* had different profiles of methylxanthines and polyphenols from *T. bicolor* and *T. cacao*. *T. grandiflorum* and *T. subincanum* were rich in theacrine and flavones. *T. grandiflorum*, *T. bicolor* and *T. subincanum* beans generally had less phenolics than *T. cacao*. Roasting decreased the concentrations of methylxanthines and polyphenols in the beans. Roasted *T. grandiflorum and T. subincanum* beans had higher concentrations of pyrazines and esters than *T. cacao*. *T. grandiflorum* and *T. subincanum* beans had high flavor potential with more complex and richer sensory profiles than *T. cacao.* Overall, the underutilized *Theobroma* species have potential to be exploited to improve the nutritional and flavor quality of cocoa products.

Affiliations: School of Chemical Sciences, University of Auckland; Indonesian Coffee and Cocoa Research Institute (ICCRI

Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

P2

Meat consumption and consumer attitudes – a New Zealand perspective

Authors: **Carolina E. Realini**, T. Driver, R. Zhang, M. Guenther, S. Duff, C.R. Craigie, C. Saunders, M.M. Farouk

This study examined consumers' consumption, motivations, and concerns regarding meat and meat alternatives by means of an online survey of 1,061 New Zealand consumers conducted in December 2021. Survey results support New Zealanders are overwhelmingly omnivorous (93%), followed by vegetarians (4%), vegans (2%) and pescatarians (1%). Consumers regarded taste as the most important factor in their meat purchasing decision followed by price and freshness and considered environmental impact and social responsibility of less importance. Those surveyed indicated willingness to pay 17-24% more for food safety and sustainability related meat attributes. About half (47%) of respondents lowered their meat consumption the previous year, mainly red and processed meats, due to affordability and health concerns. Although those surveyed showed high awareness about meat alternatives (74%, 72%, 49% and 47% heard of meat like plant-based products, traditional plant-based products, cultured meat products and edible insect products, respectively), their consumption level of the products was very low (96%, 79% and 65% have never consumed edible insect products, meat like plant-based products and traditional plant-based products, respectively) compared to what is reported in other countries, and more prevalent for female, younger and more educated individuals. Overall, results confirm NZ consumers' positive attitude and attachment towards meat and given the complexity and paradoxical nature of the factors driving consumer meat consumption choices, meat reduction rather than elimination from food systems seems more plausible.

Affiliations: AgResearch Limited, Te Ohu Rangahau Kai, Massey University, Palmerston North; Agribusiness and Economics Research Unit, Lincoln University; AgResearch Limited, 1365 Springs Road, Lincoln

Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

P3

Impact of regenerative farming on meat quality

Authors: Mustafa M. Farouk, **Renyu Zhang,** Katherine Tozer, Tracy Baylis, R. Greenfield, Noby Jacob, Michael Agnew, Steven Howarth

This study tested the hypothesis that meat from regeneratively and conventionally finished cattle differ. Regenerative farming is characterised by lower synthetic fertiliser inputs which can lead to differences in pasture botanical composition, such as a lower perennial ryegrass content and higher legume content. Nine regenerative and conventional farms each in the North Island of New Zealand were paired by geographical location, and cattle finished on these farms were selected, paired by age, and processed at local abattoirs following standard protocols. The striploins from these cattle were collected and their attributes including pH, colour, intramuscular fat content (IMF), fatty acids profile, and fat-soluble vitamins were analyzed.

Most tests showed no significant difference ($P \geq 0.05$) between farm types but there were some insignificant trends ($P>0.05$) towards higher marbling and polyunsaturated fatty acid content in regeneratively finished cattle.

The findings of this study have some limitations and are preliminary. Further studies with more cattle and farms and with better control of the cattle selection, pairing and management is needed before any firm conclusion can be made regarding the advantage, if any, in the meat quality of one farming system over the other.

Affiliations: AgResearch; Grandad's Beef ; and AgFirst

Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

P4

Metagenomics Used to Characterise and Replicate Fish-gut Microbiome

Authors: **Callum Lambert,** Rebecca Edgar, Bikiran Pardesi, Alessandro Pisaniello, Roland Schaap, Millie Maddocks, Sam Stevenson, Lindsey White, Kendall Clements, Paul Rose

Seaweed is a plentiful resource off the coasts of New Zealand but is currently under-utilised. Herbivorous fish such as *Kyphosus sydneyanus* successfully break down seaweed through hindgut fermentation by a complex, primarily symbiotic bacterial gut microbiome. The MBIE Endeavour project "Bioconversion of Seaweed to High Value Products" involves the Callaghan Innovation Bioprocessing and Fermentation team to test the capacity of these microbial communities to degrade seaweed in vitro. The goal of this Endeavour project is to use a fermentation process to convert low-value seaweed into high-value products such as animal feed, fertiliser, and black soldier fly larvae feed. We sampled the microbial communities from three sections of the posterior intestine, grew them in our controlled bioreactor systems, and utilized bioinformatics to identify how bacterial community composition changed over the course of fermentation. We identified species of bacteria that increase in relative abundance in our bioreactors, indicating their importance for breaking down the seaweed in vitro. The distal hindgut community of wild fish consists of different phyla including a high proportion of *Bacteroidetes*. In our bioreactor studies we observed that *Firmicutes* initially dominate, followed by a steady increase in *Proteobacteria*, with very few *Bacteroidetes*. Further work will test different variables influencing community composition, with the aim of assembling a bespoke bacterial community tailored for commercial production of fermented seaweed products at scale.

Affiliations: Callaghan Innovation; University of Auckland; Auckland University of Technology

Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

P5

Rapid extraction of green shell mussel and fish flesh for high throughput lipid analysis.

Authors: **Dawn Scott**, Candice Gu, Kirill Lagutin and Andrew MacKenzie

Extraction of lipids from the various matrices encountered in the food industry can be time-consuming, expensive, and often require the use of specialised equipment and toxic solvents such as chloroform. These factors make the methods inappropriate for high throughput and factory settings.

The main goal of this study is to develop a simple, fast, and effective solvent system for lipid extraction in comparison to conventional methods containing chlorinated solvents. Six alternative solvent systems will be investigated. The method used for comparison will be an adapted Bligh and Dyer method (Svennerholm & Freeman, 1980).

This work presents the results of the six alternative one-pot lipid extraction methods from green shell mussel and fish flesh. The solvents investigated include ethanol, n-hexane, methyl-tert-butyl ether (MTBE), methanol, butanol, water and propan-2-ol or mixtures of these. Analysis such as the determination of lipid yield, fatty acid profiles, lipid classes and phospholipid profiles will be performed for comparison. The advantages and disadvantages of each of the methods will be presented.

Affiliations: Biotechnologies Group, Callaghan Innovation

Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

P6

Analysis of Trimethylamine N-oxide and Trimethylamine in marine oils by NMR

Authors: Kevin Mitchell, Andrew Lewis, Rosemary Webby, Candice Gu, and Andrew MacKenzie

In organisms that concentrate urea as an osmolyte and buoyancy factor, trimethylamine *N*-oxide (TMAO) has been shown to restore proteins to their native structure and is commonly found in a range of marine biota (Lidbury 2014 and Velasquez 2016). TMAO is formed from trimethylamine (TMA), which is generated by the action of gut microbiota. TMAO can also convert to TMA during post-mortem through biochemical and microbial reactions (Muzaddadi 2016) indicating spoilage. Determining the levels TMAO and TMA in marine products is of commercial interest, for example in krill oils. A range of methods for determination of these analytes have been developed, such as reaction with picric acid and steam distillation, through to more direct techniques, gas chromatography mass spectrometry (GCMS), liquid chromatography mass spectrometry (LCMS).

We have been developing a quantitative nuclear magnetic resonance (qNMR) technique that is both robust and relatively straightforward for analyses of TMA and TMAO in various marine samples. The initial method was based on proton (^{1}H) NMR method for analysis of methyl amine metabolites in urine (Lee et al. 2006). We have significantly adapted this method and have employed dimethyl sulphone as the internal qNMR standard.

The method developed is based on a one dimensional ^{1}H NMR approach so specificity can be an issue. We are exploring other NMR techniques to increase the method's specificity and will present our initial work.

Affiliations: Biotechnologies Group, Callaghan Innovation

Collaboration
Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

P7

Rapid inactivation of Listeria monocytogenes on apples and salmon using Pulsed UV light

Authors: **Sravani Gupta**, Kathiravan Krishnamurthy, Roland Taylor, Graham C. Fletcher and Mohammed M. Farid

Illness outbreaks from food contaminated with pathogenic bacteria are common, causing health impacts, economic losses, market access issues and loss of public trust in food producers. *Listeria monocytogenes* is of particular concern to Aotearoa's food industry. Current industry best-practice for *L. monocytogenes* control depends on decontamination using chemical sanitisers or conventional (e.g. thermal) processing. These methods have limitations, including chemical leaching, waste disposal, and compromised efficacy under heavy organic loads. Consumers desire minimally processed foods with natural-like characteristics that still offer assured safety. Non-thermal processing technologies such as Pulsed UV light (PL) are emerging for *Listeria* control and can potentially provide closer-to-natural flavour/textural characteristics. PL employs photo-chemical, photo-physical, and photo-thermal mechanisms to inactivate bacteria. PL processing using a Xenon X-1100 was tested against cocktails of six strains of *L. monocytogenes* isolated from horticultural and seafood processing environments, inoculated onto apples and salmon respectively. We monitored process-related heating-cooling effects on the surface and just below the skin during treatment. These differed for apples and salmon. PL treatment at 0.2 Hz for 5, 10, and 25 s with different energy exposures caused rapid inactivation of *L. monocytogenes.* Inactivation (log CFU/sample) increased with increasing energy and time for apples: at both 5 s and 10 s processing time, for higher energy exposures, more than 5-log reduction (5.31 and 5.46 respectively) of *L. monocytogenes* was observed. For salmon under the same conditions, log reduction values were significantly lower on flesh (0.780 and 0.578) and skin surfaces (0.954 and 0.728), respectively.

Affiliations: The New Zealand Institute for Plant and Food Research Limited, Auckland; Illinois Institute of Technology, Chicago, USA; University of Auckland.

Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua

P8

Pasture-Raised Beef, Grain-Finished Beef, and a Plant-Based Meat Alternative: A comparison of protein and lipid digestion

Authors: **Lovedeep Kaur,** Amrutha Elamurugan, Feng Ming Chian, Xianqian Zhu, and Mike Boland

The study determined the protein digestibility and free fatty acid release for a commercially available plant-based meat alternative and two types of meat cuts from both grain-finished and pasture-raised animals using an *in vitro* digestion system. In terms of protein digestion, no substantial differences could be observed between the pasture-raised and grain-finished cuts of meat. On the other hand, the plant-based meat substitute performed relatively poorly in protein digestion experiments, probably due to digestion-resistant protein aggregates that had been likely formed during manufacture. The total amounts of free saturated (SFAs) and mono-unsaturated (MUFAs) fatty acids were higher in the plant-based meat alternative followed by grain-finished meat samples. The pasture-raised meat digests from both striploin and tenderloin contained significantly higher amounts of free long-chain n-3 fatty acids (particularly EPA and DPA) which have been extensively studied for their beneficial health effects.

Affiliations: School of Food and Advanced Technology & Riddet Institute, Massey University, Palmerston North

Collaboration Building New Zealand Inc.
NZIFST Conference 2022
5 - 7 July, Rotorua