

# 58TH ANNUAL CONFERENCE 2024



## **KOTAHITANGA: BRIDGING RESEARCH, INDUSTRY, AND PRACTICE**



**NOVEMBER 28 & 29, 2024**

The University of Otago Campus

Christchurch, New Zealand



# Welcome, Tēnā koutou, tēnā koutou, tēnā koutou katoa!

It is my pleasure to welcome you to the Nutrition Society of New Zealand 2024 Annual Conference and to Christchurch!

We are proud to host the conference in our vibrant garden city that offers culture and heritage with nature right on its doorstep. This is the first time the conference will be held in Christchurch since 2016; take the opportunity to come and savour its offerings. If you have not visited for some time, come and see how the city has changed. If you are a local, enjoy sharing our beautiful city with our visitors.

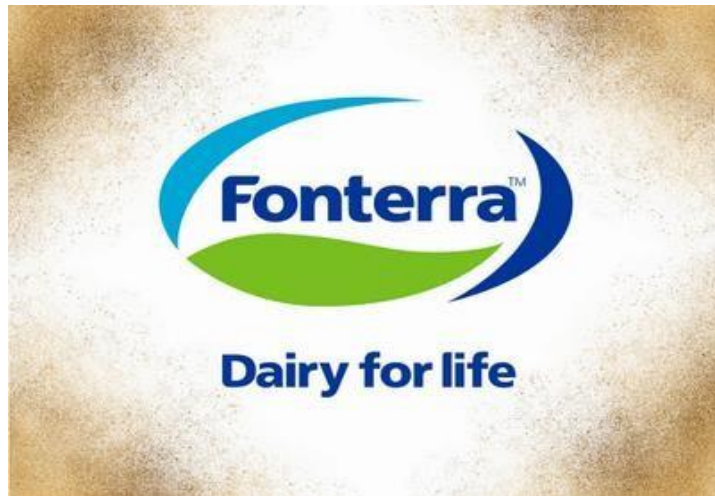
With the theme Kotahitanga: Bridging Research, Industry, and Practice, the conference will provide a wonderful opportunity to connect, network and find out about the exciting work and research being conducted by our nutrition community. The programme will cover a range of topics relevant not only to Aotearoa New Zealand but also globally, including gut health, infant and toddler's health, brain health, policy and action, sustainability, nutrition communication, and nutrition and ageing. Moreover, attendees have an opportunity to select from a range of practical workshops on a wide range of topics of interest to both academics and practicing nutritionists.

Working in nutrition is just as much about connecting and networking with others as it is about knowledge and understanding.

Thank you all for supporting this event, and special thanks to all the amazing volunteers who have made it possible. I look forward to seeing you at the conference!

Dr Maria Choukri  
Organising Committee Chair, Nutrition Society of New Zealand  
2024 Annual Conference

# *Thank you to our sponsors*



# Naturally, Nutritious



Vitamin B2 — Vitamin B12  
Vitamin A — Potassium  
Protein — Calcium

At Fonterra, we believe milk is a superfood from nature, and an important part of a balanced diet.

With a bundle of more than 10 essential nutrients, bioactives and a unique matrix, milk contains nutrition that is hard to match.

Look out for our display at the conference to find out more, enter our prize draw and enjoy our tasty products.



**Learn more about our nutritious dairy at [Fonterra.com](https://Fonterra.com)**



# Table of Contents

Welcome from Chair.....	2
Conference Team .....	6
WIFI Access.....	7
Vevox - Q and A.....	8
Programme 2024.....	9
Posters.....	14
<b>Events</b>	
Ōtākaro Orchard Tour.....	15
Student and Early Career Event .....	16
Social Event .....	17
<b>Speakers</b>	
Muriel Bell Lecture.....	18
Invited Speakers .....	19
Workshops .....	20
<b>Abstracts</b> .....	22
Plenary 1 Bridging Research Industry and Practice .....	23
Plenary 2: Gut Health.....	28
Plenary 3: Infant & Toddler Nutrition and Early Career .....	31
A1: Global nutrition and emergency preparedness .....	36
Plenary 4 Brain Health .....	41
Plenary 5: Nutrition and diseases of ageing.....	46
Plenary 6: Health and Behavioural insights in Māori, Pacific and Asian populations in Aotearoa.....	51
A3: Food surveillance to inform policy .....	54
A4 Breastmilk and breastmilk substitutes .....	57
A5: Impact of diet on NCD risk factors.....	59
A6 Bioactives.....	62
Posters.....	65

## Organising Committee

Maria Choukri (Chair);  
Khai Mardon  
Tania Vincent  
Antonia Luthi  
Kitty McClurg  
Elisa Weiss  
Beyning Tey  
Becky Ward  
Heather McCormick  
Kathryn Sinclair

## Sponsorship Committee

Luke Stanaway  
Priscilla Thoms  
Claudia Leong

## Student and Early Career Researcher Committee

Jen Gale  
Kate Campbell  
Sera Mulholland

## Scientific and Programme Committee

Pam von Hurst  
Claire Smith (Editor)  
Joanne Todd  
Michelle Gibbs  
Sheena Hendon  
Sherly Parackal

The committee would like to thank Chrissie Butts (Treasurer, Nutrition Society Council) and Tessa Scott (Nutrition Society Council, Admin) for their support.

In addition, all the volunteers who reviewed abstracts, the session chairs and those who are judging presentations and posters.

## WIFI Access

### University of Otago Guest

If you are visiting the University of Otago and only require Internet access you can use the UO\_Guest network.

How to access the UO\_Guest network:

1. Select the UO\_Guest network from the list of available networks on your device
2. Please log in if you have already created an account, otherwise follow the prompts to create one. When you create an account the login details are displayed on screen. We recommend you jot these down or take a snapshot for your reference.
3. An email with your login details will be sent to the email address you supply

A UO\_Guest account provides access to the internet for up to:

- 31 days
- 5GB data per day
- two devices at a time

Your UO\_Guest account expires after either the two weeks from creation or seven consecutive days of no activity. You can then create a new one if needed.

<https://www.otago.ac.nz/its/services/network-services/visitor-network-access>



Ask questions to speakers and the conference using the Vevox App.

Use on mobile phone or laptop.

<https://vevox.app/#/m/129173452>

Session ID: 129-173-452




**Select the Q & A**



## Programme 2024


Rāapa 27 Whiringa-ā-rangi - Wednesday 27th November 2024, <b>PRE-CONFERENCE</b>		
4:00 pm	<b>Registration</b>	
Session	<b>Pre-conference events</b>	
Evening	<b>5:30 pm Student &amp; Early Career Nutritionists Evening</b> <i>Papa Hou @the_kind_foundation</i>	<b>5:00 pm Tour of Ōtākaro Orchard: an urban food hub</b> <i>Meet at conference venue</i>
Rāpare 28 Whiringa-ā-rangi, RĀ TUATAHI - Thursday 28th November 2024, <b>DAY ONE</b>		
7:30 am	🍷 <b>Registration &amp; tea and coffee</b> <i>Sponsored by Sanitarium, Rolleston Foyer</i>	
Session	<b>He Mihi Whakatau - Welcome and Opening Plenary</b> <i>Rolleston Lecture theatre</i>	
8:15 - 10:30	<p>He Mihi Whakatau - Welcome</p> <p><b>Plenary 1: Bridging research, industry and practice</b>  <b>Prof Jeremy Krebs (Wellington Hospital, University of Otago)</b>            He Rourou Whai Painga; A collaborative community based research partnership testing the impact of a New Zealand Mediterranean dietary pattern on cardiometabolic health and wellbeing</p> <p><b>Cherise Pendergrast (PhD candidate, Massey University)</b>            ‘What helps to eat well?’ Self-perceived strengths to support people in improving their dietary habits</p> <p><b>Prof Cliona Ni Mhurchu (The University of Auckland)</b>            Effects of a tailored programme to support food companies to reform nutrition policies and practices (REFORM): a multi-centre cluster-randomised controlled trial</p> <p><b>Raquel Lozano (Sustainable Nutrition Initiative)</b>            Development of a national food system mathematical model for exploring future scenarios and impacts</p>	
10:30 -11:00	🍷 <b>Paramanawa - Morning refreshments</b> <i>Sponsored by The Crafty Weka Bar, Rolleston Foyer</i>	
Session	<b>Plenary 2: Gut Health,</b> <i>Rolleston theatre, ground floor</i>	<b>Plenary 3: Infant &amp; Toddler Nutrition</b> <i>Beaven theatre, 7th Floor</i>
11:00 - 12:30	<p><b>Dr Catherine Wall (University of Otago)</b>            Gut Health: Translating diet and gut microbiota research into practice</p> <p><b>Dr Bobbi Laing (The University of Auckland)</b> The Aotearoa Women’s Wellness Program for Irritable Bowel Syndrome</p> <p><b>Vitor Geniseli da Silva (Riddet Institute)</b>            Complementary foods modulate the colonic microbiota of NZ weaning infants: an in vitro study</p>	<p><b>Michelle Gibbs (New Zealand Food Safety)</b>            From research to food safety policy</p> <p><b>Dr Maria Casale (Massey University)</b>            Iron status of Māori, Pacific and other infants in Aotearoa New Zealand</p> <p><b>Dr Sally Mackay (The University of Auckland)</b>            Composition, nutrition and marketing claims are prolific on packaging of infant and toddler foods</p> <p><b>Meiliana Meiliana (University of Auckland)</b>            Minimum Reporting Set of nutritional intake and growth outcomes in preterm nutrition studies: A Delphi study.</p> <p><b>Amie Gooding (University of Otago)</b>            A qualitative investigation into the essential knowledge and skills for early career nutritionists in New Zealand</p>

# Programme 2024


Rāpare 28 Whiringa-ā-rangi, RĀ TUATAHI - Thursday 28th November 2024, <b>DAY ONE</b> cont'd		
12:30 -1:30	 <b>Pouputanga o te rā - Lunch</b> sponsored by Beef & Lamb, Rolleston Foyer, ground floor <b>Posters*</b> Beaven Foyer, 7th Floor	
Session	<b>Abstracts &amp; Workshops</b>	
1:30 - 3:00	<b>A1: Global nutrition and emergency preparedness, Rolleston Lecture theatre</b>	<b>Workshop 1: Noticing red flags in endurance sports nutrition, Room 704</b>
	<p><b>a. Sujirtha Vishnukumar (Massey University)</b> From gardens to plates: household food production fuels dietary diversity for women and children in rural Sri Lanka</p> <p><b>b. Ejovi Abafe (Sustainable Nutrition Initiative)</b> Improving nutritional outcomes through crop selection and land suitability: global iron and zinc deficiencies</p> <p><b>c. Raquel Lozano (Sustainable Nutrition Initiative)</b> Strategies for closing global nutrient gaps: enhancing distribution and supply</p> <p><b>d. Justine Coomson (Sustainable Nutrition Initiative)</b> Contribution of large-scale food fortification to micronutrient requirements of women of reproductive age in Sub-Saharan Africa</p> <p><b>e. Mary Yan (Unitec Institute of Technology)</b> Development of emergency food formulation with mainly New Zealand ingredients for disaster preparedness</p>	<p>Workshop Leads: Hannah Alexander, University of Otago, Juliet Slattery, Ara Institute of Canterbury</p> <p>This workshop will highlight common and less common mistakes or red flags seen in endurance athletes that may not be easily identified. There will be a focus on carbohydrate and fuelling requirements, and participants will work in groups to identify issues in different case studies and possible solutions to the issues. Participants will gain knowledge on a variety of different fuelling issues for athletes and possible solutions, or when specialised referral may be necessary.</p> <p><i>Sign up via Gecco</i></p>
	<b>Workshop 2: Codesign in action, Room 702/703</b>	<b>Workshop 3: From Global Policy to Local Action: Upskill in advocacy, Beaven lecture theatre</b>
	<p>Workshop Leads: Dr Sherly Parackal, University of Otago, and Cherise Pendergast, Massey University</p> <p>This workshop will answer the ‘what’, ‘why’, ‘how’ and ‘where’ of co-design using two case studies, of an ethnic specific health promoting intervention in NZ South Asians, and a food literacy assessment checklist for use in community health support services. Participants will co-design their own resource to improve vegetable consumption in their chosen community, identifying potential stakeholders for consultation and contributing factors to consider ahead of implementation.</p> <p><i>Sign up via Gecco</i></p>	<p>Workshop Leads: Michelle Gibbs &amp; Evelyn Mete, NZ Food Safety MPI, Donnell Alexander, Food and Grocery Council, Frances Arenhold, Heart Foundation.</p> <p>This workshop will provide information about the food regulatory system, and participants will take on the role of a key stakeholder group to work through a topical case study on the formulation of foods with protein from non-animal sources. Participants will identify the preferred policy option for their stakeholder group, and through facilitated discussions agree on an approach that best meets the needs of different stakeholders. This will increase knowledge on the policy setting process, and confidence in advocacy and negotiation skills.</p> <p><i>Sign up via Gecco</i></p>

He Wātaka 2024

## Programme 2024

3:00 - 3:30	 <b>Paramanawa - Afternoon refreshments, Rolleston foyer</b>
-------------	---

Rāpare 28 Whiringa-ā-rangi, RĀ TUATAHI - Thursday 28th November 2024, <b>DAY ONE</b> cont'd			
Session	<b>Plenary 4: Brain Health, Rolleston lecture theatre</b>		
3:30 - 4:15	<b>Assoc Professor Fiona Lithander (Liggins Institute)</b> Parkinson's disease is one of the world's fastest growing neurological conditions; does nutrition play a role?		
Session	<table border="1"> <tr> <td><b>Panel: Communicating with impact, Rolleston lecture theatre</b></td> <td><b>A2 Food in education settings Beaven lecture theatre</b></td> </tr> </table>	<b>Panel: Communicating with impact, Rolleston lecture theatre</b>	<b>A2 Food in education settings Beaven lecture theatre</b>
<b>Panel: Communicating with impact, Rolleston lecture theatre</b>	<b>A2 Food in education settings Beaven lecture theatre</b>		
4:20 - 5:20	<table border="1"> <tr> <td> <p>Panel session with: Julie North, FoodCom; Conrad Greenhew, Dietitian; Daniel Walker, Science Media Centre; Joanne Todd, FoodBiz Consultancy Chair: Donnell Alexander, Food &amp; Grocery Council</p> <p>Whether you're looking for tips on getting your research into media, fighting nutrition misinformation, working with industry, or engaging clients through social media, this panel will have something for everyone. Come along with your questions for what will be an informative interactive session.</p> </td> <td> <p><b>a. Andrea Grant (National Public Health Service)</b> Keeping our noses out of the lunchbox - supporting positive kai environments in education settings</p> <p><b>b. Frances Arenhold (Heart Foundation)</b> Paying it forward- Tohu Manawa Ora   Healthy Heart Award makes an investment in tamariki and early learning environments</p> <p><b>c. Zahrah Hatraby (University of Otago)</b> Food waste and the Ka Ora, Ka Ako school lunch programme</p> <p><b>d. Briar Mills (University of Otago)</b> Food waste at residential colleges at the University of Otago - statistics and strategies.</p> </td> </tr> </table>	<p>Panel session with: Julie North, FoodCom; Conrad Greenhew, Dietitian; Daniel Walker, Science Media Centre; Joanne Todd, FoodBiz Consultancy Chair: Donnell Alexander, Food &amp; Grocery Council</p> <p>Whether you're looking for tips on getting your research into media, fighting nutrition misinformation, working with industry, or engaging clients through social media, this panel will have something for everyone. Come along with your questions for what will be an informative interactive session.</p>	<p><b>a. Andrea Grant (National Public Health Service)</b> Keeping our noses out of the lunchbox - supporting positive kai environments in education settings</p> <p><b>b. Frances Arenhold (Heart Foundation)</b> Paying it forward- Tohu Manawa Ora   Healthy Heart Award makes an investment in tamariki and early learning environments</p> <p><b>c. Zahrah Hatraby (University of Otago)</b> Food waste and the Ka Ora, Ka Ako school lunch programme</p> <p><b>d. Briar Mills (University of Otago)</b> Food waste at residential colleges at the University of Otago - statistics and strategies.</p>
<p>Panel session with: Julie North, FoodCom; Conrad Greenhew, Dietitian; Daniel Walker, Science Media Centre; Joanne Todd, FoodBiz Consultancy Chair: Donnell Alexander, Food &amp; Grocery Council</p> <p>Whether you're looking for tips on getting your research into media, fighting nutrition misinformation, working with industry, or engaging clients through social media, this panel will have something for everyone. Come along with your questions for what will be an informative interactive session.</p>	<p><b>a. Andrea Grant (National Public Health Service)</b> Keeping our noses out of the lunchbox - supporting positive kai environments in education settings</p> <p><b>b. Frances Arenhold (Heart Foundation)</b> Paying it forward- Tohu Manawa Ora   Healthy Heart Award makes an investment in tamariki and early learning environments</p> <p><b>c. Zahrah Hatraby (University of Otago)</b> Food waste and the Ka Ora, Ka Ako school lunch programme</p> <p><b>d. Briar Mills (University of Otago)</b> Food waste at residential colleges at the University of Otago - statistics and strategies.</p>		
Session	<b>Muriel Bell Lecture, Rolleston lecture theatre</b>		
5:30	<b>Prof Pamela von Hurst</b> An unconventional career		
6:30	<b>Conference social at Cascade Bar and Courtyard</b>		

Rāmere 29 Whiringa-ā-rangi, RĀ TUARUA - FRIDAY 29th November 2024, DAY TWO		
Session	<b>Plenary 5: Nutrition and diseases of ageing, Rolleston lecture theatre</b>	
8:30 - 10:30	<p><b>Prof Robin Daly (Deakin University, Melbourne)</b> Muscle Health Matters - Navigating the Landscape of Sarcopenia from Diagnosis to Management</p> <p><b>Dr Meredith Peddie (University of Otago)</b> Micronutrient intakes of former New Zealand representative athletes over the age of 60 years</p> <p><b>Ms Charlotte Mawson (Fonterra Cooperative Group)</b> Palatability, absorption, compliance and usability of ready-to-drink compact ONS formulation containing functional dairy proteins: Programme of Research</p> <p><b>Danielle Oakes (Massey University)</b> Malnutrition risk, nutrition impact symptoms, and dietary intake in community living head and neck cancer survivors 6 months to 3 years post treatment: a case series</p> <p><b>Xue Patricia Soh (Sustainable Nutrition Initiative)</b> Assessment of protein intake and protein quality among New Zealand vegans</p>	
10:30 - 11:00	 <b>Paramanawa - Morning refreshments, Rolleston foyer</b>	
Session	<b>Plenary 6: Health and behavioural insights in Māori, Pacific and Asian populations in Aotearoa, Rolleston lecture theatre</b>	
11:00 - 12:10	<p><b>Mafi Funaki-Tahifote, NZRD, MBA</b> Pacific nutrition and dietetic practice in Aotearoa, New Zealand - bridging for healthier outcomes</p> <p><b>Dr Sherly Parackal (University of Otago)</b> Dietary beliefs, knowledge and behaviour of NZ South Asians at risk for cardiovascular disease.</p> <p><b>Julia Edmonds (New Zealand Food Safety)</b> NZFS Consumer Food Safety Insights Survey 2023 - highlights and reflections using Te Whare Tapa Whāi</p>	
Session	<b>A3: Food surveillance to inform policy, Rolleston lecture theatre</b>	<b>A4: Breastmilk and breastmilk substitutes, Beaven lecture theatre</b>
12:15 - 1:00	<p><b>a. Caitlin Haliburton (University of Auckland)</b> Child-appealing marketing on packaged food in NZ, and considerations for policy design</p> <p><b>b. Rebecca Doonan (NZFS) &amp; Kathryn Bradbury (University of Auckland)</b> Trans fatty acid in the New Zealand Food Supply: A targeted survey to inform policy in NZ</p> <p><b>c. Gabriela Lopes da Cruz (University of São Paulo)</b> Application of the Nova food classification system to a large national dataset of household food purchases in Aotearoa New Zealand</p>	<p><b>Dr Lisa Daniels (University of Otago)</b> Human breast milk</p> <p><b>Bridget Bourke (FSANZ)</b> Regulating human identical milk oligosaccharides in infant formula products</p>
1:00 - 1:45	<p><b>Poupoutanga o te rā - Lunch Rolleston foyer</b></p>	

He Wātaka 2024

## Programme 2024

Rāmere 29 Whiringa-ā-rangi, RĀ TUARUA - FRIDAY 29th November 2024, DAY TWO cont'd		
Session	<b>A5: Impact of diet on NCD risk factors,</b> <i>Rolleston lecture theatre</i>	<b>A6 Bioactives,</b> <i>Beaven lecture theatre</i>
1:45 - 2:30	<p><b>a. Helen Eyles (University of Auckland)</b> The sodium, potassium, and iodine intake, and blood pressure of NZ school children</p> <p><b>b. Maher Fuad (Fonterra Cooperative Group)</b> The use of MFGM in lowering blood lipid levels in adults: results from a meta-analysis of RCTs</p> <p><b>c. Fajer Ismael (University of Auckland)</b> Diet pattern high in refined food, sugar, sodium and fat is associated with child excess adiposity at 4.5 years within a NZ birth cohort</p>	<p><b>a. Prishanthini Muthulingam (Massey University)</b> The role of oxidative reactions in key bioactive compound transformations during black tea manufacture</p> <p><b>b. Kaushala Weerasinghe (Massey University)</b> Exploring nutritional composition and bioactive properties of <i>Gymnema lactiferum</i> (Ceylon cow plant) for food applications</p> <p><b>c. Sheba Culas (Massey University)</b> The effect of maturity stage on bioactive properties of Ceylon cinnamon bark extracts</p>
Session	<b>Workshop 4: The Non-Diet Approach: Practical Applications in Clinic,</b> <i>Rolleston theatre,</i>	<b>Workshop 5: Coeliac disease - navigating a gluten-free diet for your clients,</b> <i>Room 704</i>
2:30 - 4:00	<p>Workshop Lead: Dr Maria Casale, NZRD, Massey University</p> <p>This workshop will briefly cover the non-diet approach and practical tools for working with clients. Participants will explore mindful eating, strategies for non-hungry eating, and more. They will learn to apply these tools using motivational interviewing and identify eating disorder red flags. A toolkit for practice will be provided.</p>	<p>Workshop Lead: Suzanne Aitken, Coeliac NZ Ltd</p> <p>This workshop will outline the medical aspects of coeliac disease, and focus on how to ensure a nutritionally balanced gluten-free diet. Participants will experience 'The Buddy Shopper' experience, which helps navigate the supermarket environment to identify gluten within NZ food products, and to shop safely. Participants will gain increased knowledge and confidence to support their gluten free clients to adequately cater to their dietary requirements.</p> <p><i>Sign up via Gecco</i></p>
	<b>Workshop 6: From Food Insecurity to Food Security and Resilience – the role of a nutritionist,</b> <i>Beaven lecture theatre</i>	<b>Workshop 7: Dietary Shift and Paradigm Shift (and Paradigm Return),</b> <i>Room 702/3</i>
	<p>Workshop Lead: Bek Parry, Te Whatu Ora - National Public Health Service</p> <p>This workshop will overview the food system, discuss necessary changes for a more secure environment, and highlight the role of nutritionists. Participants will learn how they can contribute to a changing food system by understanding its complexities and interconnectedness</p> <p><i>Sign up via Gecco</i></p>	<p>Workshop Leads: Ying Xia, Suliving Ltd</p> <p>This workshop introduces the principles behind the Pure Diet (Oriental Vegan), and through a series of interactive conversations will guide participants to an understanding of the ancient wisdom behind this dietary paradigm. Participants will gain a fresh perspective on an Oriental paradigm that offers a unique set of knowledge, values and beliefs unfamiliar to many in a Western environment.</p> <p>Sign up via Gecco</p>
4:00 - 4:30	<b>Prizegiving &amp; conference close</b> <i>Sponsored by Fonterra, Rolleston lecture theatre</i>	



*On display near the Beaven Lecture Theatre, 7th Floor  
Abstracts Page*

- 1 Sarah Morrison (Plant and Food Research)**  
Identifying major sources of FODMAPs in the New Zealand diet
- 2 Elisa Weiss (The University of Auckland)**  
The impact of high-fat, high-sugar parental diet on offspring metabolic health: Initial parental and offspring phenotype in a rat model
- 3 Helen Gibbs (Diet Consulting)**  
Pragmatic intervention using milk fortified with whey protein concentrate to increase protein intake to promote wound healing – initial case series.
- 4 Suci Hermita (Liggins Institute)**  
Kawakawa and Its Antidiabetic Effects: A Mechanistic Approach
- 5 Syed Ubaid Shah (Massey University)**  
Exploring sustainable protein sources: Enhancing the nutritional profile of lucerne (*Medicago sativa*) and red clover (*Trifolium pratense*) seeds via fermentation
- 6 Sujirtha Vishnukumar (Massey University)**  
Exploring the link between home gardens and nutritional outcomes in rural Sri Lanka
- 7 Dilushi Polegodage (Massey University)**  
The effect of nutrient content on the antimicrobial efficacy of nisin and lysozyme to control *Listeria monocytogenes* in the food industry
- 8 Zichun Hau (Otago University)**  
The effect of the provision of foods high in healthy fats or dietary fibre on sodium and potassium intakes in a Post-Coronary event population
- 9 Md Faruk Ahmed (Massey University)**  
Extraction and Encapsulation of Phenolic Compounds from New Zealand Macadamia Husk: A Novel Approach for Oral Delivery of its Bioactive Compounds



# Ōtākaro Orchard Tour

We're thrilled to invite all 2024 Nutrition Society of New Zealand Scientific Conference attendees to join us on Wednesday, November 27, for a special tour of Ōtākaro Orchard!

Starting at 5 pm from the conference venue, we'll take a scenic walk along the Ōtākaro | Avon River to the Orchard, a vibrant community-led food hub right in the heart of Ōtautahi Christchurch.

This unique urban food forest and community garden is a testament to the dedication and vision of Ōtautahi's food security advocates.

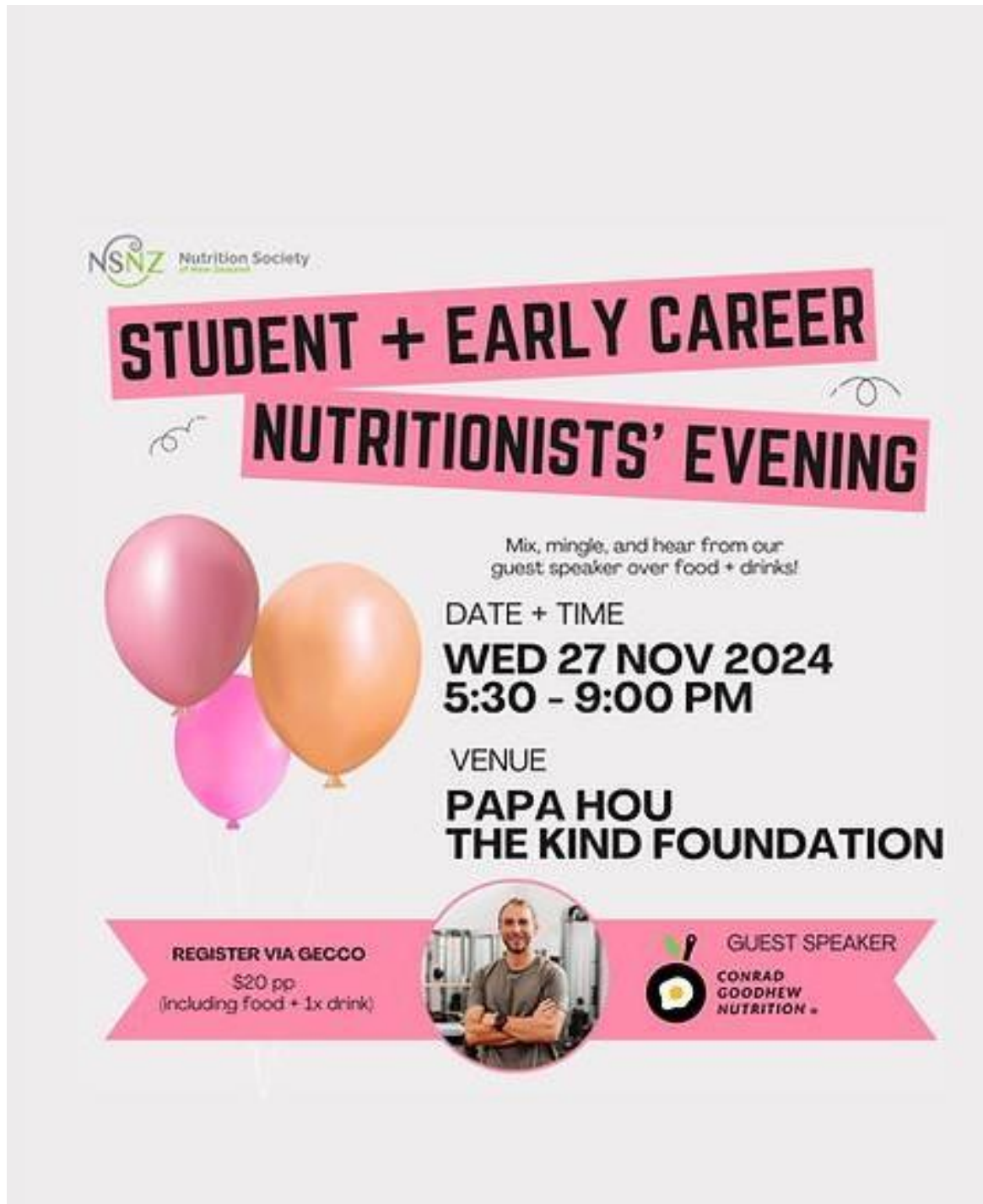
When completed, Ōtākaro Orchard will feature a learning centre, outdoor amphitheater, public food forest, and more — a living legacy for food resilience and sustainability.

The Orchard's caretaker will guide us through this inspiring space and share its incredible journey! A small koha toward their final milestone would be greatly appreciated.

[Learn more: www.otakaroorchard.org](http://www.otakaroorchard.org)



# Student and Early Career Event



**NSNZ** Nutrition Society


## STUDENT + EARLY CAREER NUTRITIONISTS' EVENING

Mix, mingle, and hear from our guest speaker over food + drinks!

DATE + TIME  
**WED 27 NOV 2024**  
**5:30 - 9:00 PM**

VENUE  
**PAPA HOU**  
**THE KIND FOUNDATION**

**REGISTER VIA GECCO**  
\$20 pp  
(including food + 1x drink)



**GUEST SPEAKER**  
**CONRAD**  
**GODDEW**  
**NUTRITION**



## Social Event



Live Music by the talented @caitlinmusicc, bringing her signature alt-pop sound. Joining us at the social night is a New Zealand singer-songwriter, Caitlin Bradley (CAITLIN), who makes a mark on the alternative music scene. Caitlin is known for her skilful lyricism, infectious energy, and her ability to win over audiences with captivating performances. If you haven't had the pleasure of hearing Caitlin Bradley perform, you're in for a treat! With her soulful sound and captivating performances, Caitlin's music creates the perfect backdrop for an evening of relaxation and connection.

## Muriel Bell Lecture

The Muriel Bell Lecture is named in honour of Dr. Muriel Bell, a pioneering nutritionist and public health advocate in New Zealand. Dr. Bell was instrumental in advancing nutrition science and improving public health policies throughout her career. In recognition of her significant contributions, the lecture series was established to celebrate her legacy. Each year, a distinguished individual who has made outstanding contributions to nutrition or related sciences is selected to deliver the Muriel Bell Lecture, sharing insights and advancements in the field of nutrition

---

### An Unconventional Career

Professor Pamela von Hurst  
Thursday 5:30pm, Rolleston Lecture  
Theatre



Pamela von Hurst (PhD) is Professor Emerita in the College of Health, Massey University. She recently retired from a full time position as Professor of Human Nutrition. Pam is the immediate past-president of the Nutrition Society of New Zealand, and until recently was the New Zealand representative for the International Union of Nutritional Sciences (IUNS). She is the Honorary Secretary for the Federation of Oceanic Nutrition Societies and serves on the Registration Panel for the Nutrition Society of New Zealand.

Although Pam's largest and most well-known body of work has been in the role of vitamin D in health and disease, she has wide research interests including bone health and nutrition throughout the life cycle. She has taught undergraduate and postgraduate nutrition at Massey University during her career, supervising over 70 postgraduate students to thesis completion. Pam was the recipient of the Massey University Research Award – Supervisor 2024.

Ever since her mid-life career change, from marketing and business management to academia, Pam has been driven (and frustrated) in her quest to make evidence-based nutrition information available to the general public. She has run multiple symposia for health professionals and practitioners, spoken to many special interest groups, given radio interviews and provided webinars, while encouraging colleagues to do the same. Her Muriel Bell lecture will address the issues of achieving impact from research, specifically in human nutrition and the push-back from the multitude of social media "experts".



## Invited Speakers

UNIVERSITY OF OTAGO  
PROFESSOR  
JEREMY KREBS



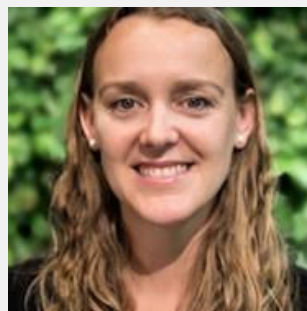
UNIVERSITY OF OTAGO  
DR CATHERINE  
WALL

DEAKIN UNIVERSITY  
PROFESSOR  
ROBIN DALY



REGISTERED DIETITIAN  
MAFI FUNAKI-  
TAHIFOTE

THE UNIVERSITY OF  
AUCKLAND  
DR FIONA  
LITHANDER



UNIVERSITY OF OTAGO  
DR LISA  
DANIELS



NZ FOOD SAFETY  
MPI  
MICHELLE  
GIBBS

<https://www.nsnzconference.co.nz/programme-speakers>

## Workshops

### **Workshop 1: Noticing red flags in endurance sports nutrition**

Workshop Leads: Hannah Alexander, University of Otago, Juliet Slattery, Ara Institute of Canterbury

This workshop will highlight common and less common mistakes or red flags seen in endurance athletes that may not be easily identified. There will be a focus on carbohydrate and fueling requirements, and participants will work in groups to identify issues in different case studies and possible solutions to the issues. Participants will gain knowledge on a variety of different fueling issues for athletes and possible solutions, or when specialised referral may be necessary.

### **Workshop 2: Codesign in action**

Workshop Leads: Dr Sherly Parackal, University of Otago, and Cherise Pendergast, Massey University

This workshop will answer the 'what', 'why', 'how' and 'where' of co-design using two case studies, of an ethnic specific health promoting intervention in NZ South Asians, and a food literacy assessment checklist for use in community health support services. Participants will co-design their own resource to improve vegetable consumption in their chosen community, identifying potential stakeholders for consultation and contributing factors to consider ahead of implementation.

### **Workshop 3: From Global Policy to Local Action: Upskill in advocacy**

Workshop Leads: Michelle Gibbs & Evelyn Mete, NZ Food Safety MPI, Donnell Alexander, Food and Grocery Council, Frances Arenhold, Heart Foundation.

This workshop will provide information about the food regulatory system, and participants will take on the role of a key stakeholder group to work through a topical case study on the formulation of foods with protein from non-animal sources. Participants will identify the preferred policy option for their stakeholder group, and through facilitated discussions agree on an approach that best meets the needs of different stakeholders. This will increase knowledge on the policy setting process, and confidence in advocacy and negotiation skills.

### **Workshop 4: The Non-Diet Approach: Practical Applications in Clinic**

Workshop Lead: Dr Maria Casale, NZRD, Massey University

This workshop will provide a brief overview of the non-diet approach to working with clients, and focus on the practical tools that can be used. Participants will experience tools and activities such as mindful eating, strategies to help with non-hungry eating, and more. Participants will gain knowledge on how to apply a range of tools through a lens of motivational interviewing, as well as on how to identify red flags for eating disorders. Participants will be provided with a toolkit that can be used in their own practice.

## Workshops (cont.)

### **Workshop 5: Coeliac disease - navigating a gluten-free diet for your clients**

Workshop Lead: Suzanne Aitken, Coeliac NZ Ltd

This workshop will outline the medical aspects of coeliac disease, and focus on how to ensure a nutritionally balanced gluten-free diet. Participants will experience 'The Buddy Shopper' experience, which helps navigate the supermarket environment to identify gluten within NZ food products, and to shop safely. Participants will gain increased knowledge and confidence to support their gluten free clients to adequately cater to their dietary requirements.

### **Workshop 6: From Food Insecurity to Food Security and Resilience – the role of a nutritionist**

Workshop Lead: Bek Parry, Te Whatu Ora – National Public Health Service

This workshop will provide an overview of the food system and discuss what changes are needed nationally and globally to activate change and the creation of a more food secure environment, specifically focusing on the role of a nutritionist in this space. Participants will be challenged to understand how they can contribute to a changing food system, through understanding the complexities and interconnectedness of the system and how nutritionists in all fields should contribute to the conversation.

### **Workshop 7: Dietary Shift and Paradigm Shift (and Paradigm Return)**

Workshop Leads: Ying Xia, Suliving Ltd

This workshop introduces the principles behind the Pure Diet (Oriental Vegan), and through a series of interactive conversations will guide participants to an understanding of the ancient wisdom behind this dietary paradigm. Participants will gain a fresh perspective on an Oriental paradigm that offers a unique set of knowledge, values and beliefs unfamiliar to many in a Western environment.

## Abstracts



Photo by Odiseo Castrejon on Unsplash

# Plenary 1 Bridging Research Industry and Practice

## **He Rourou Whai Painga; A collaborative community based research partnership testing the impact of a New Zealand Mediterranean dietary pattern on cardiometabolic health and wellbeing.**

Krebs J D 1,2, Parry-Strong A 1,2, Braakhuis A 3, Worthington A3, Merry TL3,4, Geary RB5, Foster M6, Weatherall M1, Davies C7, Mullaney J8, Ross C2, Conroy D8,9, Rolleston A10, Lithander FE9,11

1. Department of Medicine, University of Otago, Wellington, PO Box 7343, Wellington South 6242 New Zealand
2. Centre for Endocrine, Diabetes and Diabetes Research, Te Whatu Ora New Zealand Capital, Coast and Hutt Valley, PO Box 7902, Wellington, New Zealand
3. Discipline of Nutrition, School of Medical Sciences, University of Auckland, Auckland, New Zealand
4. Maurice Wilkins Centre for Molecular Biodiscovery, University of Auckland, Auckland, New Zealand
5. Department of Medicine, University of Otago, Christchurch. New Zealand
6. Edible Research Ltd, RD5 Rangiora, Ohoka 7475, New Zealand
7. Tū Kotahi Māori Asthma and Research Trust, Kōkiri Marae, Lower Hutt, New Zealand
8. National Science Challenge High Value Nutrition, Liggins Institute, University of Auckland, Auckland, New Zealand
9. The New Zealand Institute for Plant & Food Research Ltd. Auckland New Zealand
10. Centre for Health, Manawa Ora Centre 103 Third Ave, Tauranga 3110, Bay of Plenty New Zealand
11. Liggins Institute, University of Auckland, Auckland

Cardiometabolic diseases, including type 2 diabetes (T2DM) and cardiovascular disease (CVD), are common. Approximately one in three deaths annually are caused by CVD in Aotearoa New Zealand (AoNZ) (1). The Mediterranean dietary pattern is associated with a reduced risk of cardiometabolic disease in epidemiological and interventional studies (2,3). However, implementing the Mediterranean diet into non-Mediterranean populations can be challenging (4). Some of these challenges include facilitating consumption of unfamiliar foods and the cultural and social context of food consumption. AoNZ produces a rich source of high quality foods consistent with a Mediterranean dietary pattern. He Rourou Whai Painga is collaborative project combining contributions from food industry partners into a Mediterranean Diet pattern and providing foods, recipes and other support to whole household/whānau. The aim was to test if a New Zealand food-based Mediterranean diet (NZMedDiet) with behavioural intervention improves cardiometabolic health and wellbeing in individuals at risk.

This presentation will review the background to the research, the process of forming a collaboration between researchers and the food industry, the design and implementation of a complex study design (see protocol paper (5)), with results from the initial randomised controlled trial. We conducted several pilot studies (6,7,8) to inform the final design of the research, which was a combination of two randomised controlled trials (RCT 1 and 2) and a longitudinal cohort study.



### Con't

RCT-1 compared 12-weeks of the NZMedDiet to usual diet in participants with increased cardiometabolic risk (metabolic syndrome severity score (MetSSS) >0.35). The intervention group were provided with food and recipes to meet 75% of their energy requirements, supported by a behavioural intervention to improve adherence. The primary outcome measure was MetSSS after 12 weeks. Two hundred individuals with mean (SD) age 49.9 (10.9) yrs with 62% women were enrolled with their household/whānau. After 12 weeks, the mean (SD) MetSSS was 1.0 (0.7) in the control (n = 98) and 0.8 (0.5) in the intervention (n = 102) group; estimated difference (95% CI) of -0.05 (-0.16 to 0.06), p=0.35. A Mediterranean diet score (PyrMDS) was greater in the intervention group 1.6 (1.1 to 2.1), p<0.001, consistent with a change to a more Mediterranean dietary pattern. Weight reduced in the NZMedDiet group compared with control (-1.9 kg (-2.0 to -0.34)), p=0.006 and wellbeing, assessed by the SF-36 quality of life questionnaire, improved across all domains p<0.001.

In participants with increased cardiometabolic risk, food provision with a Mediterranean dietary pattern and a behavioural intervention did not improve a metabolic risk score but was associated with reduced weight and improved quality of life.

### References

1. AKR. Custom requested mortality dataset provided to Heart Foundation from the NZ Mortality Collection. : Ministry of Health; 2021
2. Esposito K, Maiorino MI, Di Palo C, Giugliano D. Diabet Med. 2009;26(9):900-7.
3. Fan H, Wang Y, Ren Z, Liu X, Zhao J, Yuan Y, et al. Diabetol Metab Syndr. 2023;15(1):107.
4. Murphy KJ, Parletta N. Curr Atheroscler Rep. 2018;20(6):28.
5. Lithander FE, Parry Strong A, Braakhuis A, Worthington A, Foster M, Rolleston A, et al. Front Nutr. 2023;10:1298743.
6. Lovell AL, Roy R, Klein A, Cavadino A, Foster M, Krebs JD, et al. Nutrients. 2023;15(12):2663.
7. Merry TL, Metcalf P, Scragg R, Geary R, Foster M, Krebs JD. Diabetes Res Clin Pract. 2022;192:110088.
8. Parry-Strong A, Geary R, Merry TL, Weatherall M, Davies C, Worthington A, et al.. BMC Nutr. 2023;9(1):146.

Keywords: Mediterranean Diet; Metabolic Syndrome Severity Score; Wellbeing; Cardiometabolic risk

## **'What helps to eat well?': Self-perceived strengths to support people in improving their dietary habits**

C. Pendergrast<sup>1</sup>, C. Conlon<sup>1</sup>, B. Erueti<sup>2</sup>, K. Beck<sup>1</sup> P. von Hurst<sup>1</sup>

1. School of Sport, Exercise and Nutrition, College of Health, Massey University, Auckland, 0632, New Zealand

2. School of Health Sciences, College of Health, Massey University, Palmerston North, 4442, New Zealand

'I just don't know what to eat!' is a frequent statement from people seeking nutrition support. With a magnitude of information available, confusion and limited confidence is a common complaint. People face myriad challenges in their attempts to have a healthy diet, including cost and time constraints, challenging food environments, and limited knowledge and skills(1). Challenges about eating well are often raised, yet enablers to eating well are not as readily discussed. Intention for healthy behaviours, self-efficacy and social support are examples of favourable elements which support healthy diets(1,2). As such, existing knowledge, skills, and positive influences should also be considered. As part of a wider qualitative study, and using an interpretive description approach, we sought to identify enablers to healthy eating perceived by people engaged with Green Prescription (GRx) and Active Families programmes. Nineteen clients aged 18 years and over, engaged with six GRx services were interviewed between May and October 2023. Eighteen whānau (family) members, (19-53 years) attending Active Families sessions facilitated in the Waitemātā area participated in focus group discussions during May-August 2024. Participants were asked in these discussions (kōrero) to share what helps them and their whānau to eat well. Braun and Clarke's (3) thematic analysis approach was used to analyse responses from these kōrero through data familiarisation, coding, and cyclical review of thematic relationships. Several themes were identified in this analysis: 'confidence in personal skills,' 'supportive environments', and 'being open and willing'. Personal skills such as planning meals, managing household budget and efforts to procure 'good' food were identified as strengths. These wider food skills have been suggested as potentially more important to enhancing dietary behaviours than cooking skills(4). Participants relayed experiences of developing skills that improved their confidence in eating well including growing, gathering and preserving food, experimenting with recipes, and knowing where to find affordable, nutritious food. Environments where people learned food and cooking skills and household members supported their endeavours to eat well were described as influential to encourage people in their efforts. Participants also expressed that being open to trying new foods and ways of eating led to inspiration and new knowledge. This attitude resulted in increased variety in the diet and further enhanced confidence to seek recipes and food information and spurred on efforts to make changes. People who have sought nutrition advice have often expressed challenges and uncertainty impacting their efforts to eat well. Nevertheless, there are also strengths which have meaningful impact on their eating. In nutrition advice provision, it would be beneficial to thoroughly explore the strengths people exhibit to support healthy eating. Identifying these insights may powerfully effect people's confidence to eat well and identify more effective support and information provision.

### References

1. Zorbas C, Palermo C et al (2018) *NutrRev* 76 (12): 861-874.
2. de Ridder D, Kroese F et al (2017) *Psychol Health* 32, (8), 907-941.
3. Walker-Clarke A, Walasek L & Meyer C (2022) *Ageing Res Rev* 77, 101597.
4. Lavelle F, Bucher T et al (2019) *Nutr Diet* 77:112-120.

Keywords: nutrition; strengths; community-health support

Financial Support: This work was supported by the Health Research Council (grant numbers HRC 21/1030, 23/979).

## **Effects of a tailored programme to support food companies to reform nutrition policies and practices (REFORM): a multi-centre cluster-randomised controlled trial**

Cliona Ni Mhurchu<sup>1</sup>, Jacqui Grey<sup>2</sup>, Stephanie Shen<sup>2</sup>, Caitlin Haliburton<sup>2</sup>, Yannan Jiang<sup>3</sup>, Helen Eyles<sup>1</sup>, Leanne Young<sup>2</sup>, Jasmine Chan<sup>4</sup>, Sally Schultz<sup>4</sup>, Josephine Marshall<sup>4</sup>, Miranda Blake<sup>4</sup>, Jaithri Ananthapavan<sup>4,5</sup>, Anna Peeters<sup>4</sup>, Gary Sacks<sup>4</sup>.

1. Department of Epidemiology and Biostatistics, School of Population Health, University of Auckland, New Zealand
2. National Institute for Health Innovation, School of Population Health, University of Auckland, New Zealand
3. Department of Statistics, Faculty of Science, University of Auckland
4. Global Centre for Preventive Health and Nutrition (GLOBE), Deakin University, Geelong, Victoria, Australia
5. Deakin Health Economics, Institute for Health Transformation, Deakin University, Australia

New Zealand and Australian governments rely heavily on voluntary industry initiatives to improve population nutrition, such as voluntary front-of-pack nutrition labelling (Health Star Rating [HSR]), industry-led food advertising standards, and optional food reformulation programmes. Research in both countries has shown that food companies vary considerably in their policies and practices on nutrition<sup>1</sup>. We aimed to determine if a tailored nutrition support programme for food companies improved their nutrition policies and practices compared with control companies who were not offered the programme. REFORM was a 24-month, two-country, cluster-randomised controlled trial. 132 major packaged food/drink manufacturers (n=96) and fast-food companies (n=36) were randomly assigned (2:1 ratio) to receive a 12-month tailored support programme or to the control group (no intervention). The intervention group was offered a programme designed and delivered by public health academics comprising regular meetings, tailored company reports, and recommendations and resources to improve product composition (e.g., reducing nutrients of concern through reformulation), nutrition labelling (e.g., adoption of HSR labels), marketing to children (reducing the exposure of children to unhealthy products and brands) and improved nutrition policy and corporate sustainability reporting. The primary outcome was the nutrient profile (measured using HSR) of company food and drink products at 24 months. Secondary outcomes were the nutrient content (energy, sodium, total sugar, and saturated fat) of company products, display of HSR labels on packaged products, company nutrition-related policies and commitments, and engagement with the intervention. Eighty-eight eligible intervention companies (9,235 products at baseline) were invited to participate, of whom 21 accepted and were enrolled in the REFORM programme (delivered between September 2021 and December 2022). Forty-four companies (3,551 products at baseline) were randomised to the control arm. At 24 months, the model-adjusted mean HSR of intervention company products was 2.58 compared to 2.68 for control companies, with no significant difference between groups (mean difference -0.10, 95% CI -0.40 to 0.21, p-value 0.53). A per protocol analysis of intervention companies who enrolled in the programme compared to control companies with no major protocol violation also found no significant difference (2.93 vs 2.64, mean difference 0.29, 95% CI -0.13 to 0.72, p-value 0.18). We found no significant differences between the intervention and control groups in any secondary outcome, except in total sugar (g/100g) where the sugar content of intervention company products was higher than that of control companies (12.32 vs 6.98, mean difference 5.34, 95% CI 1.73 to 8.96, p-value 0.004). The per-protocol analysis for sugar did not show a significant difference (10.47 vs 7.44, mean difference 3.03, 95% CI -0.48 to 6.53, p-value 0.09). In conclusion, a 12-month tailored nutrition support for food companies did not improve the nutrient profile of company products.

### References

1. Vandevijvere S, Kasture A, Sacks G, Robinson E, Mackay S, Swinburn B. Committing to health: Food company policies for healthier food environments. Company assessments and recommendations using the Business Impact Assessment on obesity and population nutrition (BIA-Obesity) tool. New Zealand 2017. The University of Auckland, Auckland, 2018

**Keywords:** Randomised controlled trial; public health; food industry; food policies

**Financial Support:** This research was funded by a Health Research Council of New Zealand programme grant (18/672), the Australian National Health & Medical Research Council, the Victorian Health Promotion Foundation (VicHealth), and the Australian Government Department of Health).

## **Development of a national food system mathematical model for exploring future scenarios and impacts**

R Lozano<sup>1</sup>, NW Smith<sup>1</sup>, A Fletcher<sup>2</sup>, W McNabb<sup>1</sup>

1. Sustainable Nutrition Initiative, Riddet Institute, Massey University, Private Bag 11222, Palmerston North 4472, New Zealand
2. Fonterra Research and Development Centre, Private Bag 11029, Palmerston North 4442, New Zealand

Sustainability in Aotearoa New Zealand's food system is essential for environmental health (taiao ora) and human well-being (tangata ora). However, achieving resilience in our food system faces significant cross-sector challenges, requiring a national food strategy that addresses environmental, economic, and social pressures (1). This work aims to develop the first national computational model of Aotearoa New Zealand's food system, integrating key factors into a decision support tool. The model aims to support food system resilience by offering an accessible platform that could help inform decisions to strengthen preparedness for shocks, while also providing insights to enhance everyday food security. The Kai Anamata mō Aotearoa (KAMA) model leverages new data and indigenous crop trials to combine work across agriculture, environment, and human wellbeing, forming a comprehensive tool to examine food system resilience. This model will capture the resources required, outputs produced, and wellbeing outcomes of our food system. The KAMA model was built using a flow-state modelling approach, which allows for flexible configuration of land uses and ensures that the model can adapt to future technologies and climate change scenarios. The preliminary development the KAMA model was used to demonstrate the current production system and applied to a regional case study from Te Taiuhu, integrating region-specific food production data, including apples, kiwifruit, mussels, wine, and hops production. Outputs included labour, carbon dioxide emissions and mass of production. Beyond food production, this model will enable users to explore the impacts of land use for commodity production, the effects of trade, nutrient supply, and the broader implications for well-being. model will be made publicly accessible online to allow any interested individual to explore the future of the national food system.

### References

1. Renwick A, Dynes R, Johnstone P, King W, Holt L & Penelope J (2019) Sustainability 11, 4912.

**Keywords:** Resilience; sustainability; wellbeing; National food systems; mathematical modelling

**Financial Support:** This research was funded by the New Zealand Ministry of Business, Innovation and Employment (Wellington, New Zealand) through the Kai anamata mō Aotearoa – exploring future food system scenarios and impacts Programme (MAUX2305).

# Plenary 2: Gut Health

## **Gut Health: Translating diet and gut microbiota research into practice.**

C Wall <sup>1</sup>

Department of Medicine, University of Otago, Christchurch

Gut health is a USD 50 billion dollar industry that is forecast to continue growing. This growth is attributed to our increased understanding and interest in the gut microbiome and its association with many chronic diseases, mental health and gut and autoimmune disorders. In 2024, “dysbiosis”, “gut microbiome” and “gut probiotics” were some of the most commonly google searched words but, what constitutes “good gut health”? There is no exact definition but in clinical practice we may use symptoms as a proxy for gut health, for example normal gastrointestinal function and the absence of chronic gastrointestinal symptoms that negatively impact on our quality of life. Consumer research found that consumers regard gut health as well-being and are interested in latest science but that does not inform their purchasing behaviours.<sup>1</sup> Interestingly, symptoms of suboptimal gut health, which may include abdominal bloating, diarrhoea, constipation, excessive flatulence, were most likely to influence consumer behaviours.<sup>1</sup> In this presentation, I review the latest scientific evidence about foods and dietary patterns that are associated with markers of gut health. I also provide examples of how we can practically educate and advise New Zealanders on implementation of dietary changes that may support sustainable gut health.

### References

Williams GM, Tapsell LC and Beck EJ. *Nutr Diet* 2022;80:85-94

Keywords: gut microbiome; gut health; dietary patterns



# The Aotearoa Women's Wellness Program for Irritable Bowel Syndrome

B Laing<sup>1</sup>, N Hart<sup>2</sup>, JP Porter-Steele<sup>3</sup>, S Balaam<sup>3</sup>, D Anderson<sup>4</sup>, S McCarthy<sup>5</sup>

1. Faculty of Medical and Health Sciences, The University of Auckland, New Zealand
2. Nikki Hart Nutrition, (Private Business) Auckland 1022 New Zealand
3. Griffith Health Centre, Griffith University, Southport QLD 4215, Australia
4. Faculty of Health University of Technology, Sydney NSW 2007, Australia
5. Griffith Health Centre, Griffith University, Southport QLD 4215, Australia

Irritable bowel syndrome (IBS) is a chronic and painful gastrointestinal disorder associated with significantly worse physical functioning (abnormal physiology, visceral hypersensitivity, inflammation, immune dysregulation, microbiome, and malabsorption issues). IBS is influenced by genetic disposition, psychological factors and diet, significantly and adversely affects quality of life <sup>(1)</sup>. Internationally IBS is a common disorder in primary and speciality care affecting 13 to 20% of people <sup>(2)</sup>. IBS imposes a significant economic burden to health systems <sup>(2)</sup>. The prevalence and economic results of IBS make it a major public health concern. Existing interventions revolve separately around diet (particularly the low FODMAP diet) and stress management. The goal of this project was to create a multimodal lifestyle intervention explicitly designed to enhance the health-related quality of life in women treated for IBS in Aotearoa with the imperative to minimise the risk of IBS recurrence and to reduce the burden of the long-term physical and psychological symptoms. This IBS programme builds on the well-established Women's Wellness Programs (WWP) based at the Health Faculty, University of Technology, Sydney. These are robust and systematic programmes developed within the WWP team which comprises international experts in women's health and chronic conditions, of cancer, diabetes, cardiovascular disease and stroke. All WWP employ individually tailored strategies to instill positive behavioural change. They are also designed for virtual delivery through participants' mobile computing devices to ensure regional and rural access. This presentation explains the 'The Aotearoa Women's Wellness Program for IBS' prototype that has been developed. This programme is designed based on the results of a study where IBS participants (n=15) and separately health professionals or researchers (n=15) working in the field of IBS in New Zealand were all asked the same questions about the IBS journey, including diagnosis and treatment. Their responses detailed how IBS adversely affected all aspects of quality of life, raised issues with diagnosis and treatment and articulated desired support approaches. When given information about the WWP and asked to provide feedback on it, all 30 interviewed participants agreed that a WWP health promotion approach for IBS was feasible, relevant, and warranted. Through this feedback the programme was developed. Participants work through the content to address issues such as nutrition, stress management, and physical activity, guided by a health professional with expertise in gut health. Various activities and opportunities to reflect are distributed throughout the programme to identify goals to help participants make and embed appropriate changes in their lifestyles. This new, evidence-based programme for IBS is now available to health professionals working in clinical situations related to gut health in Aotearoa. It gives them the opportunity to redesign care, irrespective of where care is delivered, in a way that is responsive to the needs of people with IBS.

## References

1. Drossman, D.A, Clinical Features, and Rome IV. (2016) *Gastroenterology*, 150, 1262-1279. e2.
2. GI Society Canadian Society of Intestinal Research. (2018) Hidden Costs: The Economic Impact of IBS. <https://www.badgut.org/information-centre/a-z-digestive-topics/hidden-costs-of-ibs/>.

Keywords: Aotearoa; IBS; lifestyle program; Women's Wellness.

Financial Support: This work was supported by the Faculty of Research and Development (FDRF) New Staff Grant (Grant number 3719323)

## Complementary foods modulate the colonic microbiota of New Zealand weaning infants: an *in vitro* study

V.G. da Silva<sup>1,2</sup>, N. Smith<sup>1</sup>, J. Mullaney<sup>1,2,3</sup>, C. Wall<sup>2,4</sup>, N.C. Roy<sup>1,2,5</sup>, W. McNabb<sup>1,2</sup>

1. Riddet Institute, Massey University, Palmerston North, 4410, New Zealand
2. High-Value Nutrition National Science Challenge, Auckland, 1023, New Zealand
3. AgResearch, Palmerston North, 4442, New Zealand
4. Department of Nutrition and Dietetics, The University of Auckland, Auckland, 1023, New Zealand
5. Department of Human Nutrition, University of Otago, Dunedin, 9010, New Zealand

The transition from breastmilk to solid foods (weaning) is a critical stage in infant development and plays a decisive role in the maturation of the complex microbial community inhabiting the human colon. Diet is a major factor shaping the colonic microbiota, which ferments nutrients reaching the colon unabsorbed by the host to produce a variety of microbial metabolites influencing host physiology<sup>(1)</sup>. Therefore, making adequate dietary choices during weaning can positively modulate the colonic microbiota, ultimately contributing to health in infancy and later life<sup>(2)</sup>. However, our understanding of how complementary foods impact the colonic microbiota of weaning infants is limited. To address this knowledge gap, we employed a metagenome-scale modelling approach to simulate the impact of complementary foods, either combined with breastmilk or with breastmilk and other foods, on the production of organic acids by colonic microbes of weaning infants<sup>(3)</sup>. Complementary foods and combinations of foods with the greatest impact on the *in silico* microbial production of organic acids were identified. These foods and food combinations were further tested *in vitro*, individually or in combination with infant formula. Fifty-three food samples were digested using a protocol adapted from INFOGEST to mimic infant digestion and then fermented with faecal inoculum from 6 New Zealand infants (5-11 months old). After 24h of fermentation, the production of organic acids was measured by gas chromatography. Differences in organic acid production between samples were determined using the Tukey Honestly Significant Difference test to account for multiple comparisons. The microbial composition was characterised by amplicon sequencing of the V3-V4 regions of the 16S bacterial gene. Taxonomy was assigned using the DADA2 pipeline and the SILVA database (version 138.1). Bioinformatic and statistical analyses were conducted using the R packages phyloseq and ANCOM-BC2, with the Holm-Bonferroni adjustment to account for false discovery rates in differential abundance testing. Blackcurrant and raspberries increased the production of acetate and propionate (Tukey's test,  $p < 0.05$ ) and the relative abundance of the genus *Parabacteroides* (Dunnett's test, adjusted  $p < 0.05$ ) compared to other foods. Raspberries also increased the abundance of the genus *Eubacterium* (Dunnett's test, adjusted  $p < 0.05$ ). When combined with infant formula, black beans stood out for increasing the production of butyrate (Tukey's test,  $p < 0.05$ ) and the relative abundance of the genus *Clostridium* (Dunnett's test, adjusted  $p < 0.05$ ). In conclusion, this study provides new evidence on how complementary foods, both individually or in combination with other dietary compounds, influence the colonic microbiota of weaning infants *in vitro*. Insights generated by this research can help design future clinical trials, ultimately enhancing our understanding of the relationship between human nutrition and colonic microbiota composition and function in post-weaning life.

### References

1. Ramos S & Martin M (2021) *Curr. Opin. Food Sci.* 37, 83-90
2. Tannock G (2021) *Appl. Environ. Microbiol.* 87:e01449-21
3. Da Silva V, Smith N, Mullaney J et al. (2024) *mSystems* e00577-24

Keywords: infant; food; gut microbiota

Financial Support: New Zealand Ministry for Business, Innovation and Employment (MBIE, grant no. 3710040) through the High-Value Nutrition National Science Challenge

# Plenary 3: Infant & Toddler Nutrition and Early Career

## From research to food safety and food policy: a focus on infants and young children

M Gibbs<sup>1</sup>

1. New Zealand Food Safety, Ministry for Primary Industries, Wellington, 6011, New Zealand

The objective of the food safety system is to provide safe and suitable food in New Zealand. (1) This is of particular importance for our youngest members— infants and young children. During the first 2000 days of life, food and nutrition have crucial roles. Nutrient requirements are high and children often have an increased vulnerability to hazards associated with chemical and microbiological contamination. Foods targeted to this age group typically have strict regulations, as the quality and safety of foods for infants and young children is of great concern to caregivers, public health authorities and regulatory bodies worldwide. The recent First Foods New Zealand Study (FFNZ) and Young Foods New Zealand (YFNZ) Study have provided important data into what, and how, we feed our infants and young children under four years of age.(2) Insights from the dietary intakes and health of 925 infants and young children from these studies are being used by NZFS to inform its work on food monitoring surveillance and food policy. Currently New Zealand Food Safety (NZFS) is conducting the 2024 New Zealand Total Diet Study (NZTDS) (Infants and Toddlers)(3). The NZTDS is a food monitoring and surveillance programme which aims to evaluate the risk to New Zealanders from exposure to certain chemicals such as agricultural chemicals, contaminants (including from food packaging), and nutrients. The 2024 NZTDS will, for the first time, focus exclusively on infants and young children. The FFNZ and YFNZ studies informed the selection of 117 foods to be tested from four New Zealand regions throughout 2024/2025. The dietary intake data will then be used to estimate the dietary exposure to each of the 362 chemicals analysed. This monitoring programme informs policy decision-making and food standard setting, and provides assurance on the safety of our food supply. Concerns around the nutrient quality and labelling of some commercial products for infants and young children have been identified in Australia and New Zealand. Within the joint food regulatory system, consultation is underway to consider regulatory and non-regulatory options for improving commercial foods for infants and young children.(4) This presentation will discuss NZFS's role in monitoring foods and diets of infants and young children in Aotearoa New Zealand, the importance of, and application of evidence to inform policy, food safety, and potential regulatory and non-regulatory options to ensure that the food safety system continues to deliver safe and suitable food in New Zealand.

### References

1. New Zealand Food Safety. (2022) A Strategy for New Zealand Food Safety: Strategy Refresh 2022-2024. Available online: <https://www.mpi.govt.nz/dmsdocument/52936-2022-Food-safety-strategy-2019-2024-refresh> (Accessed online October 2024)
2. University of Otago. First Foods NZ Study. Cited at: <https://www.otago.ac.nz/diabetes/research-at-edgar-diabetes-and-obesity-research/first-foodsnz-study> (Accessed online October 2024)
3. New Zealand Food Safety. (2024) 2024 New Zealand Total Diet Study (Infants and Toddlers). New Zealand Food Safety Information Paper No. 2024/01. Available online: <https://www.mpi.govt.nz/dmsdocument/61177-New-Zealand-Food-Safety-2024-NZTDS-Final-project-outline> (Accessed online October 2024)
4. Department of Health and Aged Care. (2024) Public consultation: Improving commercial foods for infants and young children. Available online: <https://consultations.health.gov.au/chronic-disease-and-food-policy-branch/commercial-foods-for-infants-and-children/> (Accessed online October 2024)

Keywords: Monitoring; food safety; infants; toddlers

## Iron status of Māori, Pacific and other infants in Aotearoa New Zealand

Maria Casale <sup>1</sup>, Kathryn Beck <sup>1</sup>, Cathryn Conlon <sup>1</sup>, Lisa Te Morenga <sup>2</sup>, Jillian Haszard <sup>3</sup>, Anne-Louise Heath <sup>4</sup>, Rachael Taylor <sup>5</sup>, Neve McLean<sup>4</sup>, Lisa Daniels<sup>4</sup>, Pamela von Hurst <sup>1\*</sup>

1. School of Sport Exercise and Nutrition, Massey University, Auckland, New Zealand.
2. Research Centre for Hauora and Health, Massey University, Wellington, New Zealand.
3. Biostatistics Centre, University of Otago, Dunedin, New Zealand.
4. Department of Human Nutrition, University of Otago, Dunedin, New Zealand
5. Department of Medicine, University of Otago, Dunedin, New Zealand.

Poor iron status is one of the most prevalent problems facing infants worldwide, in both developing and developed countries <sup>(1)</sup>. A complex interplay of both dietary and non-dietary factors affects iron intake, absorption, and requirements, and subsequently iron status <sup>(2)</sup>. We aimed to describe iron status in an ethnically diverse cohort of urban-dwelling infants. Data were collected from 364 infants aged 7.0 to 10.0 months living in two main urban centres in New Zealand (Auckland and Dunedin) between July 2020 and February 2022. Participants were grouped by total ethnicity, with any participants who did not identify as either Māori or Pacific categorised into a single 'others' group. Haemoglobin, plasma ferritin, soluble transferrin receptor (sTfR), C-Reactive protein, and alpha-1-acid-glycoprotein were obtained from a non-fasting venous blood sample. Inflammation was adjusted for using the Biomarkers Reflecting Inflammation and Nutritional Determinants of Anaemia (BRINDA) method<sup>(3)</sup>. Body iron concentration (mg/kg body weight) was calculated using the ratio of sTfR and ferritin. A total of 96.3% of Pacific infants were iron sufficient, defined as body iron  $\geq 0$  mg/kg body weight and haemoglobin (Hb)  $\geq 105$  g/L, compared to 82.3% of Māori and 76.0% of 'other' (i.e. neither Māori nor Pacific) infants. 'Other' infants had the highest prevalence of iron deficiency overall, with 2.8% categorised with iron-deficiency anaemia (IDA) (body iron  $< 0$  mg/kg, haemoglobin  $< 105$  g/L), 11.8% with early 'functional' iron deficiency (body iron  $< 0$  mg/kg, haemoglobin  $\geq 105$  g/L), and 9.4% with iron depletion (ferritin  $< 15$   $\mu$ g/L, in the absence of early 'functional' iron deficiency and iron deficiency anaemia). For Māori infants, 3.2% and 6.5% had IDA and early 'functional' iron deficiency respectively, and 8.1% were iron depleted. One (3.7%) Pacific infant was iron depleted, and the remainder were iron sufficient. Plasma ferritin and body iron concentration were, on average, higher in Pacific compared to non-Pacific infants. These findings give an up-to-date and robust understanding of the iron status of infants by ethnicity, highlighting an unexpected finding that infants who are neither Māori nor Pacific may be at higher risk of poor iron status in NZ.

### References

1. Gedfie S, Getawa S, Melku M (2022) *Glob Pediatr Health* 9
2. Lozoff B, Kaciroti N, Walter T (2006) *AM J Clin Nutr* 84(6), 1412-21
3. Suchdev PS, Namaste SM, Aaron GJ et al. (2016) *Adv Nutr* 7(2), 349-56

Keywords: Infant; Māori; Pacific; iron status

Financial Support: This study is supported by the Health Research Council (HRC) of New Zealand (19/172). The HRC had no role in the study design, writing of the protocol manuscript and in the decision to submit the manuscript for publication.

# Composition, nutrition and marketing claims are prolific on packaging of infant and toddler foods in New Zealand

S Mackay<sup>1</sup>, B Follong<sup>1</sup>, B Wilde<sup>2</sup>, M Ferreira<sup>2</sup>

1. Epidemiology and Biostatistics, School of Population Health, University of Auckland, 1023, New Zealand
2. Nutrition and Dietetics, Faculty of Medical and Health Sciences, University of Auckland, 1023, New Zealand
3. The Centre for Translational Health Research: Informing Policy and Practice (TRANSFORM), University of Auckland, 1023, New Zealand

Optimal early childhood nutrition is central to healthy growth, wellbeing and development. The World Health Organisation (WHO) Regional Office for Europe Nutrient and Promotion Profile Model (NPPM) <sup>(1)</sup> recommends that commercial infant and toddler foods do not carry compositional, nutrition, health or marketing claims. The Food Regulation Standing Committee of Australia and New Zealand (NZ) has identified labelling of these foods as a current area of concern <sup>(2)</sup>. This study aims to identify on-pack labelling and marketing claims on commercial packaged foods aimed at infants and toddlers in NZ. Relevant infant and toddler products available in NZ supermarkets were identified through Nutritrack <sup>(3)</sup>, a packaged food database managed by the University of Auckland. Information was collected from four major NZ supermarket chains in Auckland. Photographs of packaged foods and beverages were taken and names, brands, labelling, ingredients and NIP information identified. Data were collected between April and July 2023. In January 2024, online supermarket websites were checked for additional products. Infant products were those intended for ages up to 11 months as indicated on the package, and toddler products for ages 12 months to 36 months. Claims on each side of the package were coded using a pre-existing coding structure according to the three main categories identified in the WHO NPPM, composition and nutrition claims, health claims, and marketing claims. The absence or presence of the type of claim was noted. Descriptive statistics were conducted using Microsoft Excel to analyse frequency of types of claims. Two hundred and ten products were identified, 167 infant and 43 toddler products. All products had some type of claim on the package. On average, there were 7 unique types of claims per product (range 3-14) for both infant and toddler foods. The most common type of claims were composition and nutrition claims, with a mean of 4.0 types per product, followed by 3.3 types of marketing claims and 0.16 health claims. The most prevalent composition and nutrition claims were 'free from' claims relating to the absence of ingredients generally perceived to be harmful, most commonly flavours (on 72% of packages), colours (71%), added sugar (53%), preservatives (43%) and salt (33%). Two-thirds of packages (68%) carried statements on the natural or healthy nature of the ingredients mentioning words like organic/fresh/real or natural on-pack. All infant and toddler products carried some type of claim with the most common being about the composition or nutrition of the product, particularly the absence of additives, sugar and salt. Regulation is needed to ensure that parents and caregivers receive accurate information, preventing them from being misled when making purchasing decisions for their children.

## References

1. WHO Europe. Nutrient and promotion profile model. 2022
2. Food Regulation Standing Committee. Issues paper. 2023
3. Nutritrack Database. 2023. <https://diet.auckland.ac.nz/projects/nutritrack>

Keywords: Food marketing; food labelling; infant foods; toddler foods

Financial Support: This work was supported by the Health Research Council of New Zealand Programme (grant number 18/672)



## Minimum Reporting Set of nutritional intake and growth outcomes in preterm nutrition studies: A Delphi study

M Meiliana<sup>1</sup>, J Harding J, L Lin<sup>1</sup>, F Bloomfield<sup>1</sup>

1. Liggins Institute, The University of Auckland, Auckland, 1010, New Zealand

The estimated global preterm birth rate in 2020 (1) was more than 10% of livebirths or 13.4 million infants. Despite the importance of neonatal nutrition in optimising growth, neurodevelopment, and later metabolic disease risk, there is inconsistency in nutrition recommendations for preterm infants (2). Incomplete or inconsistent reporting of outcomes in nutrition intervention studies is part of the reason for the lack of consensus on optimal nutrition. To reduce uncertainty in measuring or reporting nutritional intake and growth outcomes in preterm studies, a consensus process is needed to identify relevant measures for patients, parents/caregivers, researchers, and health professionals. We aimed to develop a minimum reporting set (MRS) for measures of nutritional intake and growth in preterm nutrition studies. We collaborated with a group of international researchers from 13 countries and registered this study at the COMET initiative (registration number 3185). The target population was individuals born preterm at any gestational age and study location whose nutritional intake was assessed before first hospital discharge and whose growth was assessed at any age. Measures reported in preterm nutrition studies were systematically reviewed and used to develop the real-time Delphi survey <sup>(3)</sup> using Surveylet (Calibrium) software, including 13 questions about nutritional intake and 14 about growth outcomes. We used a snowball process to recruit participants from the consumer, healthcare provider, and researcher stakeholder groups with expertise in preterm infants, nutrition, and growth to rate the importance of each measure on a 9-point Likert scale. Participants initially rated the survey items without seeing other participants' responses, saved and refreshed the page to see the anonymous responses of other participants, and had the option to change their rating and provide reasons for their answers. Participants' final scores for each item will be used to identify the consensus criteria for that item <sup>(3)</sup>. To date, we have recruited 246 participants from 31 countries across 5 continents, including 58 (24%) consumers, 156 (63%) healthcare professionals, and 26 (11%) researchers. Preliminary findings indicate that 12 measures of nutritional intake and 4 of growth have met the criteria for inclusion in the MRS. However, participant recruitment and survey responses are ongoing. A final consensus meeting is planned for November 2024 to confirm the MRS.

### References

1. WHO (2023) <https://www.who.int/news-room/fact-sheets/detail/preterm-birth> (last accessed August 2023)
2. Meiliana M, Alexander TA, Bloomfield FH, et al. (2024) *J Parenter Enteral Nutr* 48:11-26
3. Quirke FA, Battin MR, Bernard C, et al. (2023) *Trials* 24(1):461

Keywords: preterm; nutrition; growth; Delphi

# **A qualitative investigation into the essential knowledge and skills for early career nutritionists in New Zealand**

A Gooding<sup>1</sup>, G Cottereau<sup>1</sup>, A, Hill<sup>1</sup>, C Smith<sup>1</sup>

1. Department of Human Nutrition, University of Otago, Dunedin, PO Box 56, New Zealand

The nutrition workforce plays a vital role in disease prevention and health promotion, with expanding job opportunities shaped by factors like aging populations, climate change, global food systems, and advancing technologies (1,,2). Preparing students for careers that require adaptability involves understanding the valuable skills they possess and identifying any gaps. This research aimed to identify the skills and knowledge valued by students who had recently completed work-based placements, and explore recent graduates' experiences, challenges, and preparedness for employment. At the end of their work-based placements students give presentations sharing their experiences and learning. Permission was sought from ten students to analyse the recordings of these presentations. The presentations were selected to include a range of nutrition fields, including sports nutrition, public health, community nutrition, dietary counselling, food and industry, and nutrition communication. Additionally, a list of graduates (within four years of graduation) from various fields (as above) was compiled and they were invited to participate. Semi-structured interviews (n=10) were conducted online via Zoom and recorded. The interview guide included open-ended questions on employment experiences, challenges, preparedness, and required skills. The interviews, transcription and analyses were completed by two student researchers between November 2023 and February 2024. Thematic analysis using NVivo software was used to identify themes. The themes developed included the importance of skills relating to; i) communicating complex nutrition concepts to the public, ii) collaborating within diverse teams, iii) identifying and filling personal knowledge gaps. In addition Graduates felt practical experience from their University study boosted their preparedness for the workforce, though many struggled to apply their skills in non-traditional roles and expand their career scope. In summary, ongoing focus on team-based projects, communication with non-science audiences, and strategies for continuous learning using evidence-based sources are crucial for both undergraduate and postgraduate education.

## References

1. Boak R.,Palmero C, Beck E et al. (2022) *Nutr Diet*, 79, 427-437.
2. Wegener, J. (2018) *Acad Nutr Diet*, 118, 393-398.

Keywords: nutritionist; qualitative; skills; knowledge

# A1: Global nutrition and emergency preparedness

## From gardens to plates: household food production fuels dietary diversity for women and children in rural Sri Lanka

S Vishnukumar<sup>1,2</sup>, J Weber<sup>1</sup>, R Thiagarajah<sup>3</sup>, L Brough<sup>1</sup>

1. School of Food Technology and Natural Sciences, Massey University, New Zealand
2. Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka
3. School of Agriculture and Environment, Massey University, New Zealand

Malnutrition from poor diet is a persistent issue in Sri Lanka, especially among women and children. High rates of undernutrition and micronutrient deficiencies are documented among rural poor communities (1). Household food production may enhance maternal and child nutrition directly by increasing access to diverse foods and indirectly by providing income to diversify diets (2). This study explores the cross-sectional relationship between household food production and individual dietary diversity among women aged 18-45 years and children aged 2-5 years in Batticaloa district, Sri Lanka. We randomly selected 450 low-income mother-child pairs receiving a Samurdhi subsidiary, having a home garden. Through face-to-face interview, we gathered information on the types of crops grown and livestock reared in the preceding 12 months. Production quantity and utilization were also detailed. Additionally, socio-demographic information and market access were obtained. To measure women's dietary diversity (DD), we used a scale based on 10-food groups and a 7-food group scale for children. Women who consumed five or more food groups were defined as meeting the Minimum Dietary Diversity of Women (MDD-W), whereas children who consumed four or more food groups met the minimum standards. Multiple linear regression and binary logistic regression were used to identify the factors predicting individual DD. Complete data for 411 pairs were analysed. The results showed, only 15.3% of the women met MDD-W, with a mean DDS of 3.3 (SD = 1.2). Children had a mean DDS of 3.3 (SD = 1.2), and 41.1% of them met the minimum diversity. Regression analysis indicated that growing leafy vegetables was positively associated with increased dietary diversity of women ( $\beta = 0.337$ ; 95% CI: 0.13, 0.54;  $p = 0.001$ ) and children ( $\beta = 0.234$ ; 95% CI: 0.05, 0.42;  $p = 0.013$ ) but not with meeting the minimum diversity. Moreover, monthly income above 35,000 LKR, higher education level, a secondary income source and food security were also positively associated with women's DD. Conversely, living further away from the main road reduced the women's DD. Interestingly, livestock ownership was only associated with women meeting the MDD-W, but not for children. For children, monthly income was a strong predictor of DD and meeting minimum diversity. Surprisingly, living far from the market was associated with increased DD in children ( $\beta = 0.018$ ; 95% CI: 0.01, 0.03;  $p = 0.013$ ), while distance to main road had a similar effect as in women. Notably, selling their produce at the market contributed to meeting the minimum dietary diversity in children ( $\beta = 0.573$ ; 95% CI: 0.14, 1.02;  $p = 0.013$ ). These findings suggest that enhancing household food production could play a crucial role in improving dietary diversity and addressing malnutrition, particularly in rural Sri Lankan communities, and potentially in other similar settings.

### References

1. DHS. (2016). Demographic and Health Survey 2016.
2. Kadiyala, S., Harris, J., Headey, D., et al. (2014). Annals of the New York Academy of Sciences 1331(1) 43-46

Financial Support: This research is funded by the School of Food Technology and Natural Sciences, Massey University, New Zealand and the researcher received a scholarship from Accelerating Higher Education Expansion and Development (AHEAD).

Keywords: dietary diversity; food production; women; child

# Improving nutritional outcomes through Crop Selection and Land Suitability: Global Iron and Zinc Deficiencies

E Abafe<sup>1</sup>, N. Smith<sup>1</sup>, T. Maxwell<sup>2</sup>, W. McNabb<sup>1</sup>

1. Sustainable Nutrition Initiative@, Riddet Institute, Massey University, 4410, New Zealand

2. Department of Agricultural Sciences, Lincoln University, Lincoln, 7647, New Zealand.

Global efforts to combat micronutrient deficiencies have often focused on assessing nutrient intakes and supplies (1,2), yet no studies have explored the role of crop selection and land suitability to tackle these deficiencies. This study aims to bridge this gap using existing estimates of global prevalence of iron <sup>(3)</sup> and zinc <sup>(4)</sup> deficiencies to identify crops with the highest potential to mitigate these deficiencies. Using the USDA food composition database, we established nutrient profiles for 37 widely cultivated crops, focusing on their iron and zinc content per 100 grams. To evaluate these crops' effectiveness to meet nutrient requirements, we compared compositions to Harmonized Average Requirements (H-ARs) for women of reproductive age (WRA), a group particularly vulnerable to micronutrient deficiencies. The H-ARs account for variations in nutrient absorption and bioavailability <sup>(5)</sup>. For each crop, we calculated the percentage of the H-AR met by 100 grams of iron and zinc content. This percentage was adjusted for the global prevalence of iron and zinc deficiencies by introducing deficiency weighting—multiplying each crop's nutrient contributions by the global prevalence of iron and zinc deficiencies. The result was a deficiency-weighted nutrient score for each crop. Soybeans scored highest at 61.67, followed by cowpeas (50.30), pearl millet (33.69), and Phaseolus beans (31.33), indicating their strong potential to address global iron and zinc deficiencies. Next, we integrated these nutrient scores with global land suitability and yield potential data from the Global Agro-Ecological Zones (GAEZ) database to map regions most suited for growing these nutrient-dense crops. On average, our findings show that *Tonga* is the most suitable country for soybean cultivation, with a potential yield of 3.77 tons per hectare (tons/ha), *Uruguay* for cowpeas (2.82 tons/ha), *Lithuania* for Phaseolus beans (3.93 tons/ha), and *Guinea-Bissau* for pearl millet (3.87 tons/ha). Through multivariate clustering, we linked global deficiency patterns with yield potential across various regions. Countries such as those in the Caribbean, Eastern, Western, and Middle Africa, and Southern and Southeastern Asia emerged as priority regions where the production of these crops would be most beneficial to combat iron and zinc deficiencies. The results provide valuable insights to align agricultural land use practice with nutritional requirements, particularly in regions with high iron and zinc deficiency prevalence.

## References

1. Smith et al. (2021) *The J.Nutr* 151, 3253–3261
2. Passarelli et al (2024). *The Lancet Glob. Health* 0276-6
3. World Development Indicators (accessed 2024).
4. Wessells KR, & Brown KH (2012). *PLoS One* 7(11)
5. Allen et al. (2020) *Adv. Nutr* 11, 469–483

Keywords: land use; micronutrient Deficiency; nutrient density; geospatial analysis

## Strategies for Closing Global Nutrient Gaps: Enhancing Distribution and Supply

R Lozano<sup>1</sup>, NW Smith<sup>1</sup>, A Fletcher<sup>2</sup>, W McNabb<sup>1</sup>

1. Sustainable Nutrition Initiative, Riddet Institute, Massey University, Private Bag 11222, Palmerston North 4472, New Zealand
2. Fonterra Research and Development Centre, Private Bag 11029, Palmerston North 4442, New Zealand

Although current estimates suggest that global food production is enough to meet nutritional needs, there are still significant challenges with equitable distribution <sup>(1)</sup>. Tackling these disparities is essential for achieving global nutrition security now and in the future. This study uses the DELTA Model<sup>®</sup> to analyze global nutrient supply dynamics at national resolution and address nutritional shortfalls in specific countries <sup>(2)</sup>. By examining the distribution of food commodities and nutrients in 2020, we project the future food and nutrient production needs for 2050 to ensure adequate global supply. Our findings indicate that while some nutrients are sufficiently supplied on a global scale, many countries face significant national deficiencies in essential nutrients such as vitamins A, B12, B2, potassium, and iron. Addressing these gaps will require substantial increases in nutrient supply or redistribution. For example, a 1% increase in global protein, targeted at countries with insufficient protein, could close the 2020 gaps. However, if current consumption patterns persist, the global food system will need a 26% increase in production by 2050 to accommodate population growth and changing consumption patterns. Our study developed a framework for exploring future production scenarios. This involves reducing surplus national nutrient supply linearly over decades while simultaneously increasing production of undersupplied nutrients. This framework provides a more practical assessment of future needs, transitioning from idealized production scenarios to realistic projections. Our study investigated a potential future for nutrient supply to meet minimum requirements by 2050. Calcium and vitamin E are crucial and production must be increased to address significant gaps, given their severe deficiencies in 2020. Energy and fiber production will be required to peak between 2030 and 2040 before stabilizing back near 2020 levels. Predicted changes in nutrient supply from 2020 to 2050 vary: while calcium and vitamin E will need to increase, phosphorus, thiamin and the indispensable amino acids can decrease without compromising global nutrition with only minor redistribution. These results are essential for determining the food supply required to achieve adequate global nutrient supply in the future. Incorporating these insights into global food balance models will provide key stakeholders with evidence, refine future projections, and inform policy decisions aimed at promoting sustainable healthy diets worldwide.

### References

1. Holt-Giménez E, Shattuck A, Altieri M, Herren H & Gliessman S (2012) *J Sustain Agric* 36, 595-598. doi: 10.1080/10440046.2012.695331
2. Smith NW, Fletcher AJ, Dave LA, Hill JP & McNabb WC (2021) *J Nutr* 151, 3253-3261. doi: 10.1093/jn/nxab199

Keywords: Food systems; Mathematical modelling; micronutrients; sustainability; inequality



# Contribution of large-scale food fortification to micronutrient requirements of women of reproductive age in Sub-Saharan Africa

J. B. Coomson<sup>1</sup>, N. W. Smith<sup>1</sup> and W. McNabb<sup>1</sup>

Sustainable Nutrition Initiative®, Riddet Institute, Palmerston North, 4410, New Zealand.

Micronutrient deficiencies (MND) are a significant global health issue, particularly affecting children's growth and cognitive potential and predisposing to adverse health outcomes for women of reproductive age (WRA).

<sup>(1)</sup> Over half of global MND cases occur in Sub-Saharan Africa (SSA), with 80% of women estimated to be deficient in at least one of three micronutrients<sup>(2)</sup>. Large-scale food fortification is a cost-effective strategy recommended for combatting widespread MND and has been effectively implemented in many developed countries<sup>(3)</sup>. In developing countries such as SSA, socio-economic barriers and a fragmented food processing industry hinders effective implementation of food fortification<sup>(4)</sup>. As a result, countries with fortification programmes face significant challenges, including low coverage of fortified food in the population and poor compliance with fortification standards by food producers<sup>(5)</sup>. The contribution of food fortification to nutrient intakes of WRA in SSA have yet to be fully assessed. This study sought to evaluate mandatory food fortification programmes in SSA and estimate the contribution of fortified food consumption to micronutrient intakes and requirements of WRA. We utilised multi-national fortification data from the global fortification data exchange, which includes data on country fortification standards and the estimated level of compliance to fortification requirements. Data on the supply and consumption of fortifiable food was also included from the FAO. We calculated the potential nutrient intake from fortified food consumption for each nutrient using country fortification standards and food availability. We adjusted the estimated intake for each nutrient by multiplying with the estimated compliance percentage. We also assessed what proportion of women's requirements for essential micronutrients, folate, iron, iodine, vitamin A, and zinc, are met through fortified food consumption using RNI values from WHO/FAO for WRA. Between 2019 and 2021, we estimated that mandatory fortification of wheat and maize flour, oil and salt in SSA contributes a median of 138µgDFE of folic acid, 217µg of iodine, 43µg RAE of vitamin A and 2.1mg and 2.0mg of iron and zinc respectively to the intakes of WRA daily. These intakes represent 12.8% (0.0-49.2) of iron, 27.5% (0.0-83.2) of zinc, 55.0% (0.0-245.0) of folate, 8.8% (0.0-37.2) of vitamin A and 228.2% (98.2-358.6) of iodine requirements respectively, taking into consideration the lower bioavailability of iron and zinc from cereal-based diets of SSA populations. In reality, compliance with fortification requirements in SSA is low, estimated at a median of 22% (0.0 - 83.4) for maize flour, 44% (0.0 - 72.0) for vegetable oil and 83% (0.0 - 100.0) for wheat flour fortification and is a major factor limiting the overall contribution of fortification to micronutrient intakes. Inadequate regulatory monitoring to ensure compliance with fortification requirements in SSA have resulted in lower-quality fortified foods, limiting women's potential to achieve adequate micronutrient intake through fortified food consumption.

## References

1. Black, R.E., et al., *Lancet*. 2013; 382:(9890): p. 427-451.
2. Stevens, G.A., et al., *Lancet Glob Health*. 2022; 10:(11): p. e1590-e1599.
3. WHO, *Food fortification*, World Health Organization: Rome, Italy, 2023.
4. Bhagwat, S., et al., *Asia Pacific journal of clinical nutrition*. 2014; 23.
5. Global Fortification Data Exchange, 2021. <https://fortificationdata.org/wp-content/uploads/2021/06/Brief-Compliance-2.pdf>

Keywords: Hidden Hunger; fortification; micronutrients; food processing

Financial Support: T JBC is currently a PhD Fellow with the Sustainable Nutrition Initiative® and receives PhD scholarship from the Riddet Institute, Massey University. Research by JBC is funded by the Riddet Institute

## Development of emergency food formulation with mainly New Zealand ingredients for disaster preparedness

Mary Yan <sup>1,3</sup>, Rothman Kam <sup>2</sup>, Salesni Nand <sup>1</sup>, Elaine Rush <sup>3</sup>

1. Healthcare and Social Practice, Unitec Institute of Technology, Auckland, 0612, New Zealand

2. Department of Food Science and Microbiology, Auckland University of Technology, Auckland, 1010, New Zealand

AUT Food Network, Auckland University of Technology, Auckland, 1010, New Zealand

Natural disasters, exacerbated by climate change, pose significant threats worldwide. Each year, there are hundreds natural disasters (emergencies) globally that cripple economics, destroy crops, and shift millions. Immediately after a natural disaster, preliminary aid is food, water, sanitation, and shelter<sup>(1)</sup>. New Zealand typically faces natural disaster risks such as earthquakes, floods, tsunamis, and even volcanoes to consider. According to the World Health Organisation (WHO) guidelines, 'food supply should be adequate to cover the overall nutritional needs of all population groups in terms of quantity, quality, and safety. In an emergency, an adequate food ration meets the population's minimum energy, protein and fat requirement for survival and light physical activity. An adequate food ration is also nutritionally balanced, diversified, culturally acceptable, fit for human consumption and suitable for all sub-groups of the population'(2,3). In the initial research, we could not find any market available emergency food that is based on nutrient-rich milk powder. In addition, though emergency food is called survival food, the taste and nutritional profile could be improved. The aim of the study was to develop prototypes that meet the criteria of the WHO guidelines for food and nutrition in emergencies, taste acceptable and cost effective, have good nutrient profiling score and 10+ years shelf-life; in partnership with GMP Dairy Ltd. Using mainly New Zealand ingredients (e.g. oatmeal, cornflour maize, cranberries) including milk powder (whole- and skim- milk powder content was approximately 27%), formulas were computed with different combination and composition with potential ingredients. Nutritional analysis was conducted referring to the Concise New Zealand Food Composition Tables to ensure essential nutrient provision in the formulas. Three powder- form prototypes were developed based on the WHO guidelines in terms of energy, protein, fat, and vitamins. The bench trials were conducted to check the uniformity when adding water, and the taste acceptability. Of each prototype (oatmeal-wheat, chickpea-wheat, chickpea-maize), energy intake was 2124 kcal, 2118 kcal, 2103 kcal per person/day; in which energy from protein (in g and in % kcal) was (61g, 11.5%), (63g, 12%), (62.9g, 12%); energy from fat (in g and in % kcal) was (41g, 17%), (40g, 17%), (39g, 17%); respectively. Vitamins were added to the formulas (VA: VB1: VB2: VB3: VC: VD ≈ 500µg: 0.9mg: 1.4mg: 12mg: 28mg: 3.8µg). The prototypes were acceptable in taste and had a nutritional health star rating of 3.5 (on a scale of 0.5 to 5). The further work is a refinement of the ration to meet specific considerations for vulnerable persons, and handling large-scale production, packaging for 10+ years shelf- life, and distribution of emergency food products. The successful outcomes of the research will have considerable potential in production. It is beneficial for the population.

### References

1. Prasad, A.S. & Francescutti, L.H. (2017). Natural disasters. *International Encyclopedia of Public Health*. doi:10/1016/8978-0-12-803678
2. WHO. (2004). Food and nutrition need in emergencies. Technical document. Geneva.
3. FAO/WHO. (1985). Energy and protein requirements. Joint expert consultation. Technical report series 724. Geneva.

Keywords: emergency; food; energy intake; nutritional requirement

Financial Support: This research was co-funded by Unitec Institute of Technology and GMP Dairy Ltd.

# Plenary 4 Brain Health

## The role of nutrition in Parkinson's disease; what is the latest evidence?

FE Lithander

Liggins Institute, University of Auckland, Auckland, New Zealand

Parkinson's disease (PD) is the second most prevalent neurodegenerative disease globally (1) whereby there is a loss of dopaminergic neurons in the brain and a deficiency of dopamine. PD is characterised by dyskinesia, rigidity, tremor and postural instability, and non-motor symptoms which include neuropsychiatric, sleep and autonomic dysfunction which often occur before motor symptoms (2). Several of these motor and non-motor symptoms can adversely affect nutritional status (3) and a significant number of people with PD are at risk of malnutrition (4). Observational studies have examined the relationship between dietary intake, symptoms and disease progression yet there is a lack of randomised controlled trials of dietary interventions. This presentation will examine the evidence base and suggest future directions for nutrition research in this important area.

1. GBD 2016 Neurology Collaborators (2019) *Lancet Neurol* 18, 459-480
2. Tanner CM, Ostrem JL (2024) *N Engl J Med* 391, 442-452
3. Ó Breasail M, Smith MD, Tenison E et al. (2022) *Proc Nutr Soc* 81, 12-26
4. Kacprzyk KW, Milewska M, Zarnowska A et al. (2022) *Nutrients* 14, 5194

Conflict of interest: Abbvie, honorarium

Keywords: Parkinson's disease; non-motor symptoms; nutrition; randomised controlled trials

## A2 Food in education settings

### Keeping our noses out of the lunchbox - supporting positive kai environments in education settings

A Grant<sup>1</sup>, J Quigley<sup>1</sup>, A Reihana<sup>1</sup>, D Johnstone<sup>1</sup>

1. National Public Health Service, Te Waipounamu, Health NZ | Te Whatu Ora, Timaru, 7910, New Zealand

Nourishing kai supports behaviour and concentration, tamariki learn well when they are food secure and eat regularly <sup>(1)</sup>. Evidence shows that early food experiences influence our relationship with food as adults <sup>(2)</sup> and that tamariki health and wellbeing are shaped by education environments. WAVE (Well-being and Vitality in Education) has enduring partnerships with all preschools, kindergartens, playcentres, primary and secondary schools in our South Canterbury rohe, supporting healthy education environments with the goal of reducing inequities in health and education outcomes. While priority education settings regularly express concerns related to food security and consumption of highly processed foods, health promotion advisors report that kaiako have been reluctant to promote nutrition using a whole setting approach. The whole school approach includes policies and procedures for kai and wai, nutrition education within teaching and learning and nutrition messages promoted to whānau through enrolment information, learning stories/newsletters and displays, and in conversations with whānau. We describe an increase in kaiako acceptability occurring with the move from discussing nutrition as 'healthy eating' to using language of 'supporting positive kai environments'. We include examples of mahi that the education settings put in place in this process.

Process: between October 2023 and June 2024:

- Health promotion kaimahi internal professional development in supporting positive kai environments,
- Redeveloping WAVE resources to align with messages of supporting positive relationships with kai and supporting food explorers,
- Communicating widely the updated approach of supporting positive relationships with food, through newsletters and meetings with kaiako, and sharing Education Hub and Heart Foundation webinar and article resources with education settings to support kaiako professional development.
- During meetings with lead kaiako for health and wellbeing, the health promotion advisors in early childhood education and primary schools discussed nutrition in the context of supporting positive kai and wai environments and developing positive relationships with food. Meetings were a combination of one-on-one meetings with the lead kaiako (once a term) and staff team meetings.

Evaluation: Interview questions were sent to priority education settings in September 2024 to gather feedback on perceived barriers to promoting nutrition, how the change to 'positive kai and supporting kai explorers' has made a difference, and to hear the settings' plans for current and future action in their setting. Preliminary feedback from kaiako indicates that supporting positive kai environments as an evidence-based approach has improved the capacity of kaiako in ECE and Primary Schools to embed health promoting nutrition messages in the settings. Kaiako are more willing to approach nutrition messages in a holistic manner to support tamariki, compared to advising whānau what kai to put in the lunchbox. Interview results from our priority settings will be available at the end of October 2024 and will be presented.

#### References

1. Orr G. (2023) How to support positive food environments in early childhood settings. Accessed October 2023. The Education Hub, <https://theeducationhub.org.nz/how-to-support-positive-food-environments-in-early-childhood-settings>
2. Vaughn, A. E., Ward, D. S., Fisher, J. O., et al. (2016). *Nutr Rev*, 74(2), 98–117.

Keywords: food environments; evaluation; health promotion; tamariki

## **Paying it forward- Tohu Manawa Ora | Healthy Heart Award makes an investment in tamariki and early learning environments**

F Arenhold<sup>1</sup>

<sup>1</sup>.Heart Foundation, Prevention Team, Auckland, 1010, New Zealand

The Tohu Manawa Ora | Healthy Heart Award programme helps early learning services across Aotearoa create an environment that promotes nutritional health and physical activity. It achieves a sustainable change to the environment by using a ‘whole-service’ approach, through governance and management, learning and teaching, collaboration and professional development. The programme aims to foster happy tamariki with awareness of how to have hearts fit for life, ensuring healthier futures for whānau across Aotearoa New Zealand. To evaluate and understand the impact and social value of the Tohu Manawa Ora | Healthy Heart Award programme on fostering healthy habits and creating supportive environments in early learning settings across Aotearoa New Zealand the Heart Foundation undertook this evaluation with ImpactLab. Two hundred and fifteen early learning services and 33,717 tamariki across Aotearoa New Zealand, who were enrolled in or had achieved a Tohu Manawa Ora | Healthy Heart Award, were used to determine the impact and social value of the programme. This was achieved through using a social value calculation which integrates multiple data sources and analytical methods. Firstly, impact values derived from the programme were combined with evidence from global literature on the effectiveness of similar health promotion programmes. Secondly, the size of the opportunity for participants—early learning services across Aotearoa New Zealand—to achieve more positive health outcomes was assessed. Thirdly, the number of people supported by the programme was considered. Every year, the Tohu Manawa Ora | Healthy Heart Award programme delivers \$6,163,581 of measurable good to society in New Zealand. Outcomes for tamariki of improved oral health, physical activity and reduced diabetes and improved physical activity for whānau directly contribute to the social value. Improved health equity, nutrition, increased food exposure and physical activity, promotion of lifelong wellbeing and positive health behaviours, reduced cardiovascular disease and sugar consumption indirectly contributed to the social value. This means that every dollar invested in the Tohu Manawa Ora | Healthy Heart Award programme delivers \$4.50 of measurable good to New Zealand. The Tohu Manawa Ora | Healthy Heart Award programme delivers significant measurable social value to Aotearoa New Zealand. Growth, development and continued funding of the programme should continue to further positively impact the future of tamariki and their whānau in Aotearoa New Zealand.

### References

1. Impact Lab, Heart Foundation. (2024). Tohu Manawa Ora | Healthy Heart Award ImpactLab GoodMeasure Report. Impact Lab

Keywords: early learning; nutrition; physical activity; environment; impact; social value



## Food waste and the Ka Ora, Ka Ako school lunch programme

Z Hatraby<sup>1</sup>, C Smith<sup>1</sup>, M Miroso<sup>2</sup>, SA Skeaff<sup>1</sup>

1. Department of Human Nutrition, University of Otago, Dunedin, 9054, New Zealand

2. Department of Food Science, University of Otago, Dunedin, 9054, New Zealand

Globally, food waste from school lunch programmes varies considerably, ranging from 33 to 116 g/student/day, with vegetables the most wasted food category <sup>(1)</sup>. In New Zealand, the Ka Ora Ka Ako school lunch programme provides free healthy lunches to schools whose communities face greater socio-economic barriers. The programme has been criticised with claims that large quantities of food is wasted, although there is no available data available to support these comments. The aim of this study was to measure the quantity and destinations of food waste from the Ka Ora, Ka Ako school lunch programme in Dunedin schools. A total of eight primary schools in Dunedin participated. At each school, data was collected over four days: the first day was an observation day and on the remaining three consecutive days food waste was measured. Equipment (e.g., measuring scales, buckets and containers) was used for direct weighing and to carry out the waste composition analysis (i.e., manually sorting waste by type). Data was recorded and analysed using Microsoft Excel software. School rolls ranged from 17 to 353 students. Across the seven schools, the total amount of food waste from leftovers was 7606 g/day (SD: 6171), with a mean of 52 g/student/day (SD 22). Destinations of food waste from leftovers varied, ranging from returning to the supplier to being disposed in school rubbish bins (to landfill). Using the Target, Measure, Act approach recommended for food waste, the 'Target' is to halve per capita global food waste at the retail and consumer levels by 2030 <sup>(2)</sup>. This study contributes to the second step, which is to 'Measure' food waste. The findings from this study may be used for the third step, 'Act', to reduce food waste from the Ka Ora, Ka Ako school lunch programme, diverting this from landfill.

### References

1. Byker CJ, Farris AR, Marcenelle M, Davis GC, Serrano EL. (2014) *J Nutr Educ Behav* 46(5), 406-411
2. Food and Agricultural Organization of the United Nations. Accessed via: <https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/1231-global-food-losses/en>

Keywords: food waste; sustainability; children; school

## Food waste at residential colleges at the University of Otago - statistics and strategies

BC Mills<sup>1</sup>, M Miroso<sup>2</sup>, R O'Brien<sup>3</sup>, SA Skeaff<sup>1</sup>

1. Department of Human Nutrition, University of Otago, Dunedin, 9016, New Zealand.
2. Department of Food Science, University of Otago, Dunedin, 9016, New Zealand.
3. Sustainability Office, University of Otago, Dunedin, 9016, New Zealand.

Food waste is a global problem, with estimates of a third of all food produced going to waste<sup>(1)</sup>. In 2015, the United Nations set Sustainable Development Goal (SDG) Target 12.3, to halve food waste by 2030<sup>(2)</sup>. To reach this goal, following the Target-Measure-Act approach is considered best practice<sup>(3)</sup>. At the University of Otago, in Dunedin, Aotearoa New Zealand, approximately 3,500 students live across 14 fully catered residential colleges. The University of Otago has formally committed to pursuing the SDGs, and therefore reducing food waste. In order to track progress towards SDG 12.3, baseline measurements of food waste at the residential colleges are required. This research aimed to quantify food waste from the residential colleges, as well as to qualitatively discuss reasons for the waste and potential ideas to reduce waste. On three days at each of the 14 residential colleges, preparation, servery, and plate waste were measured from breakfast, lunch, and dinner, following a protocol developed from the Waste and Resources Action Programme Food Loss and Waste Standard. Additionally, five focus groups were conducted across three residential colleges, with students and staff, to discuss food waste at the residential colleges. An average of 172 g (95% CI 154 g to 191 g) of food waste were produced per student per day, with approximately 50% being plate waste, 35% being servery waste, and 15% being preparation waste. Reinforcing the quantitative data, in the focus groups staff voiced that the plate waste was a concern to them. Ways to reduce plate waste were discussed and included increasing awareness through making the waste more visible, as well as improving communication between kitchen staff and students particularly regarding serving sizes and preferred menu items. Servery waste was also considered, with more consistent forecasting of meal attendance across the residential colleges and a range of solutions for leftovers, such as a fridge for students or donation to other organisations, being suggested. With these baseline measurements of quantities of food waste produced at the University of Otago's residential colleges, actions taken to reduce and mitigate food waste can be measured for effectiveness, and steps can be taken towards achieving SDG 12.3 collaboratively across the tertiary education sector.

### References

1. Gustavsson J, Cederberg C, Sonesson U, Van Otterdijk R, Meybeck A. Global food losses and food waste. FAO; 2011. <https://www.fao.org/4/mb060e/mb060e00.pdf>
2. FAO. Indicator 12.3.1 - Global Food Loss and Waste. 2024 <https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/1231-global-food-losses/en>
3. Champions 12.3. Call to Global Action on Food Loss and Waste. 2020 Sep 24. <https://champions123.org/sites/default/files/2020-09/call-to-global-action-food-loss%20-waste-champions-123.pdf>

Keywords: food waste; tertiary education; Sustainable Development Goals; waste prevention

# Plenary 5: Nutrition and diseases of ageing

## Muscle Health Matters – Navigating the Landscape of Sarcopenia from Diagnosis to Management

RM. Daly

Institute for Physical Activity and Nutrition, Deakin University, Melbourne, Victoria, Australia 3125

Sarcopenia is a skeletal muscle disease characterised by low muscle mass, strength and/or impaired physical function that is associated with a wide range of adverse outcomes including osteoporosis, falls, fractures, disability, hospitalization, loss of independence and quality of life and mortality, if left untreated.<sup>(1-2)</sup> This is also growing evidence linking sarcopenia to many other chronic conditions, including type 2 diabetes, fatty liver disease, cognitive impairment and dementia, certain cancers (and post-treatment outcomes), cardiovascular disease and impaired immunity.<sup>(3-4)</sup> Despite its significant impact, awareness and knowledge about this disease amongst healthcare professionals (and the general public), including how to identify and treat/manage sarcopenia, remains low. There are currently no approved pharmacological agents for the treatment sarcopenia, but there is moderate-to-high level evidence informing clinical practice guidelines that multifaceted interventions incorporating resistance-based training with adequate nutrition focusing on high quality protein or multi-nutrient protein-based supplements can prevent and manage this disease.<sup>(1, 5-6)</sup> Meta-analyses of randomised controlled trials consistently demonstrate that progressive resistance training (at least twice weekly) is the most effective approach to elicit gains in muscle mass and strength (independent of age), with the provision of dietary protein or multi-nutrient protein-based supplements providing small added benefits.<sup>(7)</sup> Emerging evidence also indicates that minimal dose exercise strategies (e.g., resistance/strength “snacking” activities) and limiting sedentary behaviours (breaking up prolonged sitting) may help to attenuate age-related muscle loss. With regards to nutritional factors, most guidelines for older adults recommend a protein intake of 1.2 to 1.6 g/kg/d (25-30g of protein per meal) incorporating 3-4g of leucine to support muscle health. However, the benefits of protein alone on muscle-related outcomes are modest and appear mostly limited to those with insufficient (deficient) intakes (levels) and/or who are sarcopenic, frail and/or malnourished. A wide range of other nutritional-related factors (with and without exercise) have been investigated, including  $\beta$ -hydroxy  $\beta$ -methylbutyrate (HMB), vitamin D, creatine, antioxidants, omega-3 fatty acids, and phospholipids, as well as multi-nutrient supplements and various diets (Mediterranean diet), dietary patterns and foods (dairy products). There is also growing evidence that altering the gut microbiota and the use of probiotics, prebiotics and synbiotics may enhance muscle health. This presentation will provide an update of the evidence related to these factors to help guide decision making for clinical management and provide an overview of the current criteria used to identify poor muscle health and sarcopenia, including a new muscle health monitoring and management algorithm we have developed.

### References

1. Cruz-Jentoff AJ, Bahat G, Bauer J, Boirie Y et al. (2019) *Age Ageing* 48(1), 16-31
2. Beaudart C, Zaaria M, Pasleau F, Reginster J-Y et al. (2017) *PLoS One* 12(1), e0169548
3. Yuan S & Larsson SC (2023) *Metabolism* 144, 155533.
4. Xia L, Zhao R, Wan Q, Wu Y et al. (2020) *Cancer Med* 9(21):7964-7978.
5. Dent E, Morley JE, Cruz-Jentoft AJ, Arai H et al. (2018) *J Nutr Health Aging* 22(10),1148-1161
6. Daly RM, Iuliano S, Fyfe JJ, Scott D et al. (2022) *J Nutr Health Aging* 26(6):637-51
7. Liao C-D, Huang S-W, Chen H-C, Huang M-A et al. (2024) *Nutrients* 16(7), 941

### Keywords

Sarcopenia; muscle; older adults; dietary protein; multi-nutrient supplementation; resistance training; exercise

### Conflict of Interest

Honorarium and educational grant from Abbott Australasia Pty Ltd

## **Micronutrient intakes of former New Zealand representative athletes over the age of 60 years**

M Peddie<sup>1</sup>, JT. Gale<sup>1</sup>, M Harland<sup>1</sup>, S Grenfell<sup>1</sup>, XJ. Walker<sup>2</sup>, D Gerrard<sup>2</sup> TRussel-Camp<sup>2</sup>, DL. Waters<sup>2,3,4</sup>, L Vlietstra<sup>5</sup>

1. Department of Human Nutrition, University of Otago, Dunedin, 9016, New Zealand
2. Department of Medicine, University of Otago, Dunedin, 9016, New Zealand
3. School of Physiotherapy, University of Otago, Dunedin, 9016, New Zealand
4. Department of Internal Medicine, Division of General Internal and Geriatric Medicine, University of New Mexico, USA
5. School of Physical Education, Sport and Exercise Sciences, University of Otago, Dunedin, 9016, New Zealand

Masters athletes tend to have higher intakes of calcium, magnesium, iron, and zinc when compared to Australian national population data from similar age groups<sup>(1)</sup>. However, little is known about the diets of New Zealand Olympians as they get older. This study aimed to describe the micronutrient intakes of New Zealand Olympic and Commonwealth Games athletes over the age of 60 years and make comparisons with National Nutrition Survey data. Thirty-three individuals (mean age 76±8 years, n=27 male) who had represented New Zealand at an Olympic or Commonwealth Games participated in this study. Dietary intake was assessed using three 24-h diet recalls. The first recall was conducted face to face in the participant's home and the second and third were completed over a voice or video call on non-consecutive days following this. All recalls were performed using a multiple-pass technique and entered into FoodWorks dietary analysis software (Version 9, Xyris Software Ltd., Brisbane, Australia). Mean intakes across the three recalls were used to represent the intake of each individual. This study was approved by the University of Otago Ethics Committee (Health; H23/054, April 2023). The mean intakes of iron (males 13.3±5.1 mg, females 9.9±1.9 mg) and zinc (males 10.7±4.0 mg, females 9.6±1.9 mg) in Olympians were similar to those reported in those over 70 y in the 2008/09 New Zealand Adult Nutrition Survey, but more than 60% of Olympians had intakes below the estimated average requirements for these nutrients. Intakes of calcium (males 1048±474 mg, females 810±139 mg) and selenium (males 66.7±49.1 µg, females 48.4±17.7 µg) were higher in Olympians when compared to the 2008/09 New Zealand Adult Nutrition Survey data, however 39% and 61% of Olympians still had intakes below the estimated average requirements, respectively. While this group of older New Zealand Olympians did have higher intakes of some nutrients than a representative sample of their peers, a marked number are still at risk of inadequate intakes and may benefit from a nutrition intervention to improve the overall quality and adequacy of their diet.

### References

1. Guo S, Shaoni GL, Stuart-Smith WA, et al (2023) *Nutrients*, 15, 4973.

Keywords: Olympian; Calcium; Zinc; Older adults; Diet

## **Palatability, absorption, compliance and usability of ready-to-drink compact ONS formulation containing functional dairy proteins: Programme of Research**

C Mawson<sup>1</sup>, K Munday<sup>2</sup>, N Janin<sup>1</sup>, MC. Kruger<sup>3</sup>, J Thomson<sup>1</sup>

1. Fonterra Research and Development Centre, Private Bag 11029, Dairy Farm Road, Palmerston North 4472, New Zealand
2. UCOL Manawatu, Palmerston North, 4442, New Zealand
3. School of Health Sciences, College of Health, Massey University, Palmerston North, 4472, New Zealand

Malnutrition is a significant issue among older New Zealanders, with 24% malnourished and 35% at high risk (1). Oral nutritional supplements (ONS) are prescribed to improve nutrient intake in malnourished or at-risk individuals. Evidence supports that ONS can enhance energy and protein intake (2). However, efficacy depends on regular and adequate consumption. Fonterra Research and Development Centre sponsored a research programme of three interventions with the aim of assessing the liking, absorption, and compliance of ONS formulations (containing functional proteins at 9.6% and 14.4% w/v protein) versus commercial comparators. A feasibility study was also done to assess whether ONS could be used to fortify foods in a residential care setting. All trials received ethics approval. In study one (trial registration: NCT04397146), the palatability and satiating effects were evaluated in 104 participants. Fonterra's 14.4% protein ONS was well-received for sweetness, creaminess, and texture, while the 9.6% protein ONS had lower palatability. Satiety levels were similar across all products. Key drivers of overall liking included smooth texture, pleasant taste, and ease of drinking. In study two (ACTRN12621000127808), a randomized, double-blind crossover trial of 18 healthy adults, the post-prandial effects of Fonterra's formulation compared to energy and protein matched commercial products on amino acid (AA) appearance and gastric emptying were examined. Fonterra's 14.4% protein ONS significantly increased the incremental area under the curve and peak concentration of essential and branched-chain AA, including leucine, compared to control ( $p < 0.05$ ). These findings suggest potential benefits for muscle mass preservation in at-risk patients. In study three (ACTRN12622000842763), a randomized, single-blind crossover trial, 100 older adults completed compliance and tolerance assessments of Fonterra's formulation compared to energy and 9.6% protein matched commercial product. Compliance for all three ONS was high, with mean compliance rates of 96.1% for Fonterra 9.6%, 94.5% for Fonterra 14%, and 95.2% for comparator. Palatability scores were not significantly different. Adverse events were minimal and short-lived, mainly occurring on the first day; 30-50% of participants reported tolerance issues, such as flatulence, bloating, and burping, regardless of the product. No significant differences in satiety were observed between the interventions. Lastly, a pilot study assessed the feasibility of incorporating ONS into foods in a residential care setting. The chef found the ONS easy to work with and add to desserts, which subsequently increased the protein and calcium content of main meals. Residents found the fortified desserts palatable and acceptable. This research programme supports the use of ONS assisting older adults to meet their nutrient requirements and demonstrates that formulations containing Fonterra's functional proteins are well-accepted, effective in increasing amino acid appearance, and easily incorporated into institutional diets, with high consumption compliance and minimal adverse effects.

### References

1. Wham, C., et al. *Australas J Ageing*, 2017. 36(3): p. 205-211.
2. Collins, J. and J. Porter. *J Hum Nutr Diet*, 2015. 28(1): p. 1-15.

Keywords: Malnutrition; older-adults; protein; oral-nutritional-supplements

Conflict of Interest: Some authors are employees of Fonterra.

## Malnutrition risk, nutrition impact symptoms, and dietary intake in community living head and neck cancer survivors 6 months to 3 years post treatment: a case series

D. Oakes<sup>1</sup>, P. von Hurst<sup>1</sup> and M. Casale<sup>1</sup>

1. Massey University, School of Sport, Exercise and Nutrition, Auckland, 0632, New Zealand

Head and neck cancer (HNC), characterised by malignant neoplasms originating in the oral cavity, upper aerodigestive tract, the sinuses, salivary glands, bone, and soft tissues of the head and neck, is diagnosed in approximately 600 people annually in New Zealand. Although HNC is a less common cancer, it has a profound effect on almost all aspects of the lives of those affected, particularly the nutritional and social domains. This is due to the common treatment modality being surgery and/or radiotherapy, which can result in major structural and physiological changes in the affected areas, which in turn affects chewing, swallowing, and speaking <sup>(1)</sup>. Specific nutrition impact symptoms (NIS) of HNC have been identified and are significant predictors of reduced dietary intake and malnutrition risk <sup>(2)</sup>. We aimed to identify and describe the malnutrition risk, prevalence of NIS, and protein and energy intake of community living adult HNC survivors 6 months–3 years post treatment in New Zealand. Participants were recruited through virtual HNC support groups in New Zealand. A descriptive observational case series design was used. Malnutrition risk was determined using the Patient-Generated Subjective Global Assessment Short Form (PG-SGA SF). Malnutrition was defined as a PG-SGA SF score between 2 - 8 (mild/suspected - moderate malnutrition) or  $\geq 9$  (severely malnourished). NIS were obtained via a validated symptom checklist specific for HNC patients <sup>(3)</sup>, and dietary data was collected using a four-day food record. Participants (N=7) are referred to as PTP1 – PTP7. PTP1 was well-nourished. PTP3 through PTP7 were categorised as mildly/suspected to moderately malnourished (scores ranged from 2- 7), and PTP2 was severely malnourished (score of 16). NIS were experienced by all seven participants, with “difficulty chewing” and “difficulty swallowing” being the most selected and highest scored NIS that interfered with oral intake. PTP2 (severely malnourished) scored loss of appetite, difficulty chewing, and difficulty swallowing highly (interfering “a lot”), indicating a high degree of prevalence and impact. Despite being well-nourished, PTP1 had inadequate energy intake (85.5% of their estimated energy requirement (EER)). PTP2, 3, 6, and 7 also had inadequate energy intake (79.3%, 79.3%, 73.9%, and 99.3%, respectively, of their EER). All participants had adequate protein intake based on a range of 1.2-1.5 g/kg body weight per day. The prevalence of malnutrition and NIS in this case series indicates an urgent need for research to identify the true extent of malnutrition in community living HNC survivors post treatment.

### References

1. Nilsen ML, Belsky MA, Scheff N et al. (2020) *Curr Treat Options Oncol* 21, 92
2. Kubrak C, Olson K, Jha N et al. (2010) *Head Neck* 32, 290-300
3. Schmidt KN, Olson K, Kubrak C et al. (2013) *Support Care Cancer* 21, 27-34

Keywords: Head and neck cancer; survivorship; nutrition impact symptoms; malnutrition



# Assessment of protein intake and protein quality among New Zealand vegans

BXP Soh,<sup>1</sup> N Smith<sup>1</sup> P von Hurst<sup>2</sup> M Vignes<sup>3</sup> W McNabb<sup>1</sup>

1. Riddet Institute, Massey University, Palmerston North, 4410, New Zealand
2. Massey University, School of Sport, Exercise and Nutrition, Auckland, 0632, New Zealand
3. Massey University, School of Mathematical and Computational Sciences, Palmerston North, 4410, New Zealand

Dietary protein provides amino acids, nine of which are indispensable (IAAs) as they are not synthesised within the body. Adoption of a vegan diet has shown an increased trend in several Western countries.

(1) Past assessments of total protein intake of vegan populations were found to be low but not necessarily below daily requirements.<sup>(2)</sup> However, plant-sourced proteins generally have lower quantities of digestible IAAs as compared to animal-sourced proteins.<sup>(3)</sup> Simply accounting for protein intake without considering amino acid profile and digestibility could overestimate protein adequacy among vegans. This study aims to quantify protein intake and protein quality (digestible IAAs) among a cohort of NZ vegans as compared to individual requirements. Dietary intake data was obtained through a four-day recall from 193 individuals participating in a cross-sectional study of adult vegans (above 18 years) residing in New Zealand who have followed a vegan diet for at least two years. Ethical approval was granted (HDEC 2022 EXP 12312). Anthropometric data was collected at Massey University, Auckland. Protein and IAA composition of all foods were derived by comparing dietary data to food composition data from New Zealand FoodFiles and the US Department of Agriculture. Mean values for protein and IAA were adjusted for true ileal digestibility and body weight (kg). 4,5

Mean protein intakes for males and females were 0.99 and 0.81 g/kg of body weight/day, respectively. Overall, 78.8% of males and 74.5% of females met the Estimated Average Requirement (EAR) for daily protein. Plant-sourced proteins in the vegan diet provided 52.9 mg of leucine/g of protein and 35.7 mg of lysine/g of protein, which were below the reference scoring patterns (leucine: 59mg/g, lysine: 45mg/g).<sup>(5)</sup> When adjusted to individual body weight, average IAA intakes were above daily requirements, but lysine just met requirements at 31.2 mg/kg of body weight/day (reference: 30 mg/kg/d). The importance of adjusting for digestibility is noted as the percentage of vegans meeting adequacy for protein and IAAs decreased as compared to using only IAA compositions without this adjustment. In contrast to grains and pasta, legumes and pulses were the foods that contributed most to overall protein and lysine intake while providing lower energy intake. Lysine followed by leucine were the two most limiting IAAs in the diet of this NZ vegan cohort. Increased proportion of legumes and pulses, and decreased proportion of grains and pasta within the diet can potentially increase leucine and lysine intake but must be considered in the context of the whole diet.

## References

1. Allès B et al. (2017). *Nutrients*, 9(9).
2. Bakaloudi DR et al. (2021). *Clinical Nutrition*, 40(5), 3503-3521.
3. Pinckaers P J et al. (2021). *Sports Medicine*, 51, 59-74.
4. Gilani S et al. (2012). FAO, World Health Organisation.
5. FAO, WHO (2007). World Health Organisation.

Keywords: Vegan diets, protein intake, protein quality, lysine

Financial Support: Lottery Health Project Grant (LHR-2022-185)

# Plenary 6: Health and Behavioural insights in Māori, Pacific and Asian populations in Aotearoa

## **Pacific nutrition and dietetic practice in Aotearoa, New Zealand - bridging for healthier outcomes**

M Funaki-Tahifote

An independent part-time contractor clinical dietitian from Fakaolla at the Tongan Health Society GP clinics in Auckland, New Zealand; Member of the Total Diet Study Governance Board, New Zealand Food Safety, Ministry of Primary Industries; One of the auditors for the 2023 and 2024 MyCCP for NZ registered and practicing dietitians; Member of the Food Policy Expert Group of Health Coalition Aotearoa (HCA); Member of PIFNAG (Pacific Islands Food & Nutrition Action Group); Current treasurer of the Federation of Oceanic Nutrition Society (FONS); One of the Heads of Foundation, MAS Foundation.

The poorer health outcomes of Pacific peoples in Aotearoa New Zealand are well documented. It is therefore, of no surprise that Pacific peoples die ten years earlier than non-Pacific and non-Māori peoples. A devastating situation that is very preventable both from an individual, communal, societal, national and global perspective. Public health experts would argue that the poorer health experienced by Pacific peoples are the outcomes and results of the environment and system in which they live, including the health system itself. Putting the wider system and its complexity aside, nutritionists and dietitians are a part of Aotearoa New Zealand's health system and play an important role in providing accurate and evidence-based nutritional information that will help Pacific peoples take control of their health and be part of the co-design of their own health outcomes and destiny. This presentation aims to provide the contexts, Pacific health models and worldviews and corresponding practical information that may be useful for nutritionists and dietitians working with Pacific peoples. It is hoped that these will provide support and a catalyst for better bridging opportunities for healthier outcomes for Pacific peoples living in Aotearoa New Zealand.

Keywords: Pacific nutrition; Pacific dietetics, Pasifika foods

## **Dietary beliefs, knowledge and behaviour of NZ South Asians at risk for cardiovascular disease.**

Dr Sherly Parackal<sup>1</sup>; Assoc Prof Kirsten Coppell<sup>2</sup>; Dr Mudassir Anwar<sup>3</sup>; Dr Sumera Saeed Akthar<sup>1</sup>

1. Centre for International Health, Division of Health Sciences, University of Otago, 55 Hanover Street, Dunedin 9016, New Zealand
2. Department of Medicine, Level G/7 – Ward Support Block, University of Otago, Wellington, 23A Mein Street, Newtown, Wellington 6021, New Zealand
3. School of Pharmacy, Division of Health Sciences, University of Otago, 18 Frederick Street, Dunedin North, Dunedin 9016, New Zealand

Cardiovascular disease (CVD) is the most potent killer in Aotearoa New Zealand (NZ) with South Asians being one of the three high-risk groups. This study aimed to investigate health beliefs, knowledge, and behaviours related to diet among NZ South Asians at risk of CVD, using a mixed- methods approach. Demographics and dietary data were collected via an online Qualtrics survey and qualitative data on health beliefs and knowledge about heart-healthy foods were collected using semi- structured phone interviews. Twenty-one South Asian participants with diagnosed type 2 diabetes and/or hypertension and/or hypercholesterolemia were recruited via stakeholder engagement and advertisements through South Asian cultural and religious organisations. The majority of participants (62%) were aged 35-50 years, 10 were female, 11 were male and 67% were long-term residents of NZ. Most participants were unsure of the recommendations for fruit and vegetable consumption and only 48% and 29% met these guidelines, respectively. This is worrying as NZ Health survey data show a steady decrease in fruit and vegetable consumption among South Asians over 20 years with only 27% meeting the guidelines in 2021. <sup>(1)</sup> Sixty-two percent of participants consumed milk and yoghurt  $\geq 4$  times a week; 63% consumed full-fat milk and 45% consumed full-fat yoghurt regularly. These findings are consistent with that found for healthy South Asians in NZ, <sup>(2)</sup> where dairy, the primary source of saturated fats in South Asian cuisine, increased post-migration. Some participants believed that full-fat dairy increases the risk of heart disease, yet they still preferred to use full-fat milk and ghee as they believed it is healthier than low-fat varieties. Most participants believed that salty foods and pickles increase the risk of heart disease with 33% consuming salted pickles “sometimes” and only 28% choosing “low or reduced salt” food varieties “regularly/always”. More than half (57%) chose reduced-fat varieties of foods deliberately to reduce their risk of CVD. Red meat and deep-fried fatty foods were the most common foods that most participants thought they should avoid; however, some were not sure. Foods that participants considered heart-healthy were green vegetables, lentils and ghee in moderation. Most meat-consuming participants were unaware of healthy cuts of meat with only 38% reporting always choosing low-fat cuts of meat. Most participants believed that they could take some measures to reduce their risk of heart disease. Nevertheless, their health beliefs were not consistent with knowledge of or behaviours concerning heart-healthy measures. Substantial knowledge gaps evident in the reported dietary behaviours need to be addressed to reduce the risk of CVD among at-risk South Asians.

### References

1. Wu Z et al. 2024. Asian Health in Aotearoa: Findings from the New Zealand Health Survey 2002–2021.
2. Parackal S. Post-migration food habits of New Zealand South Asian migrants: Implications for health promotion practice. *J Migr Health*. 2023;7:100182.

Financial Support: This project was funded by an Otago Medical Research Foundation Laurensen Award, 2023.

Keywords: South Asian; Cardiovascular Diseases; Health Beliefs; Knowledge and Behaviour

## **New Zealand Food Safety Consumer Food Safety Insights Survey 2023 – highlights and reflections using Te Whare Tapa Whā**

J Edmonds<sup>1</sup>, P Turner<sup>2</sup>

1. New Zealand Food Safety, Pastoral House, 25 the Terrace Wellington, 6011
2. The Navigators, New Zealand

In New Zealand, Māori and Pasifika have the lowest foodborne illness notification rates (per 100,000 people) for most foodborne illnesses <sup>(1)</sup>; with underreporting of illness and differing food safety practices as possible factors. New Zealand Food Safety (NZFS) is responsible for regulating the New Zealand food safety system to make sure food is safe and suitable for all New Zealanders. Supporting consumers to make informed food choices and understand safe food preparation practices is a key priority for NZFS <sup>(2)</sup>. As part of this, NZFS communicates food safety advice through various traditional channels including published material and campaigns. To better understand consumer attitudes, knowledge and behaviours around food safety and suitability, NZFS conducted an online survey of 1602 New Zealanders 15 years and over between 24 November and 17 December 2023. The survey used a quota sampling method and included booster samples for Māori and Pasifika. The margin of error was  $\pm 2.9\%$  at a 95% confidence interval. The survey was available in English and Te Reo Māori. <sup>(3)</sup> The study highlighted key insights into food safety practices for Māori and Pasifika. For example, NZFS advises consumers not to wash raw chicken due to the potential for cross-contamination during food preparation. In the survey <sup>(3)</sup>, we found that 67% of consumers who prepare chicken said they washed it either sometimes or always; further, 79% of consumers who prepare chicken believe they should. The most common reason for washing raw chicken was because of hygiene (23%). Even though NZFS messaging is clear to not wash raw chicken, it is concerning that the advice is not adhered to, and the risks are not recognised. In the survey, Pasifika who prepare chicken were more likely to say they wash raw chicken either sometimes or always (79% of Pasifika). As a food safety regulator, it is important to understand our Māori and Pasifika consumers and their perceptions, knowledge and behaviours around food safety practices, but also to consider how we can communicate effectively with them. For example, of the food safety information sources most trusted, Māori were more likely to trust friends, family and or whanau (49%), and Pasifika were most likely to trust health professionals (53%) <sup>(3)</sup>. With a view of trying to better understand our Māori and Pasifika consumers models such as Te Whare Tapa Wha <sup>(4)</sup> (the Māori Health Model) provide an important and holistic view of health-based concepts of taha whanau (family and social wellbeing), taha tinana (physical wellbeing), taha hinengaro (mental and emotional wellbeing) and taha wairua (spiritual wellbeing). There are opportunities for NZFS to reflect on and use Te Whare Tapa Wha throughout the survey development and implementation process, through to the delivery of targeted food safety messages.

### References

1. NZ Food Safety. NZFS Strategy Refresh 2022-24, August 2022.
2. Consumer Food Safety Insights Survey: Perceptions, knowledge and behaviours. 2003.
3. Horn B, Pattis I, Cressey P, Armstrong B, Lopez L, Soboleva T. Annual report concerning Foodborne Diseases in New Zealand 2022. 2023.
4. Durie, M. Te Whare Tapa Whā. 1984.

Financial Support: Funded by New Zealand Food Safety

Keywords: Food safety; food suitability; consumer behaviour; Māori Health model

## A3: Food surveillance to inform policy

### Child-appealing marketing on packaged food in New Zealand, and considerations for policy design

C.Haliburton<sup>1</sup>, B. Follong<sup>1</sup>, C. Ni Mhurchu<sup>1</sup>, K.E. Bradbury<sup>(1)</sup>

1.Epidemiology and Biostatistics, School of Population Health, The University of Auckland, Auckland 1023, New Zealand

There is strong evidence that children are particularly vulnerable to the persuasiveness of marketing, and that their exposure to marketing of unhealthy food products influences their preference for and consumption of these products<sup>(1)</sup>. In New Zealand (NZ), marketing is self-regulated by the industry-led Advertising Standards Authority (ASA). The ASA has two relevant codes, the Children's Advertising and Food and Beverage Advertising Codes; however, product packaging is omitted. We investigated child-appealing marketing techniques displayed on packaged food products in NZ. We also assessed the potential impacts of different nutrient profiling systems to inform future policy design to restrict child-appealing marketing on food products in NZ. This research was conducted using the 2023 Nutritrack dataset, which contains data collected via photographs of packaged food products available in major NZ supermarkets. We focused on product categories that were shown to have a high prevalence of child-appealing marketing in a similar Australian study<sup>(2)</sup>: confectionery, snackfoods, cereal bars and breakfast cereals (n=2015 products). The images of products within these selected categories were assessed and coded using the "Child-appealing packaging" criteria developed by Mulligan et al.<sup>(3)</sup>. Mann-Whitney U tests were used to assess differences in nutrient composition between products with and without child-appealing packaging, using information extracted from Nutrient Information Panels. In addition, the Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (NPSC) and the World Health Organization Nutrient Profiling Model for the Western Pacific Region (WHO WPRO) were applied to all food products identified as appealing to children to determine which products would be ineligible to be marketed to children under these two potential policy options. Overall, 724 (35.9%) of the 2015 products examined had child-appealing packaging. Snackfoods had the highest proportion of products with child-appealing packaging (44.5%), followed by confectionery (39.3%), cereal bars (23.3%) and breakfast cereals (22%). The most common type of child-appealing marketing technique used was "child-appealing visual/graphical design of package" which featured on 513 food items. Overall, compared with products without child-appealing packaging, the median content of energy, protein, total fat, and saturated fat was lower, and the median content of sugar and sodium was higher in products with child-appealing packaging (all  $p < 0.05$ ). Of the 724 products that were found to have child-appealing packaging, 566 (78.2%) would be considered ineligible to be marketed to children when assessed using the NPSC and 706 (97.5%) would be ineligible using the WHO WPRO. Our research shows that a considerable number of food products available in New Zealand supermarkets are using marketing techniques on their packaging that appeal to children. If policies were introduced to reduce the use of child-appealing marketing on food packaging, the WHO WPRO would provide the highest level of protection for children.

#### References

1. Boyland EJ, Nolan S, Kelly B et al. (2016) *Am J Clin Nutr* 103(2), 519–533
2. Jones A, Shahid M, Morelli G et al. (2023) *Public Health Nutr* 26(12), 3291–3302
3. Mulligan C, Potvin Kent M, Vergeer L et al. (2021) *Int J Environ Res Public Health* 18(9)

Keywords: Marketing; Food packaging; Child; Policy

## **Trans fatty acid in the New Zealand Food Supply: A targeted survey to inform policy in New Zealand**

R. Doonan<sup>1</sup>, K. E. Bradbury<sup>2</sup>, T. Gontijo de Castro<sup>3</sup> M. Gibbs<sup>1</sup>, E. Mete<sup>1</sup>, S-Y. Quek<sup>4</sup>, M. Miller<sup>5</sup>

1. New Zealand Food Safety, Pastoral House, 25 the Terrace Wellington, 6011

2. Department of Epidemiology and Biostatistics, School of Population Health, The University of Auckland, Auckland 1142, New Zealand

3. Department of Nutrition and Dietetics, University of Auckland, Auckland 1010, New Zealand

4. Department of Food Science, School of Chemical Sciences, The University of Auckland, Auckland 1142, New Zealand

5. Cawthron Institute, Nelson 7040, New Zealand

The World Health Organization (WHO) has a global initiative to eliminate industrially produced trans fatty acids (iTFA) from the food supply <sup>(1)</sup>. Formed via the partial hydrogenation of vegetable oils to create hardened vegetable fat, iTFA can be found in processed foods including fried foods and baked goods. Even small amounts of iTFA can increase the risk of coronary heart disease. These can be successfully eliminated from the food supply with the WHO recommending a ban on partially hydrogenated oils or to limit iTFA in food to a maximum of 2% of total fat <sup>(1)</sup>. As of June 2024, over 50 countries had one of these regulatory measures in place. The trans-Tasman Food Regulation System is considering policy options to ensure iTFA are eliminated or reduced as much as possible from the food supply in Australia and New Zealand. Up to date data on the presence of iTFA in the New Zealand food supply is needed to inform this work as this was last measured in New Zealand in 2007/09 for packaged food and 2013 for fast food. The aim of this survey was to determine the presence and levels of iTFA in the New Zealand food supply. Since it is not possible to analytically quantify iTFA separately from trans-fats that occur naturally in food products of ruminant origin, such as dairy, beef and lamb products, the sampling plan was designed to target products likely to contain predominately iTFA and adapted from the WHO global protocol for measuring trans fatty acid profiles of foods <sup>(2)</sup> to the New Zealand context. The survey analysed the trans-fat content of 627 products across national supermarkets (275 products), international supermarkets specialising in imported foods (149 products) and ready-to-eat food outlets (203 products from three regions). One hundred and six products (16.9%) contained trans-fat that exceeded 2% of total fat. Twenty-five (4%) of these products were likely to contain predominately iTFA. The 25 products predominately containing iTFA included eight products from national supermarkets (mostly bakery products), nine products from international supermarkets (mostly curry pastes and biscuits) and eight products from ready-to-eat food outlets (all fried foods). The median trans-fat content of these 25 products was 3.2% of total fat (assumed to be all iTFA). Over a third of these products contained more than double the recommended WHO limit, with five products containing over four times the limit and one product containing more than 16 times the WHO limit. The remaining 81 products may contain some iTFA, but we were unable to quantify the amount. The results from this survey will be used by New Zealand Food Safety to inform the consideration of regulatory options for reducing iTFA in foods in New Zealand.

### References

1. World Health Organization. Replace Trans Fat: An Action Package to Eliminate Industrially Produced Trans-fatty Acids. World Health Organization, 2021.
2. World Health Organization, Global Protocol for Measuring Fatty Acid Profiles of Foods, with Emphasis on Monitoring Trans-fatty Acids Originating from Partially Hydrogenated Oils, World Health Organization, 2020.

Keywords: Industrially produced trans fatty acid; New Zealand Food Supply; monitoring; analytical survey  
Financial Support: This research was funded by New Zealand Food Safety



## Application of the Nova food classification system to a large national dataset of household food purchases in Aotearoa New Zealand: a nutrition surveillance strategy

G Lopes da Cruz<sup>1</sup>, ML da Costa Louzada<sup>1</sup>, S Mackay<sup>2</sup>, T Gontijo de Castro<sup>3</sup>, K Garton<sup>2</sup>, KE Bradbury<sup>2</sup>

1. Department of Nutrition, University of São Paulo, São Paulo, 01246-904, Brazil

2. Department of Epidemiology and Biostatistics, University of Auckland, Auckland, 1023, New Zealand

3. Department of Nutrition and Dietetics, University of Auckland, Auckland, 1023, New Zealand

The Nova classification<sup>(1)</sup> categorises foods according to the degree of food processing. Ultra-processed food have undergone a high level of industrial processing and typically contain cosmetic additives<sup>(1)</sup>. Increased consumption of ultra-processed food has been associated with adverse health outcomes, including obesity and chronic diseases<sup>(2)</sup>. Evaluating household food acquisition according to the Nova classification allows the assessment of dietary quality within populations, a strategy of nutrition surveillance that can support the development of effective public health actions to improve dietary quality. In Aotearoa New Zealand (NZ), there is limited up-to-date information on population dietary habits and a lack of data on ultra-processed food consumption. This study aimed to: i) develop a methodology to classify food items purchased by NZ households according to the Nova food groups: unprocessed/minimally processed foods (Group 1 [G1]), processed culinary ingredients (Group 2 [G2]), processed foods (Group 3 [G3]), and ultra-processed foods (Group 4 [G4]) and; ii) to describe the proportions of unique food items purchased according to Nova. We obtained data on food items purchased by NZ households from the 2019 NielsenIQ Homescan® panel, a national dataset of approximately 2,000 households who recorded their grocery purchases over 1-year. In total, 28,824 unique items were purchased. Using barcodes, we merged the products with the 2019 Nutrtrack dataset, an inventory of NZ supermarkets foods<sup>(2)</sup>, to obtain the products' ingredient lists. We followed best practices for classification according to Nova<sup>(3)</sup>. Where available, the ingredient lists were used to classify products. Of the total unique products, 13,263 (46%) were matched to Nutrtrack and classified based on their ingredient lists. For the remaining 15,561 products (54%), we identified whole Nielsen product categories (PC) that were exclusively associated with a single Nova group. Items classified by PC level included rice, fresh fruits, eggs and coffee beans in G1; baking powder, liquid cooking oils and salt in G2; beer and wine in G3; and margarine, carbonated soft drinks and bubble gum in G4. An additional 6,398 products were identified at this stage, representing 41.1% of the total 15,561 products without ingredient lists. We classified the remaining 9,163 items (58.9% of those 15,561 without ingredient list) based on the distribution of Nova groups for the 60% most purchased items within their PC. If the ingredient list was absent for any item under the 60% most purchased group, it was obtained from a search of online supermarkets. The final unweighted distribution of unique products purchased in NZ according to the Nova classification were 5583 (21.7%) in G1, 671 (2.6%) in G2, 3043 (11.8%) in G3, and 16466 (63.9%) in G4. Further stages of the research will estimate the energy from Nova groups derived from household food purchases in NZ, examining socioeconomic distribution and temporal trends.

### References

1. Monteiro CA, Cannon G, Levy RB et al. (2019) *Public Health Nutr* 22(5):936-941
2. Lane MM, Du S, McGuinness A et al. (2024) *BMJ* 2024;384:e077310
3. Eyles H, Ni Mhurchu C (2024) *The University of Auckland Dataset*
4. Martinez-Steele E, Khandpur N, Batis, C et al. (2023) *Nat Food* 4, 445–448

Keywords: Nova classification; Ultra-processed foods; Nielsen Homescan; Population diets

Financial Support: Health Research Council of New Zealand Programme (grant number 18/672); the São Paulo Research Foundation - FAPESP (G.L.C., grant number 2023/07638-2); the NZ Heart Foundation Research Fellowship (K.G., grant number #1975); the Heart Foundation Fellowship, NZ Senior Heart Foundation Fellowship supported by the G.R. Winn Trust (K.E.B., grant number #3728679); and Salary support for strategic research-Department of Nutrition & Dietetics (T.G.C.).

## A4 Breastmilk and breastmilk substitutes

### Assessment and prediction of human milk intake in late infancy

Lisa Daniels<sup>1</sup>, Anne-Louise Heath<sup>1</sup>, Rachael Taylor<sup>2</sup>, Bailey Bruckner<sup>1</sup>, Jillian Haszard<sup>3</sup>

1.Department of Human Nutrition, University of Otago, Dunedin, 9016, New Zealand

2.Department of Medicine, University of Otago, Dunedin, 9016, New Zealand

3.Haszard Biostatistics, New Zealand

The significance of human milk in an infant's diet is well-established, yet accurately measuring human milk intake remains challenging. Current methods are either unsuitable for large-scale studies, such as the dose-to-mother stable isotope technique, or rely on set amounts of human milk, regardless of known variability in individual intake(1). There is a paucity of data on how much infants consume, particularly in later infancy (>6 months) when complementary foods have been introduced. This research aimed to estimate human milk intakes and total infant milk intakes (including infant formula) in New Zealand infants aged 7-10 months, explore factors that predict these intakes, and develop and validate equations to predict human milk intake using simple measures. Human milk intake data were obtained using the dose-to-mother stable isotope technique in infants aged 7-10 months and their mothers as part of the First Foods New Zealand study (FFNZ)(2). Predictive equations were developed using questionnaire and anthropometric data (Model 1) and additional dietary data from diet recalls (Model 2)(3). The validity of existing methods to estimate human milk intake (NHANES and ALSPAC studies) was compared against the dose-to-mother results. FFNZ included 625 infants, with 157 mother-infant dyads providing complete data for determining human milk volume. Using the dose-to-mother data, the measured mean (SD) human milk intake was 785 (264) g/day. Older infants had lower human milk and total milk intakes, male infants consumed more total milk. The strongest predictors of human milk intake were infant age, infant body mass index, number of breastfeeds a day, infant formula consumption, and energy from complementary food intake. When the predictive equations were tested, mean (95% CI) differences in predicted versus measured human milk intake (mean, [SD]: 762 [257] mL/day) were 0.0 mL/day (-26, 26) for Model 1 and 0.5 mL/day (-21, 22) for Model 2. In contrast, the NHANES and ALSPAC methods underestimated intake by 197 mL/day (-233, -161) and 175 mL/day (-216, -134), respectively. The predictive equations are presented as the Human Milk Intake Level Calculations (HuMILC) tool, designed for use in large-scale studies to more accurately estimate human milk intakes of infants. The use of objective quantifiable assessment methods enhances our understanding of infant human milk intakes, improving our ability to accurately assess nutritional adequacy in infants.

#### References

1. Daniels L, Gibson RS, Diana A, Haszard JJ, Rahmannia S, Luftimas DE, et al. (2019) *Am J Clin Nutr* 9(169), 2227–10
2. Taylor RW, Conlon CA, Beck KL, vonHurst PR, Morenga LAT, Daniels L, et al. (2021) *Jmir Res Protoc* 10(4), e29048
3. Haszard JJ, Heath ALM, Taylor RW, Bruckner B, Katiforis I, McLean NH, et al. (2024) *Am J Clin Nutr* 120(1), 102–10

Keywords: Human milk, Infants, New Zealand, Prediction

Financial Support: Health Research Council of New Zealand, Otago Medical School Foundation Trusts, Lotteries Health Post-Doctoral Fellowship

# Regulating human identical milk oligosaccharides in infant formula products

B Bourke<sup>1</sup>, E Breen<sup>1</sup>

1. Food Standards Australia New Zealand, Canberra, 2606, Australia

Breastfeeding is the recommended way to feed infants. However, a safe and nutritious substitute for human milk is needed for infants when breastfeeding is not possible. As infants are a vulnerable population group, infant formula products are regulated by prescriptive provisions for composition and labelling. Any changes to the composition of these products must be established as safe prior to being permitted. As our knowledge of human milk expands, infant formula ingredients are developed to better replicate it. Food Standards Australia New Zealand (FSANZ) has assessed the addition of ingredients for the addition to infant formula products including human identical milk oligosaccharides (HiMOs) isolated using precision fermentation methodology. These ingredients are considered to be nutritive substances as their addition to food is intended to achieve specific nutritional purposes. In accordance with the Ministerial Policy Guidelines, FSANZ must assess both the safety and the health effect of nutritive substances for their use in infant formula. FSANZ risk assessments are undertaken by a multidisciplinary team covering toxicological and nutritional considerations using the best available scientific evidence. FSANZ assessments of the health effects concluded that the use of HiMOs in infant formula products would have a beneficial outcome for infants and align with the equivalent role of these substances in human milk (1,2). The weight of evidence supports health effects through an increase in the abundance of *Bifidobacterium* spp. in the infant gut microbiota, anti-pathogenic effects, inflammatory suppression and facilitation of appropriate immune responses and antigenic memory. FSANZ safety and technical assessments concluded that there are no public health and safety concerns associated with adding HiMOs to infant formula products (1), (2). The permitted levels are comparable to levels in human milk and are chemically and structurally identical to the naturally occurring forms. Food Standards Australia New Zealand, Canberra, 2606, Australia Based on the available evidence and intended purpose, a number of HiMOs have been permitted for use in infant formula products including 2'-fucosyllactose, lacto-N-neotetraose, difucosyllactose, lacto-N-tetraose, 3'-sialyllactose sodium salt, 6'-sialyllactose sodium salt. Evidence continues to emerge on the beneficial effects of HiMOs on infant health.

## References

1. FSANZ (2020) Application A1155 - 2'-FL and LNnT in infant formula and other products. FSANZ, Canberra. <https://www.foodstandards.gov.au/food-standards-code/applications/A1155>
2. FSANZ (2023) Application A1265 - 2'-FL/DFL, LNT, 6'-SL sodium salt and 3'-SL sodium salt for use as nutritive substances in infant formula products. FSANZ, Canberra. <https://www.foodstandards.gov.au/food-standards-code/applications/A1265-2-27-FL-DFL-2c-LNT-2c-6-27-SL-sodium-salt-and-3-27-SL-sodium-salt-for-use-as-nutritive-substances-in-infant-formula-products>

Keywords: infant; nutrition; regulation; oligosaccharides

## A5: Impact of diet on NCD risk factors

### The sodium, potassium, and iodine intake, and blood pressure of New Zealand school children: A cross-sectional survey

H Eyles<sup>1</sup>, J Rapson<sup>1</sup>, K Fuavao<sup>1</sup>, Y Jiang<sup>2</sup>, G Kira<sup>3</sup>, C Wall<sup>4</sup>, S Skeaff<sup>5</sup>, S Grimes<sup>6</sup>, R McLean<sup>7</sup>

1. Department of Epidemiology and Biostatistics, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, 1142, New Zealand
2. Department of Statistics, Faculty of Science, The University of Auckland, Auckland, 1142, New Zealand
3. Te Hau Kori - Centre for Physical Activity and Wellbeing, Victoria University of Wellington, Wellington, 6140, New Zealand
4. Department of Nutrition and Dietetics, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, 1142, New Zealand
5. Department of Human Nutrition, University of Otago, Dunedin, 9054, New Zealand
6. Institute of Physical Activity and Nutrition, School of Exercise and Nutrition Sciences, Deakin University, Melbourne, 3125, Australia
7. Department of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, 9054, New Zealand

In childhood, diets high in sodium and low in potassium contribute to raised blood pressure and cardiovascular disease later in life<sup>(1)</sup>. For New Zealand (NZ) children, bread is a major source of dietary sodium, and fruit, vegetables, and milk are major dietary sources of potassium<sup>(2,3)</sup>. However, it is mandatory to use iodised salt in NZ bread meaning reducing the salt and thus sodium content could put children at risk of iodine deficiency<sup>(4)</sup>. Our objective was to measure the sodium, potassium, and iodine intake, and blood pressure of NZ school children 8-13 years old. A cross-sectional survey was conducted in five primary schools in Auckland and Dunedin. Primary schools were recruited between July 2022 and February 2023 using purposive sampling. Seventy-five children (n= 37 boys, 29 girls, and nine children who did not state their gender) took part. The most common ethnicity was NZ European and Other (n=54 or 72%) followed by Māori (indigenous inhabitants; n=9 or 12%) and Pasifika (n=5 or 7%). The main outcomes were 24-hour sodium and potassium intake, sodium to potassium molar ratio, 24-hour iodine intake, and BP. Sodium, potassium, and iodine intake were assessed using 24-hour urine samples and BP was assessed using standard methods. Differences by gender were tested using two-sample t-tests and nonparametric Wilcoxon two-sample tests. The mean (SD) 24-hour sodium excretion, potassium excretion, and sodium to potassium molar ratio for children with complete samples (n=59) were 2,420 (1,025) mg, 1,567 (733) mg, and 3.0 (1.6), respectively. The median (25<sup>th</sup>, 75<sup>th</sup> percentile) urinary iodine excretion was 88 (61, 122) µg per 24 hours and the mean (SD) systolic and diastolic blood pressure (n=74) were 105 (10) mmHg and 67 (9) mmHg, respectively. There was a significant difference between boys and girls for iodine (77 (43, 96) vs. 98 (72, 127) µg per 24 hours; p=0.02) but no other outcomes. In conclusion, children consumed more sodium and less potassium and iodine than World Health Organization recommendations. However, future research should confirm these findings in a nationally representative sample. Evidence-based, equitable interventions and policies with adequate monitoring should be considered to reduce potentially suboptimal sodium, potassium, and iodine intakes in New Zealand.

#### References

1. Leyvraz M, Chatelan A, Da Costa BR, et al. (2018) *Int J Epidemiol* 1, 47(6), 1796–810
2. Eyles H, Bhana N, Lee S, et al. (2018) *Nutrients*, 10(9), 1198
3. Parnell W. (2003) *Ministry of Health*
4. Skeaff SA, Lonsdale-Cooper E (2013). *Br J Nutr*, 109(6), 1109–13
5. World Health Organization. (2012) *WHO*

Keywords: child; sodium; potassium; iodine

Financial Support: The Heart Foundation of New Zealand (grant #1843 - Senior Fellowship to HE, and grant #1821- project grant to HE)

# The use of Milk Fat Globule Membrane in lowering blood lipid levels in adults: results from a meta-analysis of randomized controlled trials

Kanon A<sup>1</sup>, Spies J, Macgibbon A<sup>2</sup>, Fuad M<sup>2</sup>

1. University College Cork, College Rd, University College, Cork, Ireland

2. Fonterra Research and Development Centre, Private Bag 11029, Dairy Farm Road, Palmerston North 4472, New Zealand

Cardiovascular diseases (CVD) are the leading cause of mortality worldwide, with impaired lipids levels being a significant risk factor <sup>(1)</sup>. This meta-analysis provides comprehensive insights on the impact of bovine dairy-derived milk fat globule membrane (MFGM) supplementation on blood lipid profiles in adults. A systematic search was conducted across various databases (including PubMed, Scopus, Web of Science, the Cochrane Library, Google Scholar, ACS Publications, Academic Search Index, BMJ Journals, BNP Media, and others) up until March 2024, resulting in the inclusion of six trials with a total of 464 participants. The findings indicate that MFGM phospholipid supplementation may significantly reduce total cholesterol (TC) and low-density lipoprotein (LDL) cholesterol levels. A combined analysis of the effects on TC, LDL and triglycerides (TG) revealed a significant overall reduction in these markers (SMDs = -0.174; 95% CI: -0.328~-0.021;  $p = 0.026$ ;  $I^2 = 0\%$ ). However, no significant increase or reduction was observed for high-density lipoprotein (HDL) (SMDs = 0.019; 95% CI: -0.289~-0.326;  $p = 0.906$ ;  $I^2 = 95.5\%$ ) and TG levels (SMDs = -0.083; 95% CI: -0.198~-0.033;  $p = 0.160$ ;  $I^2 = 0\%$ ). Overall, these results suggest that MFGM supplementation could be a promising dietary intervention for improving lipid profiles in adults. Nonetheless, further research is warranted to confirm these results and to better understand the potential variability in the impact of MFGM on blood lipid levels.

## References

1. Brunham LR, Lonn E, Mehta SR. Dyslipidemia and the Current State of Cardiovascular Disease: Epidemiology, Risk Factors, and Effect of Lipid Lowering. *Canadian Journal of Cardiology*. 2024 Aug 1;40(8):S4-12.

Keywords: MFGM, milk phospholipids, blood lipid, cholesterol, gangliosides, metabolic health, meta-analysis

Financial Support: No External funding was received for this Meta-analyses

Conflict of Interest: MF, JS, and AM work for Fonterra Cooperative group; a dairy company. AK used to work for Fonterra when this meta-analyses was conducted.

# Diet pattern high in refined food, sugar, sodium, and fat is associated with child excess adiposity at 4.5 years within a contemporary New Zealand birth cohort

F. Ismael<sup>1</sup>, C. Wall<sup>1</sup>, A. Lovell<sup>1</sup>, T. Gontijo de Castro<sup>1</sup>

1. Department of Nutrition and Dietetics, University of Auckland, Auckland, 1010, New Zealand

New Zealand ranks among the highest globally for childhood obesity <sup>(1)</sup>. One of the main platforms to maximize the prevention of child excess adiposity is the establishment of healthy diets in early life<sup>2,3</sup>. Despite this recommendation, Aotearoa has limited information on children's whole diet quality and its associations with child healthy weight. This study explored the associations between dietary patterns and indicators of excess adiposity among 4.5-year-olds within the *Growing Up in New Zealand* birth cohort study (n= 6,048, 98.2% of the children who took part of the 4.5-year data collection wave). At 4.5 years, two dietary patterns were previously derived and described: "*Refined, high in sugar, sodium and fat*" and "*Fruit and vegetables*"<sup>4</sup>. The indicators of excess adiposity examined at 4.5 years were body-mass-index- for-age (BMI/A) (>+2 z-score) and waist-to-height ratio (WtHR) > 90th percentile. Information on child and maternal sociodemographic and maternal health behaviour characteristics was sourced from the antenatal and the 4.5-year-interviews. Children's scores in both dietary patterns were ranked in tertiles. Multiple Poisson regressions with robust variance were performed to examine the associations between the dependent variables (BMI/A z-score >+2 and WtHR >90th percentile) and the independent variables (dietary patterns), adjusted by child and mother characteristics (IBM SPSS software). Sensitivity analyses excluding children with outliers for BMI/A (<-5 z-score or >+5 z-score) was also performed. Findings were reported as adjusted risk ratio (RR) and 95% confidence intervals (CIs). Children in the highest tertile of the "*Refined high in sugar, salt and fat*" dietary pattern were more likely to be overweight/obese (BMI/A) compared to children in the lowest tertile (RR:1.51; 95% CI: 1.20-1.90; p<0.001). This significant association was confirmed in the sensitivity analyses (RR:1.49; 95% CI: 1.18-1.89; p <0.001). There were no significant associations between this dietary pattern and WtHR > 90th percentile nor between the "*Fruit and vegetables*" dietary pattern and the indicators of child excess adiposity. This study provided nationally generalizable information that poor diet quality in early life is associated with child excess adiposity. National strategies to prevent childhood obesity need to encompass approaches to reduce the availability and intake of refined foods and those high in sodium, sugar and unhealthy fats in children.

## References

1. Ministry of Health (2023) New Zealand Health Survey 2022/23
2. World Health Organisation (2023) WHO acceleration plan to stop obesity
3. Hawkes C, Ruel M, Salm P et al. (2020) *Lancet* 395, 142-155
4. Castro TG, Lovell A, Santos LP et al. (2023) *Sci Rep* 13, 22754

Keywords: dietary patterns; childhood obesity; whole diet quality

Financial Support: Graduate student funds (GSF), School of Medical Sciences, University of Auckland



## A6 Bioactives

### The role of oxidative reactions in key bioactive compound transformations during black tea manufacture

P Muthulingam<sup>1</sup>, A Rashidinejad<sup>2</sup>, N Punyasiri<sup>3</sup>, C Nanayakkara<sup>4</sup>, C Mesarich<sup>5</sup>, D Popovich<sup>6</sup>.

1. School of Food and Advance Technology, Massey University, Palmerston North, 4442, New Zealand

2. Riddet Institute, Massey University, Massey University, Palmerston North, 4442, New Zealand

3. Institute of Biochemistry, Molecular Biology and Biotechnology, University of Colombo, 90, Cumaratunga Munidasa Mawatha, Colombo 00300, Sri Lanka

4. Department of Plant Sciences, Faculty of Science, University of Colombo, Cumarathunga Munidasa Mawatha, Colombo 00300, Sri Lanka

5. School of Agriculture and Environment, Massey University, Palmerston North, 4442, New Zealand

6. School of Science, Engineering & Technology, Saigon South Campus, RMIT University, Vietnam.

Black tea (*Camellia sinensis* L.) is renowned for its distinctive chemical composition, particularly the presence of oxidized polyphenols such as theaflavins (TF), thearubigins (TR), and theabrownins (TB), along with caffeine. These compounds, along with residual monomeric polyphenols like catechins, contribute to black tea's characteristic taste, color, and health benefits. The transformation of fresh tea leaves into black tea involves complex biochemical reactions, most notably oxidation<sup>(1)</sup> which is essential for developing these unique chemical properties. This study aimed to explore the dynamic changes in key compounds—such as catechins, caffeine, gallic acid, theobromine, and oxidized polyphenols—during different stages of black tea processing, including withering, rolling, fermentation (at intervals of 45, 90, and 135 minutes), and firing. Samples were collected at various stages of production, including fresh leaves and leaves undergoing withering, rolling, oxidation, and firing at a selected factory in Sri Lanka. Polyphenols and other metabolites were quantified using high-performance liquid chromatography (HPLC) and spectrophotometry. The results revealed that epigallocatechin gallate (EGCG), the predominant catechin in fresh tea leaves (187.3±0.8 g/kg), decreased by 22% during withering due to initial enzymatic oxidation. EGCG levels declined sharply as processing progressed, particularly during rolling (with a 47.74% reduction) and fermentation, where only 2.2% of the original EGCG content remained. This rapid reduction in catechins, especially EGCG, during rolling and oxidation is attributed to oxidation processes facilitated by polyphenol oxidase (PPO) enzymes, which convert catechins into oxidized polyphenols such as TF, TR, and TB. Among the oxidation products of catechins, theaflavin-3-gallate exhibited the strongest negative correlations with EGCG ( $r=0.783$ ), epigallocatechin ( $r=0.710$ ), epicatechin gallate ( $r=0.662$ ), and epicatechin ( $r=0.620$ ), indicating a direct link between the decline in monomeric polyphenols and the formation of TF during oxidation. TR showed a positive correlation with TF-3-3'-digallate ( $r=0.6780$ ), while TB displayed a weak negative correlation with this compound ( $r=0.217$ ). The final ratio of TF: TR in the fired black tea was 1:4.91:0.81, which is in line with the optimal values typically sought to produce high-quality black tea. The insights from this study are crucial for optimizing black tea production, as they highlight how different processing stages influence the final polyphenol profile. By understanding the transformation of catechins into oxidized polyphenols, producers can refine processes to enhance beneficial compounds like TF, while maintaining a favorable balance with TR and TB. Antioxidant activity in black tea was found to be 29% lower than in fresh leaves, with total phenolic content having a more substantial influence on antioxidant activity than catechins and theaflavins. Further research is being continued to explore the use of tea-derived microorganisms, particularly those with PPO activity, to manipulate and enhance the oxidation process, ultimately contributing to the development of black tea with a unique and desirable polyphenolic profile.

#### References

1. Tanaka, T., & Matsuo, Y. (2020). *Chemical and Pharmaceutical Bulletin*, 68(12), 1131–1142.

2. Lu, L.; Liu, J.; Zhang, W.; Cheng, X.; Zhang, B.; Yang, Y.; Que, Y.; Li, Y. (2024) *Foods* 2024, 13, 1373.

Financial Support: AHEAD PhD Grant (AHEAD/PhD/R3/Tech/406) administered by the Sri Lankan Government

Keywords: Catechins, Oxidation, Theaflavin, Polyphenol oxidases.

## Exploring nutritional composition and bioactive properties of *Gymnema lactiferum* (Ceylon cow plant) for food applications

K Weerasinghe<sup>1</sup>, A Rashidinejad<sup>1</sup>, D Everett<sup>1,2</sup>, L Brough<sup>1</sup>

1. School of Food Technology and Natural Sciences, Massey University, Private Bag 11222, Palmerston North, 4442, New Zealand
2. Riddet Institute, Massey University, Private Bag 11222, Palmerston North, 4442, New Zealand.

*Gymnema lactiferum* (*G. lactiferum*) is a medicinal plant that has played a significant role in traditional medical systems <sup>(1)</sup>. This plant has been used in Ayurveda, Siddha, and Unani medicinal practices to address various health conditions, including diabetes, rheumatoid arthritis, as a diuretic agent, and for digestive disorders. However, there are few scientific studies on its nutritional value and bioactive compounds. Additionally, no prior study has endeavoured to introduce this plant's extracts into food and beverages. Accordingly, the objectives of this study were to extract bioactive compounds from *G. lactiferum* using different extraction methods and to analyse its nutritional value and bioactivity. *G. lactiferum* leaf powder was extracted using different techniques and quantified for mineral and proximate composition, as well as phenolic, flavonoid, and antioxidant properties. Accelerated solvent extraction (ASE), water bath extraction (WB), and ultrasonication (US) techniques were used with 100% water extract (WE) and 50% aqueous ethanol extract (EE) as extracting solvents. Total phenolic content (TPC), total flavonoid content (TFC), and total antioxidant capacity (TAC) using 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity <sup>(2)</sup> were measured. Statistical analysis was carried out using one-way analysis of variance (ANOVA), followed by Tukey's test for post hoc comparison analyses. The composition included carbohydrates (19.3%), crude protein (17.5%), dietary fibre (35.1%), and fat content (4.8%). The mineral profile included potassium (4200 mg/100g), calcium (950 mg/100g), phosphorus (240 mg/100g), magnesium (240 mg/100g), iron, zinc, copper, and chromium. The extracts yielding the highest TPC ( $11.12 \pm 0.32$  mg gallic acid equivalents/g), TFC ( $4.73 \pm 0.22$  mg quercetin equivalents/g), and TAC ( $791.00 \pm 18.9$  mg ascorbic acid equivalents/mg) values were for WB-WE, ASE-EE, and WB-EE, respectively. The results indicate that water extracts in all three methods exhibited pronounced efficacy in the extraction of phenolic compounds. All 50% ethanol extracts demonstrated heightened efficiency in the extraction of flavonoids from *G. lactiferum* leaf powder. Furthermore, ethanol extracts exhibited higher antioxidant activity compared to the water extracts across all extraction methods. The results of this study show that *G. lactiferum* is a significant source of various nutritional compounds, such as crude protein, dietary fibre, and potassium-like minerals, as well as bioactive compounds. The phenolic, flavonoid, and antioxidant characteristics varied greatly depending on the extraction method and solvent used. These results provide a better understanding of the possible uses of *G. lactiferum* in the development of functional food.

### References

1. Wasana KGP, Attanayake AP, Jayatilaka KAPW, Weerarathna TP (2021) *Evidence-Based Complementary and Alternative Medicine*, 6644004.
2. Herald TJ, Gadgil P, Tilley, M (2012) *Journal of the Science of Food and Agriculture* 92, 2326-2331.

Keywords: *G. lactiferum*, extraction efficiency, nutritional analyses, bioactivity, functional foods

Financial Support: The project is supported by Massey University Doctoral Scholarship

## The effect of maturity stage on bioactive properties of Ceylon cinnamon bark extracts

S Culas<sup>1</sup>, L Kaur<sup>1,2</sup>, D.G. Popovich<sup>3</sup>, A Rashidinejad.<sup>1</sup>

1. School of Food and Advanced Technology, Massey University, Private Bag 11222, Palmerston North 4442, New Zealand

2. Riddet Institute, Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand

3. School of Science Engineering & Technology, 702 Nguyen Van Linh, District 7, RMIT Vietnam, Ho Chi Minh, Viet Nam

Ceylon cinnamon (*Cinnamomum zeylanicum*), a native spice of Sri Lanka, is rich in bioactive compounds known for their potent antioxidant properties, which contribute to various health benefits such as anti-diabetic, anti-cancer, lipid-lowering and anti-inflammatory effects <sup>(1)</sup>. However, the concentration of these bioactives can fluctuate throughout the plant's life due to internal and external factors such as light, temperature, and stress responses. This study aimed to investigate the changes in total phenolic content (TPC), total flavonoid content (TFC), and the 2,2-Diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity at different stages of maturity (1<sup>st</sup> to 4<sup>th</sup> year), using two extraction methods: ultrasonic extraction and accelerated solvent extraction. The identification and quantification of key bioactive compounds, including cinnamaldehyde, eugenol, and cinnamic acid, were performed using high-performance liquid chromatography (HPLC). The accelerated solvent extraction proved to be more effective in extracting TPC, TFC, cinnamaldehyde, eugenol and inhibiting DPPH. The extracts obtained from the accelerated solvent extractor showed a notable decrease in TPC (from 55.89±4.28 to 14.12±0.75 mg/g gallic acid equivalent) and TFC (from 170.08±13.75 to 39.35±9.39 mg/100g quercetin equivalent) up to the 3<sup>rd</sup> year, followed by an increase in TPC (from 14.12±0.75 to 19.71±0.49 mg/g gallic acid equivalent) and TFC (from 39.35±9.39 to 68.82±9.44 mg/100g quercetin equivalent) thereafter. The highest and lowest DPPH inhibition of 85.30 ± 0.39% and 40.68 ± 1.08% was observed with the 1<sup>st</sup> year and 3<sup>rd</sup> year plants. There was no significant difference between the DPPH inhibition of the 2<sup>nd</sup> and 4<sup>th</sup> year plants (p>0.05). The highest yields of eugenol (18.2485±0.02 mg/g of dry weight) and cinnamaldehyde (22.1475±0.024 mg/g of dry weight) were observed in the 3<sup>rd</sup>-year plant extracts obtained via accelerated solvent extraction. Conversely, the highest yield of cinnamic acid (0.4161±0.00 mg/g of dry weight) was found in 4<sup>th</sup>-year plants extracted using ultrasonic extraction. A statistically significant correlation was observed between cinnamaldehyde and eugenol content (p<0.05, R<sup>2</sup>=0.992), TPC and cinnamic acid (p<0.05, R<sup>2</sup>=0.906), and TFC and cinnamic acid (p<0.05, R<sup>2</sup>=0.956) across all ages. This study offers valuable insights into the variation of essential bioactive compounds in cinnamon as the plant matures, facilitating the optimization of its applications.

### References

1. Ranasinghe, P., Jayawardana, R., Galappaththy, et al. (2012). *Diabetic medicine*, 29(12), 1480-1492.

Keywords: Cinnamaldehyde; Cinnamic acid; Antioxidant activity; Cinnamon maturity.

# Posters

## Identifying major sources of FODMAPs in the New Zealand diet

Morrison SC<sup>1</sup>, Andrews FM<sup>1</sup>

1. The New Zealand Institute for Plant and Food Research Limited, Lincoln, 7608, New Zealand

FODMAPs (Fermentable Oligosaccharides Disaccharides Monosaccharides And Polyols) are indigestible, short-chain carbohydrates fermented in the large intestine, causing discomfort in patients with irritable bowel syndrome (IBS). FODMAPs, specifically fructans, galacto-oligosaccharides (GOS), lactose, fructose in excess of glucose, and polyols, are found in fruits, vegetables, grains, milk and their processed products. The aim of this project was to identify the major sources of FODMAPs in the New Zealand diet to guide research into reducing FODMAPs in those major sources. FODMAP data were collected from the New Zealand Food Composition Database<sup>(1)</sup>, in-house data and published sources<sup>(2-5)</sup>. NZ food consumption data were sourced from multiple published sources<sup>(6-12)</sup>. Estimated potential dietary intake of FODMAPs in NZ was calculated in grams per capita per annum. Foods and beverages were ranked to ascertain major FODMAP sources within each food group. Without replicated data for individual foods, inferential statistical analysis was not possible. NZ food consumption data on a per capita per annum basis is limited, therefore consumption data were calculated based on serving size and serves per day per capita for some foods. Comprehensive FODMAP data are not available for NZ foods and beverages. In terms of FODMAP data, the New Zealand Food Composition Database<sup>(1)</sup> contains only fructose and glucose data (to calculate excess fructose) and lactose data. The main cereal and grain source of FODMAPs is wheat flour (763–831 g fructan) and the main cereal-based product sources are breads (55–1194 g fructan, up to 121 g excess fructose and 55–159 g GOS) and breakfast cereals (60–525 g fructan, up to 99 g excess fructose, up to 159 g GOS, and 2409 g lactose if consumed with cow's milk). The main fruit source of FODMAPs is apples, providing up to 456 g excess fructose and 68–81 g sorbitol. The main vegetable sources are onion bulb (134–662 g fructan), cauliflower (131 g mannitol) and mushroom (53 g mannitol). Consumption data for garlic were unavailable. Cow's milk is the main source of lactose (4516–5259 g), followed by ice cream (415–937 g), cheeses and butter. The main beverage sources are milk and milk-based café-style coffee (1407–4220 g lactose) and apple-based fruit juices (486–836 g excess fructose). Little data exist for sweeteners and confectionery. Honey and pear juice (containing excess fructose) are sources, as are artificial sweeteners such as erythritol, maltitol and xylitol (i.e. polyols), commonly found in chewing gum, diabetic and low-carb food products. Milk chocolate contributes to lactose consumption. More comprehensive New Zealand food consumption data (on a per capita per annum basis) are required to obtain a more accurate picture of dietary FODMAP intake. Adding oligosaccharide and polyol data to the New Zealand Food Composition Database would be beneficial to provide complete FODMAP data of New Zealand foods.

### References

1. Ministry of Health (2023) New Zealand Health Survey 2022/23
2. World Health Organisation (2023) WHO acceleration plan to stop obesity
3. Hawkes C, Ruel M, Salm P et al. (2020) *Lancet* 395, 142-155
4. Castro TG, Lovell A, Santos LP et al. (2023) *Sci Rep* 13, 22754

Keywords: wheat; onions; apples; milk

Financial Support: This research was funded by the SSIF NZ Wheats for Wellness programme.

# The impact of high-fat, high-sugar parental diet on offspring metabolic health: Initial parental and offspring phenotype in a rat model

Weiss E<sup>1#</sup>, Toor K<sup>2#</sup>, Vickers MH<sup>2</sup>, Abbasi M<sup>2</sup>, Muralidharan S<sup>3</sup>, Davenport M<sup>3</sup>, Ponnampalam A<sup>3</sup>, Hedges C<sup>1</sup>, Albert B<sup>2\*</sup>, Musson DS<sup>1\*</sup> #Co-first author; \*Co-last author

1. Department of Nutrition and Dietetics, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, 1023, New Zealand.
2. Liggins Institute, The University of Auckland, Auckland, 1023, New Zealand.
3. Department of Physiology, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, 1023, New Zealand.

In Aotearoa New Zealand, approximately 1 in 3 adults and 1 in 8 children are classified as obese, with Māori and Pacific communities disproportionately affected <sup>(1)</sup>. While maternal nutrition has been extensively studied, paternal impacts and the combined effect of both parents' obesogenic environments on offspring health remain underexplored <sup>(2)</sup>. The primary objective of this study is to characterise the metabolic phenotype of parent rats fed a High Fat High Sugar (HFHS) diet and investigate the birth characteristics of their offspring, from a factorial mating design. Eighty female and 40 male Sprague-Dawley rats were randomised to a standard chow diet (SD) (24% protein, 18% fat, 58% carbohydrates) or HFHS diet (Specialty Feeds SF23-120: 16% protein, 41% fat, 43% carbohydrates) for five weeks prior to mating. Females were then continued on their respective diets throughout pregnancy and lactation. Four mating combinations were established: SDmum-SDdad, SDmum-HFHSdad, HFHSmum-SDdad, and HFHSmum-HFHSdad. A subset of parents (n=38) underwent body composition assessments using dual-energy X-ray absorptiometry (DEXA). Additionally, a subgroup (n=23) was evaluated for metabolic profiles using Prometheon metabolic cages. Offspring birth weights and body lengths were recorded. The HFHS diet's efficacy was confirmed in both male and female rats, with HFHS groups showing higher body weight (females: 327.1 g ± 19.69 vs. 288.2 g ± 20.12; males: 575.8 g ± 39.75 vs. 532.6 g ± 50.33; p < 0.05), greater fat percentage (females: 46.76% ± 5.619 vs. 29.15% ± 5.575; males: 40.51% ± 7.163 vs. 28.72% ± 6.819; p < 0.001), and a lower respiratory exchange ratio (RER) (females: 0.8108 ± 0.02753 vs. 0.8679 ± 0.02881; males: 0.8257 ± 0.03043 vs. 0.8759 ± 0.02664; p < 0.05) compared to the SD group. In male offspring, birth weights in HFHSmum-SDdad (6.308 g ± 0.9129) and HFHSmum-HFHSdad (5.993 g ± 0.8991) groups were significantly lower (p < 0.0001) than in SDmum-SDdad (6.980 g ± 0.7753) and SDmum-HFHSdad (6.991 g ± 0.6876) groups. Birth weights were further reduced in HFHSmum-HFHSdad versus HFHSmum-SDdad (Mean Diff. = 0.3148; p < 0.05). Body lengths in HFHSmum-HFHSdad males were shorter (43.10 mm ± 3.255; p < 0.0001) compared to other groups (≥ 45.33 mm). Female offspring birth weights were lower in the HFHSmum-SDdad (5.839g ± 0.7682) and HFHSmum-HFHSdad groups (5.751 g ± 0.8689; p<0.0001) compared to the other groups (means ≥ 6.4g) but paternal HFHS diet had no additional effect on birth weight. As with males, body lengths in the HFHSmum-HFHSdad female offspring were significantly shorter (41.95 mm ± 3.281; p<0.0001) compared to all other groups (≥43.83mm).

Parental HFHS diets synergistically reduce offspring birth length and weight, with stronger effects in males. These findings underscore the importance of inclusive dietary guidelines for both parents to reduce intergenerational obesity risk and support long-term health.

## References

1. Ministry of Health (2021) Obesity in 2021/22: Annual Data Explorer 2020/21. *NZ Health Survey*.
2. Batra V, Norman E, Morgan HL & Watkins AJ (2022) *Biomolecules* 12, 1289.

Keywords: Parental diet; Obesity; Offspring metabolic health; High-fat, high-sugar  
Financial Support: Auckland Medical Research Foundation, (grant number 1123001).

## **Pragmatic intervention using milk fortified with whey protein concentrate to increase protein intake to promote wound healing – initial case series**

H Gibbs<sup>1</sup>, F Wong<sup>2</sup>

1. Diet Consulting Regus-Dunedin 2i18 George Street, Dunedin 9016, New Zealand
2. Presbyterian Support Otago 407 Moray Place, Dunedin 9016, New Zealand

As many as 1 in 12 people in residential care are likely to have a pressure injury at any time <sup>(1)</sup>. Our pragmatic intervention, consented by both patients and their EPOA, provided 20g whey protein concentrate (WPC) in 200ml whole milk to be consumed by the resident in the morning with breakfast or morning tea, to compensate for the likely lowest protein meal of the day <sup>(2)</sup>, and increase total protein intake. WPC has a number of beneficial substances that support wound healing, such as arginine, and glutamine (3), plus the branch chain amino acids <sup>(4)</sup>. The intervention was uncomplicated, well tolerated and resulted in wound healing, as evidenced by the pictures of the three initial cases. We need further trials to show that this is better than usual interventions. However, we believe this is a useful protocol to address a recognised problem of poor protein intake for those who need extra to heal wounds

### References

1. Sugathpala RDUP, et al. (2023)
2. Hiol AN et al. (2023)
3. Arribas-Lopez E et al. (2021)
4. Hung SY et al. (2019)

Keywords: wound-healing; protein-intake;older-people;case-studies

Financial Support: Whey Protein Concentrate was provided by McLeod Nutrition to Presbyterian Support Otago to facilitate these interventions.



# Kawakawa and Its Antidiabetic Effects: A Mechanistic Approach

H Suci<sup>1</sup>, L Kate<sup>2</sup>, F Meika<sup>1,3,4</sup>, P Chris<sup>1</sup>, R Farha<sup>1</sup>

1. Liggins Institute, University of Auckland, Auckland, 1142, New Zealand
2. Molecular Medicine and Pathology Department, University of Auckland, Auckland, 1142, New Zealand
3. Edible Research Ltd, Christchurch, New Zealand
4. AuOra Ltd, Wakatū Corporation, Nelson, New Zealand

Type 2 diabetes mellitus (T2DM) is a major disease worldwide, causing significant mortality and morbidity. Currently, in Aotearoa, New Zealand, there is a high prevalence of T2DM, with a disproportionate impact on Māori and Pacific populations<sup>(1)</sup>. Moreover, it has been predicted that the prevalence will continually increase. Research has shown that insulin resistance (IR) has been reported to play a critical role in the development of T2DM and other related cardiometabolic diseases<sup>(2)</sup>. Therefore, managing IR is crucial to reducing the development of T2DM. Notably, bioactive compounds in various diets are known to modify the risk of T2DM by regulating IR. Among such dietary compounds include kawakawa (*Piper excelsum*), an indigenous species used by Māori in traditional medicine (Rongoā). Kawakawa is shown to contain several bioactive compounds that are shown to have insulin-sensitising effects. Research by our group has recently shown kawakawa to have potential anti-diabetic and anti-inflammatory effects in healthy human volunteers<sup>(3,4)</sup>. However, how Kawakawa exerts these effects on insulin signalling and glucose uptake remains unknown. We hypothesise that kawakawa will enhance the glucose uptake in the treated cells and will differentially regulate key genes involved in insulin signalling pathways, including GLUT2, IRS-1, PPAR- $\gamma$ , and PI3K/Akt, across various tissues. To test our hypothesis, we aim to investigate the mechanistic action of kawakawa extract on insulin signalling pathways in different cell models from metabolically active organs. We will use the same kawakawa powder sample shown to improve postprandial insulin in a healthy population. Cell models representing different insulin-responsive organs: liver (HepG2), skeletal muscle (L6-GLUT4myc), pancreas (MIN6), and adipose (3T3-L1) will be used. The cells will be treated with different doses of kawakawa extract, and glucose uptake will be measured. Key signalling pathways, including GLUT2, IRS-1, PPAR- $\gamma$ , and PI3K/Akt, will be monitored using western blot and quantitative polymerase chain reaction (qPCR) analysis. The findings of this study have the potential to identify key targets of kawakawa action on insulin signalling in metabolically active organs. These outcomes will inform future research with kawakawa in clinical settings in people with cardiometabolic diseases such as T2DM and can form the basis for developing a dietary intervention for individuals at risk of these diseases. Additionally, Rongoā is an acceptable intervention by Māori, integrating this knowledge with evidence-based scientific interventions would aid in creating a holistic health paradigm that resonates within Māori communities.

## References

1. Barnes LA, Eng A, Corbin M (2020) Ann Work Expo Health 64.
2. Saito I, Maruyama K, Kato T (2022) JDC, 36.
3. Ramzan F, Jayaprakash R, Pook C et al. (2022), J. Nutr 14.
4. Tautuiaki S, Gojer J, Jayaprakash et al. (2024), Mol. Nutr. Food Res 68.

Keywords: Kawakawa; insulin resistance; T2DM; genes

Financial Support: This research was funded by High Value Nutrition (HVN).

# Exploring sustainable protein sources: Enhancing the nutritional profile of lucerne (*Medicago sativa*) and red clover (*Trifolium pratense*) seeds via fermentation

S. U. Shah<sup>1</sup>, M. C. Kruger<sup>1</sup>, C. Montoya<sup>2</sup>, J. Palmer<sup>3</sup>, W. H. Chua<sup>4</sup>

1. School of Health Sciences, Massey University, Palmerston North
2. AgResearch/Riddet Institute, Palmerston North
3. School of food technology and natural sciences, Massey University, Palmerston North
4. School of Veterinary Sciences, Massey University, Palmerston North

Food security constitutes a worldwide concern closely correlated with population growth. By 2050, the global population is expected to reach 9.3 billion <sup>(1)</sup>. The rising population, along with increasing life expectancy and shifts toward Western dietary patterns, is expected to drive higher food demand and contribute to a rise in metabolic conditions <sup>(2)</sup>. In this context, looking for alternative and sustainable food and protein sources is imperative. Pasture legumes including lucerne (*Medicago sativa*) and red clover (*Trifolium pratense*) are becoming popular as they can be used as an alternative protein and functional food source. Both crops play an important role in New Zealand's agriculture. Their seeds can be used in human nutrition as alternative food and protein options; however, the presence of anti-nutritional factors (ANF) and their distinct taste make them less favourable for human consumption. Fermentation can be used as a possible strategy to mitigate these limitations. *Lactobacillus* fermentation was conducted using *Lactococcus plantarum*, *Lactobacillus acidophilus* and *Lactobacillus casei*. Proximate composition and mineral content were determined following Association of Official Analytical Chemists (AOAC) methods. Total phenol content (TPC), total flavonoid content (TFC) and antioxidant activity (2,2-Diphenyl-1-picrylhydrazyl and 2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic) acid) and ANF including phytic acid, trypsin, and chymotrypsin inhibition were assessed using colourimetric techniques. For the enzyme inhibition assays, enzyme-substrate reactions were performed with sample extracts before measurement. All the experiments were replicated three times, and the results were expressed as mean  $\pm$  SD. A factorial analysis of variance (ANOVA) was conducted (4 legume seed samples  $\times$  3 LAB cultures) with a Tukey's post-hoc test for mean comparison at  $P < 0.05$  using IBM SPSS Statistics

29.0. All the legume seeds demonstrated high nutritional content, with crude protein and fibre levels around 40 and 16% respectively. The seeds were also rich in minerals, particularly magnesium, phosphorus, iron and zinc. In addition, fermentation led to an increase ( $P < 0.05$ ) in TPC, TFC and antioxidant activity, while significantly reducing ANF. For instance, fermentation led to an increase in TPC (18.8 to 47.1% increase), TFC (9.6 to 34.5% increase) and AOA via DPPH and ABTS. *Lactobacillus* fermentation has proven to be an effective processing technique to enhance the nutritional value of lucerne and red clover seeds. These findings support the potential of using fermentation to develop novel and sustainable protein sources, contributing to improved dietary quality and nutrition. Moreover, further work to study the effect of fermentation on the nutrient digestibility of lucerne and red clover seeds is warranted.

## References

1. Alexandratos N & Bruinsma J (2012) World Agric Towards 2030/2050.
2. Liang X, et al. (2011–18) National Health Nutr Exam Surv.

Keywords: ANF; antinutritional factors, LAB; lactic acid bacteria, AOAC; association of official agricultural chemists

## Exploring the link between home gardens and nutritional outcomes in rural Sri Lanka

S. Vishnukumar <sup>1,2</sup>, Weber. JL<sup>1</sup>, Ramilan ,T<sup>3</sup>, Brough, L <sup>1</sup>

1. School of Food Technology and Natural Sciences, College of Sciences, Massey University, New Zealand

2. Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka

3. School of School of Agriculture and Environment, College of Sciences, Massey University, New Zealand

Household food production is considered a key avenue for improving food security and nutritional status, particularly for low-income people from developing countries. However, little is known about what aspects of home garden production enhance nutritional outcomes. This paper aims to assess how home gardens influence nutritional status while considering the impact of various child, maternal, and household characteristics such as birthweight, age, education, and income. We also examined the impact of distance to the market mediating this association. We conducted a cross-sectional study of 403 children (24-60 months) and their mothers (18-45 years) in Batticaloa district, Sri Lanka using a pre-tested structured questionnaire. Maternal and child anthropometric measures were taken, and children were classified as stunted, wasted and underweight based on the WHO references, and BMI was calculated for mothers <sup>(1)</sup>. Logistic regression was used to analyse the factors associated with the dependent variable, nutritional outcomes. Food production diversity was not associated with maternal or child nutritional outcomes. The only production variable associated with child nutritional outcome was livestock ownership, and it was negatively associated with child wasting ( $P < 0.01$ ). Surprisingly, increased market distance improved the child undernutrition ( $P < 0.05$ ). Higher levels of maternal education were significantly associated with reducing stunting and underweight in children ( $P < 0.01$ ). Childbirth weight showed a negative association with a child underweight ( $P < 0.01$ ), and we also observed a small negative effect of a child's age on stunting. These findings suggest that while home gardens can be an entry point, improving nutrition may require a multifaceted approach that addresses a broader range of factors.

### References

1. WHO. (2006). Multicentre Growth Reference Study Group. (WHO Child Growth Standards based on length/height, weight and age, Issue. W. H. Organization. <https://www.who.int/tools/child-growth-standards/who-multicentre-growth-reference-study>

Keywords: food production; livestock; nutrition; child; education

## The effect of nutrient content on the antimicrobial efficacy of nisin and lysozyme to control *Listeria monocytogenes* in the food industry

Ruwankumari P.<sup>1</sup>, Flint, S.<sup>1</sup>, Palmer, J.<sup>1</sup>, Altermann, E.<sup>2</sup>

1. School of Food Technology and Natural Sciences, Massey University, Private Bag 11222, Palmerston North 4442, New Zealand

2. School of Veterinary Science, Massey University, Private Bag 11222, Palmerston North 4442, New Zealand

*Listeria monocytogenes* is a major foodborne pathogen that forms biofilms, enhancing their potential to survive under harsh conditions, including existing antimicrobial treatments <sup>(1)</sup>. Natural antimicrobials such as lysozyme and nisin are generally recognized as safe in food applications <sup>(2)</sup>. As a result of repetitive exposure to antimicrobials and the formation of biofilms, *Listeria monocytogenes* have developed resistance, making it more challenging to ensure food safety. The hurdle effect, which combines various antimicrobial compounds, has gained attention for controlling foodborne pathogens. Before applying the combined treatment, the effect of nutrient content on the antimicrobial efficacy of these individual antimicrobials is important to optimizing conditions for designing effective combined treatments, as it ensures the maximum potential of each antimicrobial under a given nutrient condition. In preliminary experiments, the effect of nutrient content on the antimicrobial efficacy of nisin and lysozyme to inhibit planktonic cells of two different *Listeria monocytogenes* strains was studied in nutrient-rich (full-strength TSB) and nutrient-reduced (10% TSB) environments with the Minimum Inhibitory Concentrations (MICs) of Nisin (1250 µg/mL) and Lysozyme (312.5 µg/mL). To study the effect of nutrient content on structural modifications of the *Listeria monocytogenes* cell envelop and its subsequent impact on the antimicrobial efficacy, nisin and lysozyme concentrations were studied under various nutrient conditions (10%, 30%, 50%, 75%, and 100% TSB). Two sets of cultures for each strain were prepared by pre-growing the microorganism in full-strength TSB (non-preconditioned cells) and corresponding strengths of TSB (preconditioned cells) prior to inoculating into various TSB strengths to perform antimicrobial treatment. Statistical analysis was carried out using two-way analysis of variance (ANOVA), followed by Turkey's test for post hoc comparison analysis. The results of this study showed that the number of surviving cells at the end of the treatment was significantly decreased ( $P < 0.05$ ) in both nisin and lysozyme treatments compared to the untreated controls with the maximum antimicrobial activity in 10% TSB. Under both non- preconditioned and preconditioned cell states, the maximum inhibitory activity of lysozyme was observed in 10% TSB. The maximum inhibitory activity of nisin was observed in 10% TSB and 30% TSB under preconditioned cell state and non-preconditioned cell state, respectively. Preliminary results of this study found that the nutrient content at the time of antimicrobial treatment and the initial state of the *Listeria monocytogenes* cells through preconditioning growth conditions influence the antimicrobial efficacy of nisin and lysozyme. This research could provide insights for optimizing future antimicrobial treatments, such as selecting the appropriate dose and antimicrobial strategies.

### References

1. Nika, J., Blaž, Š., Meta, S., et al (2021). *Microbial Biotechnology*, 14(4), 1269-1281.
2. Nawaz, N., Wen, S., Wang, F., et al (2022). *Molecules*, 27(19).

Keywords: *Listeria monocytogenes*, antimicrobial efficacy, preconditioned cell state, non-preconditioned cell state

# The Effect of the Provision of Foods High in Healthy Fats or Dietary Fibre on Sodium and Potassium Intakes in a Post-Coronary Event Population

Zichun Hao<sup>1</sup>, Meredith Peddie<sup>1</sup>, Andrew N Reynolds<sup>2</sup>,

1. Department of Human Nutrition, University of Otago, Dunedin, New Zealand

2. Department of Medicine, University of Otago, Dunedin, New Zealand

In the New Zealand diet, most sodium intake originates from salt added during food processing by manufacturers and in restaurant preparations.<sup>(1,2)</sup> Dietary intervention may be an effective approach to reducing individuals' sodium intake. This study investigated whether the provision of foods high in fibre or healthy fats, inadvertently effect sodium and potassium intakes. A total of 297 individuals (mean age 64 ± 10 years, n=96 females) who had a coronary event in the previous six months participated in this study. Participants were randomly allocated into one of three groups for 12 weeks: weekly delivery of foods high in healthy fats, weekly delivery of foods high in dietary fibre; and a control group that didn't receive any groceries. All participants received basic healthy eating advice. Sodium and potassium intakes were assessed at baseline, the end of the 12-week intervention, and after a further 12 week follow up using four-day food records. Participants chose to complete these records either on paper or using the Research Food Diary application on their phone (Xyris Software Ltd., Brisbane, Australia). Food records were analysed using FoodWorks dietary analysis software (Version 10, Xyris Software Ltd., Brisbane, Australia). The mean sodium and potassium intakes recorded over the four days were used to represent participants' intakes at each time point. Compared to the control group, sodium intake at the end of the 12-week intervention were modestly lower in both food-delivery intervention groups (-109 mg (95% CI: - 344, 125) in the healthy fats group and -175 mg (95% CI: -412, 63) in the high fibre group. Potassium intakes at 12 weeks were 284 mg higher in the high fibre group (95% CI: 4, 564), while the difference was more modest in the healthy fats group (72 mg (95% CI: -207, 350)). At the end of the 12 week follow-up, the mean sodium intake in the high fibre group was 254 mg (95% CI: -514, 7) lower than the control, whereas there was only a very small difference in the healthy fats group at -37 mg (95% CI: -300, 266). Differences in potassium intake at 24 weeks were modest for both groups (66 mg; 95% CI: -241, 374) in the healthy fats group and -53 mg (95% CI: -356, 251) in the high fibre group). The provision of healthy foods, particularly foods high in fibre, may be an effective strategy to reduce sodium and increase potassium intakes in high-risk populations.

## References

1. Eyles HC, Cleghorn CL. Preventive Medicine Reports. 2022 Oct 1;29:101927.
2. Wang NX, McLean RM, Cameron C, Skeaff SA. Front Nutr. 2022;9:1065710.

Key Words: Sodium, Potassium, Dietary Assessment, Grocery Delivery

# Extraction and Encapsulation of Phenolic Compounds from New Zealand Macadamia Husk: A Novel Approach for Oral Delivery of its Bioactive Compounds

Md F Ahmed 1, 2, D Popovich 3, C Whitby 1 A Rashidinejad 2, \*

1. School of Food Technology and Natural Science, Massey University, Palmerston North, New Zealand
  2. Riddet Institute, Massey University, Private Bag 11 222, Palmerston North, New Zealand
  3. School of Science, Engineering & Technology, RMIT, Ho Chi Minh City, Vietnam
- \*Corresponding Author, Email: A.Rashidinejad@massey.ac.nz

Every year tonnes of macadamia nuts are produced globally, resulting in a large production of by-products such as macadamia husk. This by-product contains high concentrations of phenolic compounds with antioxidant and health-promoting properties (1). Oral delivery of these phenolic compounds via food systems is challenging as the stability and biological activities can change when exposed to different types of environmental conditions (e.g., heat, light, oxygen, and pH) (2). Therefore, this study aimed to protect the integrity and stability of phenolic compounds from macadamia husk against such environmental conditions towards their delivery via food and related products. Different extracts of macadamia husk were prepared by conventional solvent extraction (CSE), accelerated solvent extraction (ASE), and ultrasonic probe-assisted extraction (UPAE) using water and organic solvents such as ethanol and methanol mixtures of different concentrations with water. The extracts were characterised by their total phenol content (TPC), total flavonoid content (TFC), and antioxidant properties (using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity method). UPLC-HRes-MS/MS analysis was applied for screening and characterising phenolic compounds in macadamia husk extracts (MHE). Liposomes composed of soy lecithin were used to encapsulate the phenolic compounds to maintain their stability and biological activity against environmental conditions. The mean particle size, homogeneity, zeta potential, and encapsulation efficiency were used to characterise the liposome properties. 50% ethanol was the most effective solvent for maximising the TPC ( $47.90 \pm 0.67$  mg GAE/g of dry weight) and TFC ( $149.85 \pm 6.54$  mg QE/g of DW) in extracts obtained using the three methods studied. Fifteen phenolic compounds including phenolic acids (e.g. chlorogenic acid, protocatechuic acid), flavonoids (e.g. catechin, epicatechin, epigallocatechin, gallic acid) and other polyphenols (e.g. daidzin, myricetin 3-O-arabinoside, quercetin O-glucoside) were identified in the aqueous ethanol extract. The empty (control) liposomes had a mean diameter of  $173.23 \pm 1.29$  nm and exhibited a zeta potential of  $-80.14$  mV. MHE loading significantly ( $p < 0.05$ ) increased the liposome size (to  $186.33 \pm 0.29$  nm) and reduced the zeta potential values ( $-77.00 \pm 0.73$  mV) and homogeneity of the size distribution. This study shows 50% ethanol was the most effective solvent for maximising the TPC and TFC in extracts obtained using the three different methods studied. Liposomes containing phenolic extract exhibited highly negative zeta potential values, indicating favourable stability and long-term protection of phenolic compounds. Thus, this study provides a promising approach to the extraction and encapsulation of phenolic compounds from New Zealand-grown macadamia husk for their possible incorporation into food products.

## References:

1. Zhang, M., Li, Y., Shuai, X. X., Qiao, J., Wei, C. B., Ma, F. Y., ... & Du, L. Q. (2023). LWT, 189, 115552.
2. Minatel, I. O., Borges, C. V., Ferreira, M. I., Gomez, H. A. G., Chen, C. Y. O., & Lima, G. P. P. (2017). Phenolic Compd. Biol. Act, 8, 1-24.

**Keywords:** Macadamia husk, Bioactive phytochemicals, Phenolic compounds, Liposomal encapsulation, Functional foods.

**Financial Support:** This work was funded by Massey University and the Riddet institute under supervision of Dr. Ali Rashidinejad.



## Student Representative on Council

---

Jennifer Gale our current student representative has finished her PhD and is about to Graduate. So we are looking for a new student representative on the Council. This is a volunteer role.

Network and build your CV

Express your interest:

Email- [info@nutritionsociety.ac.nz](mailto:info@nutritionsociety.ac.nz)

## Volunteer Opportunities

---

Want to get more involved with the Society? We are always looking for keen volunteers

- Webinars
- Social Media
- Branch leaders
- Mentors
- Conference Organisation
- Other roles

Express your interest:

Contact [info@nutritionsociety.ac.nz](mailto:info@nutritionsociety.ac.nz)