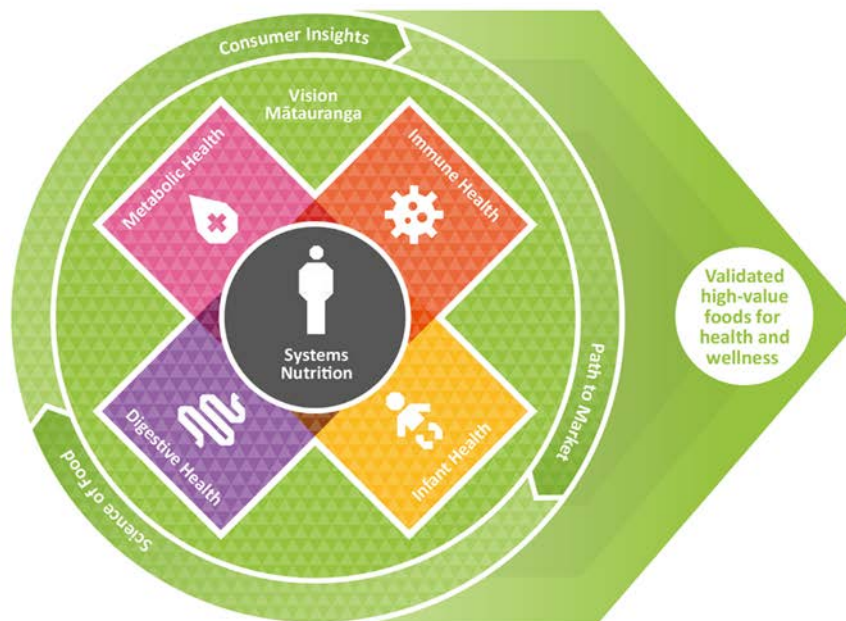


## High Value Nutrition Priority Research Programme Detail for Tranche Two

This information provides insights about the High-Value Nutrition (HVN) research plan to date (Tranche 1) and for Tranche 2 (July 2019-June 2024) for each of the four health themes and supporting programme of Consumer Insights.

National **SCIENCE** Challenges HIGH-VALUE NUTRITION Ko Ngā Kai Whai Painga **Growing the science to take high-value foods to the world**



High-Value Nutrition has four food-for-health research themes that share a Systems Nutrition approach. Three Sector Support programmes provide pre-competitive advice and expertise for New Zealand's food and beverage sector.

## **Metabolic Health**

The Metabolic Health programme aims to identify food and beverage (F&B) strategies to prevent adverse metabolic health. The overarching theme is prevention of type 2 diabetes (T2D) in consumers susceptible to rapid worsening of glycaemia and development of T2D, focusing on overweight Chinese adults. This population is at increased risk even when young and outwardly lean, the 'thin on the outside fat on the inside', TOFI profile.

Aims of the programme include:

- identification of early body composition (total/regional adipose depots, ectopic deposition of lipid in 'risky' sites of pancreas, liver, muscle) and blood/urine (LCMS/GCMS metabolomics) or faecal (microbiome) biomarkers that may change in advance of worsening blood glucose, to identify those most at risk and to predict progression of pre-diabetes;
- characterising the response of established and novel biomarkers of susceptibility to F&B interventions.

Tranche 1 has identified candidate biomarkers in cross-sectional assessments which characterise Asian Chinese individuals within New Zealand, and is undertaking several clinical F&B interventions through 2018/19 looking at response to diet. The studies are conducted in collaboration with NZ industry partners, including a cluster of Māori owned businesses.

Tranche 2 will build on these investigations within New Zealand, looking to differentiate effects of ethnicity versus lifestyle (habitual diet) and also further validate putative biomarkers. In parallel, clinical studies will be developed and conducted within China to evaluate these early T2D-specific markers and response to F&B intervention in the target Chinese market. The trials will be conducted in collaboration with clinical partners in China, to be confirmed early in Tranche 2.

## **Immune Health**

The aim of the Immune Health programme is to identify foods that support immunological homeostasis in the lung, with particular focus on pollution-mediated inflammation from 2019 onwards. Specifically, the second tranche of the programme will complete its translational portfolio with the design and implementation of dietary intervention trials aiming at reducing pollution-driven airway inflammation in the target Chinese market. The trials will be conducted in collaboration with clinical partners in China.

The planned outcomes of the programme are;

- provide robust experimental data documenting the impact of foods on lung function as well as local and systemic pollution-mediated inflammation
- quantify the mechanistic contributions of the gut and lung microbiota,
- establish a metabolomic signature for decreased lung inflammation and identify novel immune-active metabolites, and
- establish an "immune-metabolic", HVN-transversal, resource that will co-inform all the other health themes.

## Digestive Health

The Digestive Health programme will identify food solutions to support healthier digestion. Functional GI disorders (FGDs) are common within the Asian population and affect the quality of life of many. This line of research is important for Asian consumers, in particular the emerging middle and upper classes in Asia.

The aims of the programme are to:

- identify biomarkers and mechanisms of action of host-microbe interactions to improve characterisation of functional GI disorders,
- conduct food intervention clinical studies that successfully demonstrate improvement in GI symptoms, biomarkers and mechanisms of action
- develop a mathematical model based on the clinical and mechanistic data to predict which foods will be most likely to improve GI comfort and function.

Tranche 1 has established and characterised a unique cohort (FGDs) using a portfolio of internationally accepted (including novel) questionnaires, identified microbial and host factors that provide mechanistic insights into FGDs using a systems nutrition approach (metabolomics, microbiomics); and is currently undertaking a proof-of-principle food intervention study using these resources.

Tranche 2 will build on the resources developed by the team to conduct dietary intervention studies (in collaboration with NZ F&B businesses) with the aim of improving GI comfort and function in the target population. Validating biomarkers and identifying underlying mechanisms, including the intricate connections between the GI tract and the brain. A deeper understanding of the brain-gut axis and how foods can drive these interactions is central to Tranche 2. During this period, the cohort demographic base will be extended, including linking with collaborators who study similar Asian-based cohorts to determine similarities and differences in biomarker responses between ethnic groups, helping to define the measurement outcomes for nutritional clinical studies in-market.

## Infant Health

The objective of the HVN Infant Health programme is to seed an immune-beneficial infant gut microbiome through designed complementary feeding during weaning. Rather than the traditional “feeding and bleeding” approach, in which pre-selected candidate prebiotics and probiotics are tested for their effects, a reverse-metabolic “seeding through feeding” methodology has been developed. The team has defined two desired health benefits: reduced number of infections and improved influenza vaccine response. Then sophisticated natural language processing has mined the public domain probiotic bacteria in the infant gut microbiome around weaning that can confer these benefits and prebiotic feeds that nourish these bacteria. From this data natural food sources have been identified as prebiotic feeds. This approach, combined with *in silico* gut ecology modelling, has yielded known and new pro- and prebiotics, and a number of infant feeding-suitable food sources, of which kūmara (sweet potato) has been selected and applied in a first feasibility clinical trial in NZ. The trial will be completed in Tranche 1.

In Tranche 2, we will build on this proof-of-concept by:

- building a microbiome-food-health database for application across HVN
- designing and conducting a full clinical trial recruiting Chinese infants and mothers recruited in NZ; and
- designing and conducting a full clinical trial in China. The reverse-metabolic approach and the gut ecology modelling will be applied across Challenge health themes and complementary feeding diets developed beyond kūmara. The aim is to discover clinical evidence for prebiotic seeding of immune-beneficial probiotic microbiomes.

### **Consumer Insights**

This programme aims to understand Chinese consumers' beliefs, attitudes and behaviours when they are making food choices, in relation to their needs for health and nutrition. The targeted Chinese consumers are those who are looking for solutions to their health concerns to be delivered through the foods they eat, and they are willing to pay a premium for this. The research is designed to support decision-making in the HVN health themes: Metabolic Health, Digestive Health, Immune health and Infant Health. The broader focus is to better predict how consumer attitudes today will translate into product choices that will be sustained and remain relevant in the future.

Tranche 1 has taken an interpretivist approach, interviewing Chinese consumers in their homes to build a more holistic view of food, health and culture. This has been backed up by focus group interviews, surveys and analyses of social media. Tranche 2 will expand on this research in China by developing a more intensive focus on:

- identifying and understanding those consumers who are most responsive to HVN food concepts
- understanding factors that contribute to building consumers' trust in foods developed by HVN (
- understanding how Chinese consumers acquire food knowledge and who are the influencers of their food choices
- assessing how Chinese attitudes and behaviours regarding food and health are changing over time.

As foods and beverages become available from other HVN programmes, there will be opportunities to assess consumer behaviour more directly using concept products.