

HIGH-VALUE  
NUTRITION

Ko Ngā Kai  
Whai Painga

# INFANT HEALTH

## NUTRITIONAL SCIENCE FUELLING INNOVATION

High-Value Nutrition NZ Conference 2017

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**On behalf of the HVN ICF Team**

Host Institution



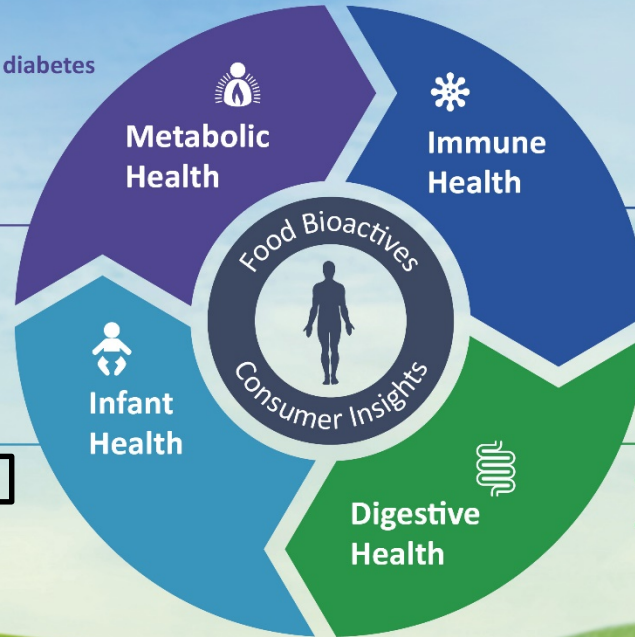
# High-Value Nutrition National Science Challenge

## research themes and projects

- TOFI: Thin on the outside, fat inside: preventing diabetes
- Kiwifruit for glucose control
- Combined proteins for lean body mass
- Grass-fed beef for cholesterol control

### Immunity & Metabolism Human Microbiome Systems Nutrition

- Complementary feeding for immune protection
- Fibres for sustained energy release



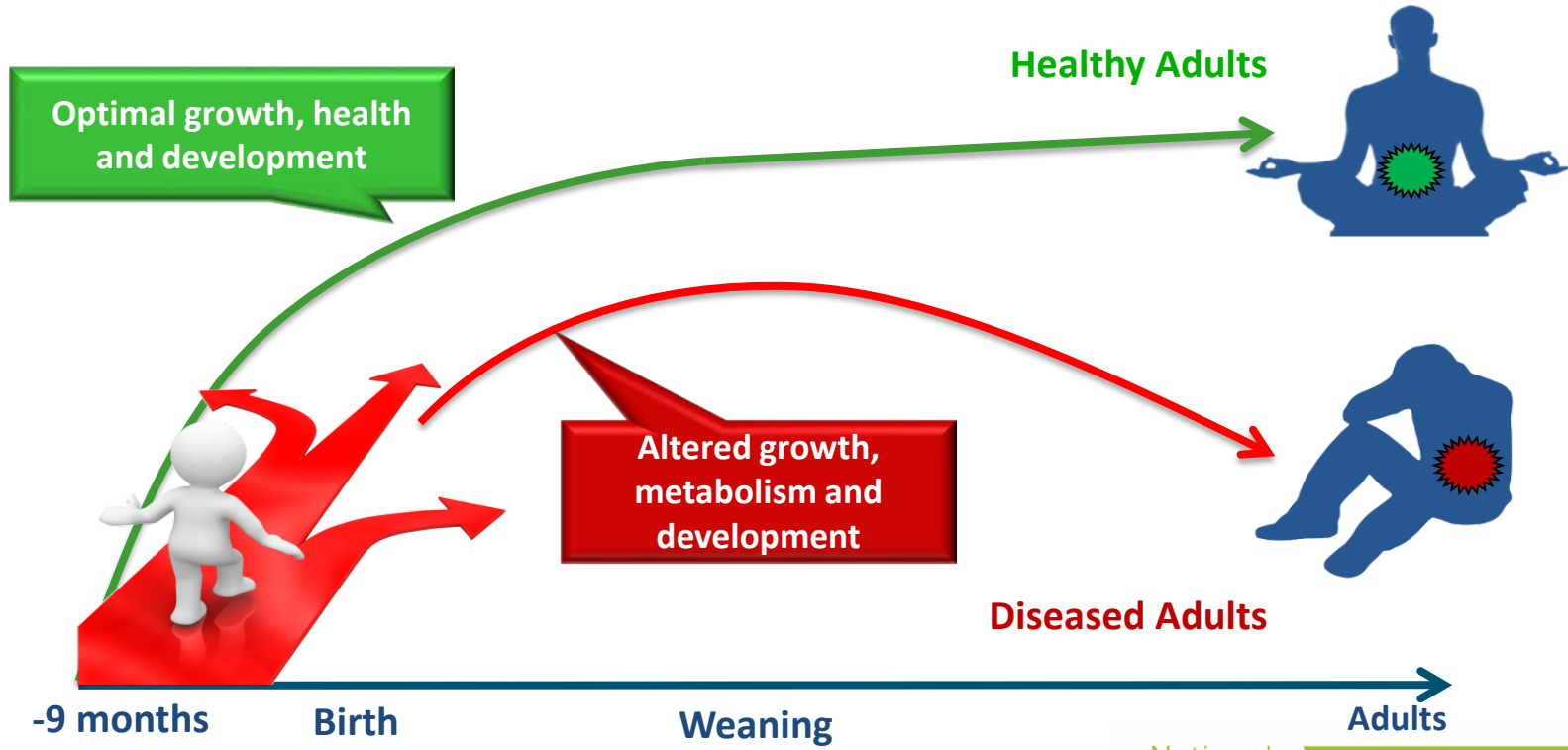
### Food Bioactives Asian Consumers

# Outline

- Weaning – Introduction of Solid Food
- Infant Health Programme



# Early Life Nutrition



# Breast Feeding



National  
**Science**  
Challenges

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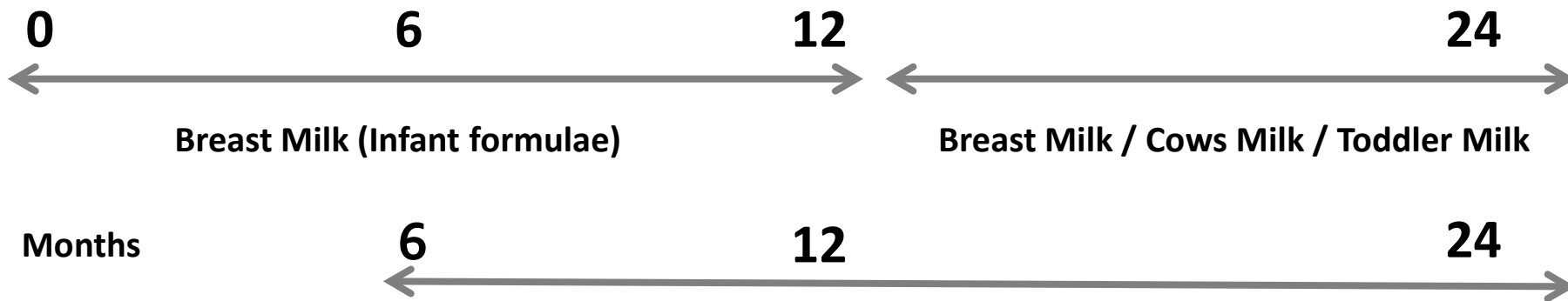


# Weaning: Introduction of Solid Food

- Development of feeding skills
- Taste
- Nutrients
- Gut maturation
- Immune maturation

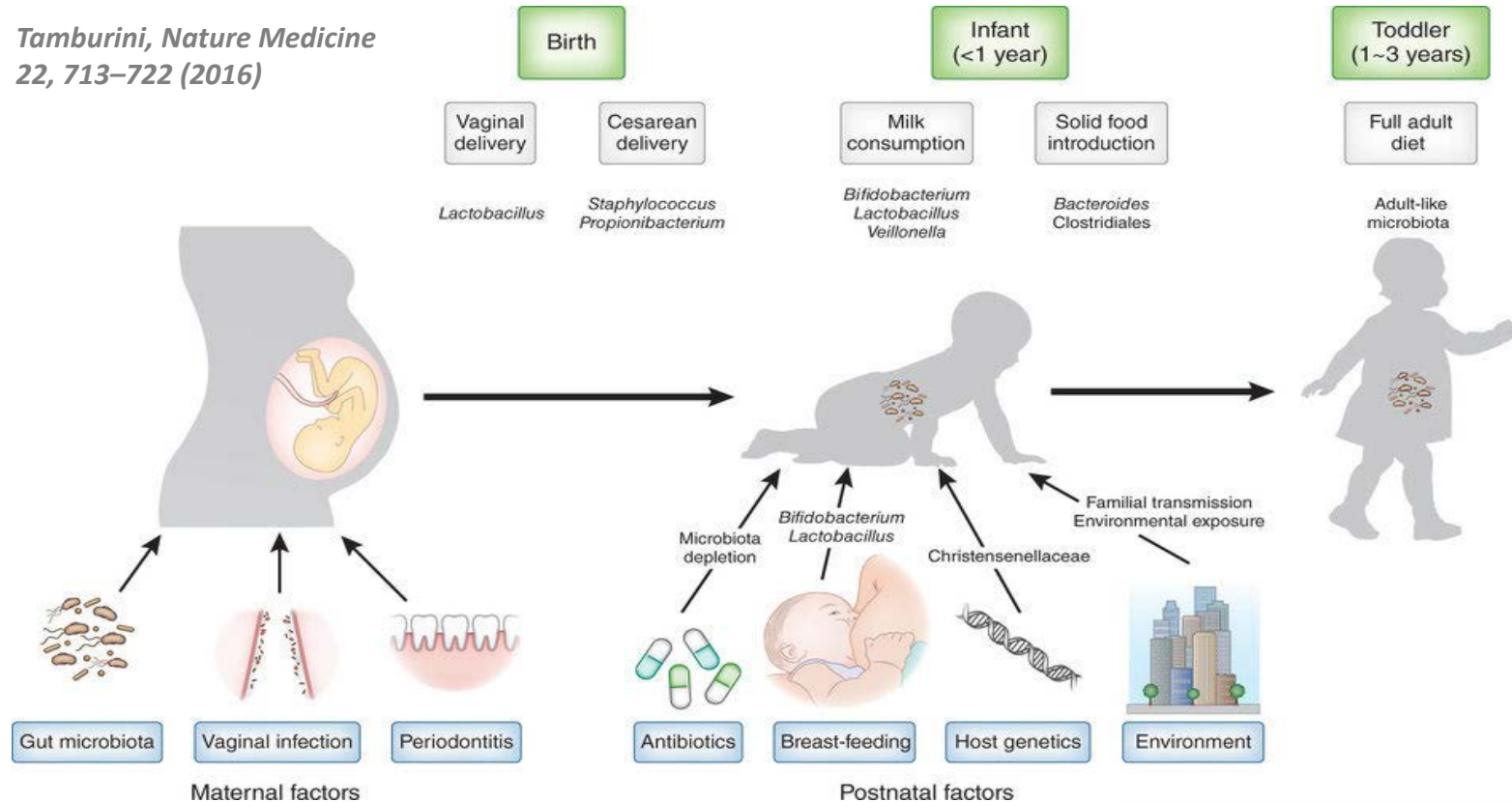


# Introduction of Solid Food



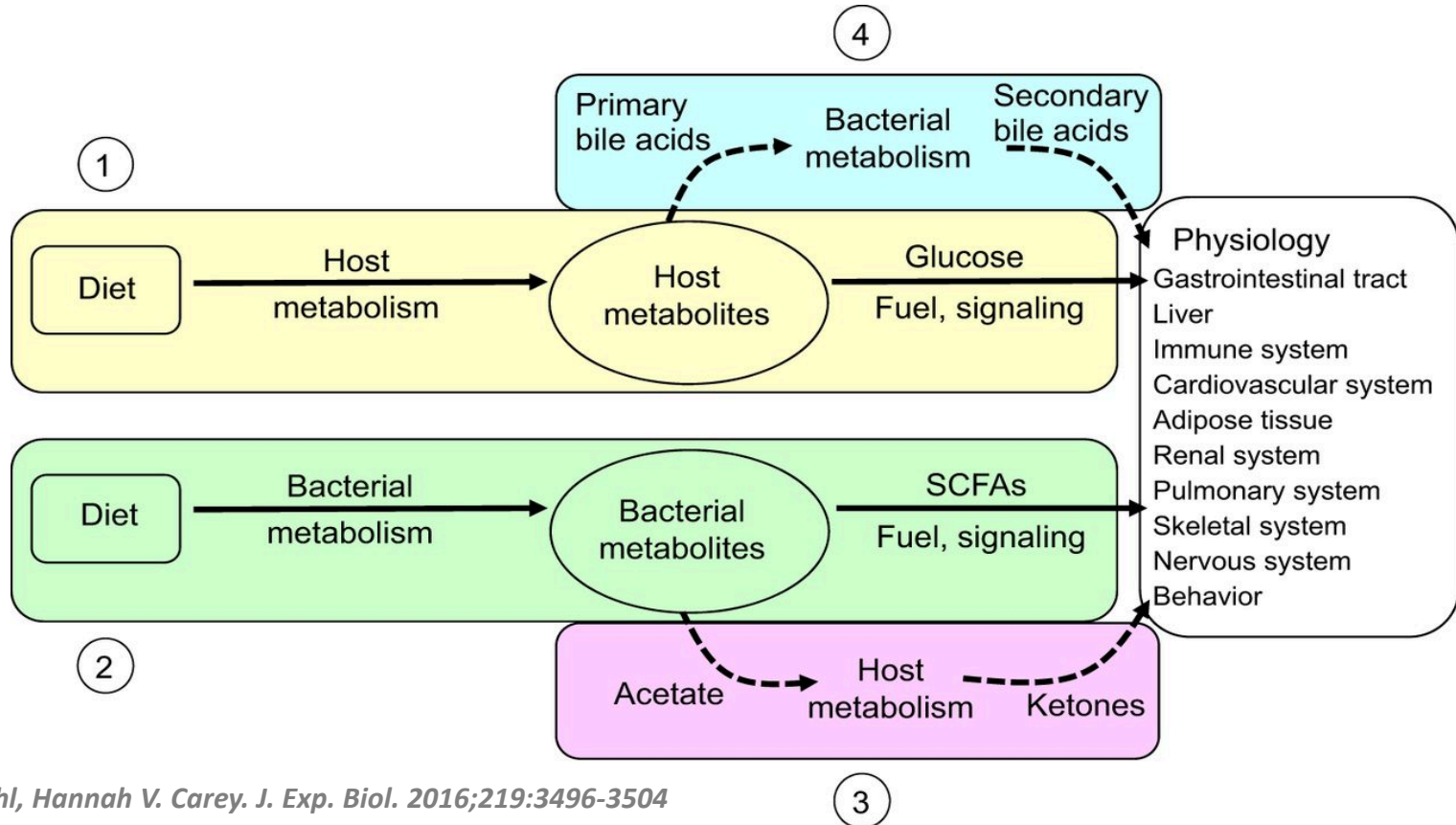
# Weaning and Microbiota

Tamburini, *Nature Medicine*  
22, 713–722 (2016)





# Host-Microbe Metabolism



# Infant Immunity & Microbiota

- Immune system co-evolves with microbiota.

## Questions

- How do **microbiota-immune interactions** in early life regulate immune homeostasis ?
- Can establishment of the **pioneer microbiota** in early life have **lifelong consequences** for the function of the host's immune system ?



# Collaborative Programme



COSBI

- **Systems Biology**

Identify immune health–beneficial bacteria in infant gut microbiome around and after weaning. Identify candidate “prebiotic” feeds for these bacteria.

- **Food Science**

Design and deliver experimental “prebiotic” complementary feed based on upstream Systems Biology.



- **Clinical Research**

Pilot trial on benefits of experimental CF in weaning infants for microbiome and immunity.



Measurements: Clinics, microbiomics, metabolomics, immune parameters incl. BCR seq.



- **Leverage into full EU JPI proposal**

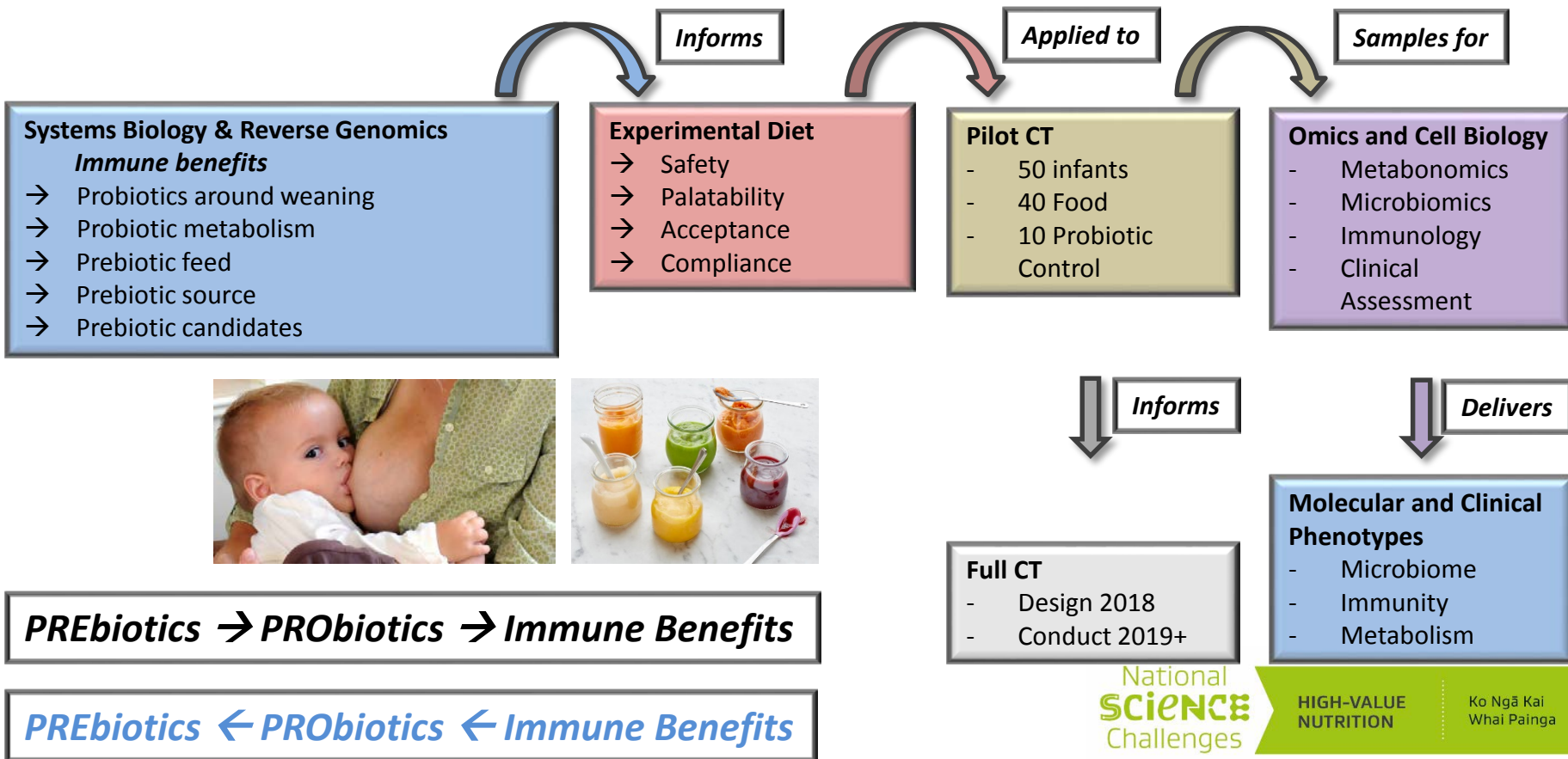


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# Workflow



# Project Gantt Chart





Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Base n=8			CF 1			CF 2			CF 3						
	B (8)			CF 1			CF 2			CF 3					
		B (8)			CF 1		CF 2			CF 3					
			B (8)			CF 1		CF 2		CF 3					
				B (8)			CF 1		CF 2		CF 3				
					B (8)			CF 1		CF 2		CF 3			

	<i>Baseline 2-3 months</i>	<i>CF 1 4-6 months</i>	<i>CF 2 9 months</i>	<i>CF 3 12 months</i>
Questionnaires	√	√	√	√
Anthropometry	√	√	√	√
Diet (Adherence)		√	√	√
Stool	√	√	√	√
Saliva	√	√	√	√
Health	√	√	√	√
Breast Milk	√	√	√	√
Blood		√		√
Urine	√	√	√	√
Primary Health Data				√

# Clinical Pilot: Gantt Chart & Samples

## Achievements since June 2017

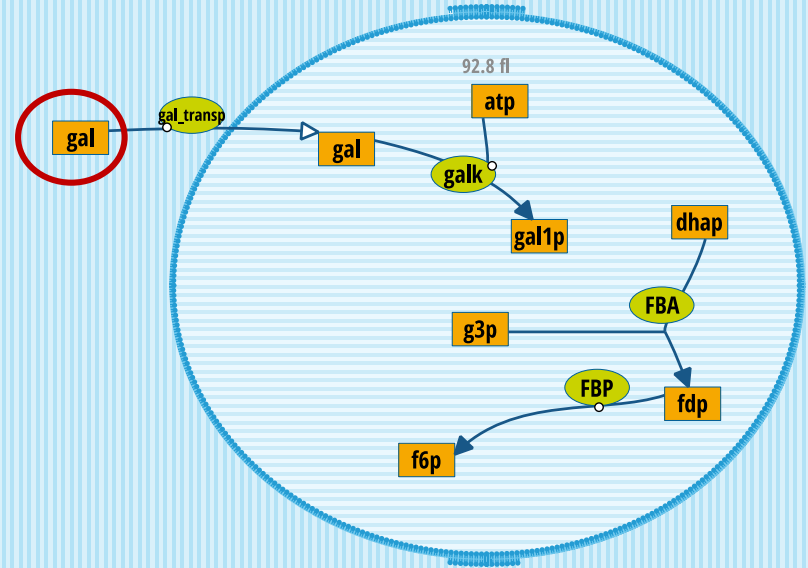
- **Bioinformatic proof-of-concept delivered**
- > **32'000** PubMed microbiome publications
  - ~**2000** papers on infant gut microbiome & immunity
  - ~50 bacterial genera ~**500** bacterial species in human gut
  - ~8 bacterial genera ~**80 bacterial species related to infant gut microbiome & immunity**
- **Including positive controls**  
e.g. *Lactobacilli* and *Bifidobacteria*



# Bioinformatics: Exogenous Metabolites

Netseed

Example: *Bacteroides fragilis*



# Next 18 Months

- **Validate reverse genomics proof-of-concept** Q4 2017

***PREbiotics** ← **PRObiotics** ← **Immune Benefits***

- **Advance from PRObiotics to PREbiotic** feed via Human Metabolome Database Q4 2017
- Inform **design of complementary feed** Q4 2017
- Back up complementary feed by “known” prebiotics
- **Classical proof-of-concept:**

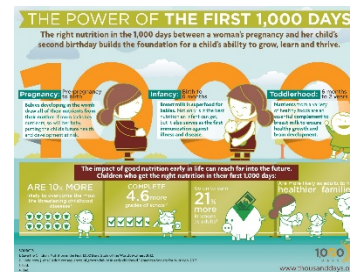
***PREbiotics** → **PRObiotics** → **Immune Benefits***

- Design and **deliver complementary feed** Q1 2018
- **Clinical trial** Q2-3 2018:  
Metagenomics, metabolomics, immune parameters, clinical assessment
- **Data analysis and integration** Q4 2018 – Q1 2019
- **Reporting, publications** Q1 2019



# Industry Engagement

- Programme set up with industry consultation:  
**Infant Nutrition Workshop** October 2016  
HVN Industry Advisory Panel
- **Infant Complementary Feeding Workshop** Nov. 2017
- **Industry Reference Group** to be established





# Weaning Foods NZ Inc.



- Determine the **optimal age** and food for increasing intestinal **microbial diversity**
- Optimize effects on gut microbiota, **immune maturation** and **later health outcomes**.