

HIGH-VALUE
NUTRITION

Ko Ngā Kai
Whai Pāinga

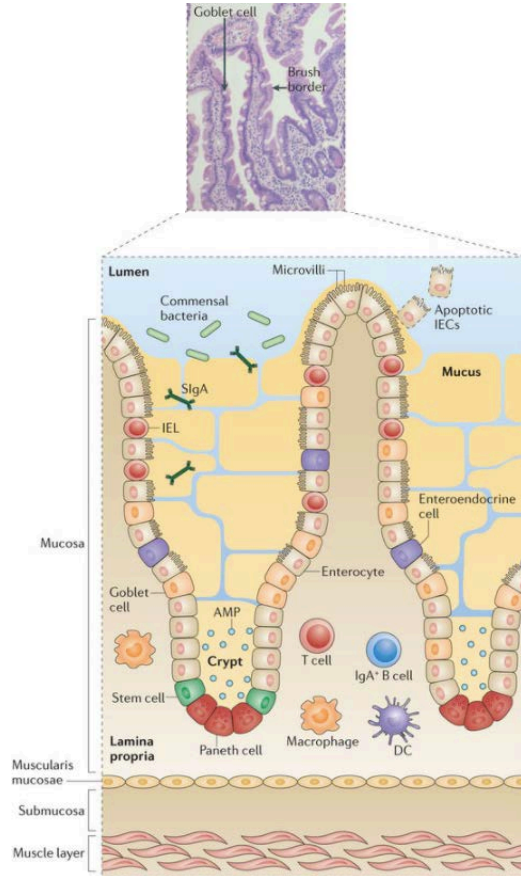
Enhancing influenza vaccine efficacy with functional foods

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Masters Student

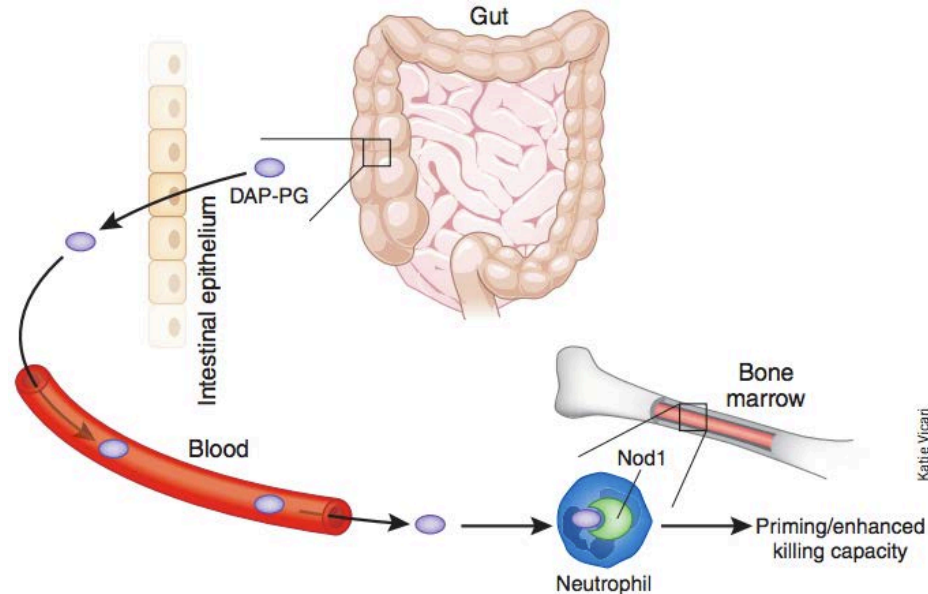
Host Institution



The gut is an immune-rich organ



The gut microbiota influences immunity at sites distal from the gut

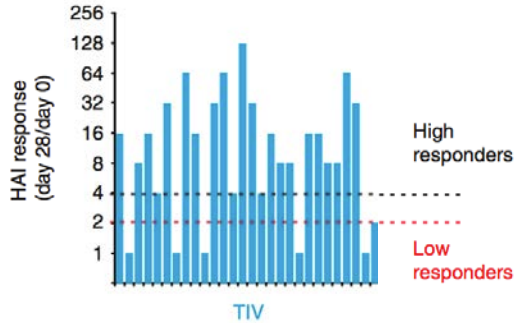


Katie Vicari

Clarke et al. 2010, Nature Medicine

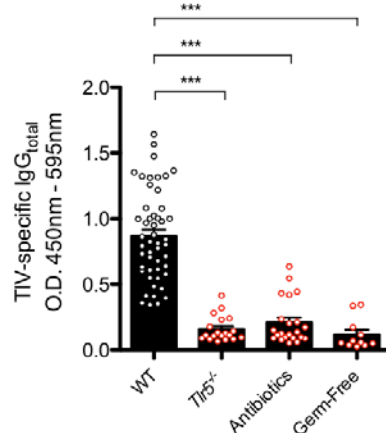
Sensing of gut microbes regulates antibody responses to influenza vaccination

IgG antibody
blocks binding receptor and can block fusion event



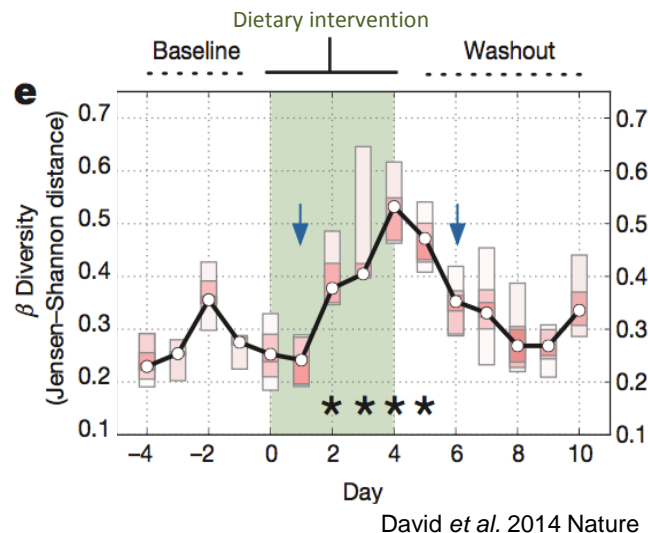
Nakaya et al. 2011 Nat. Immunol.

→ **TLR-5** expression in human immune cells correlated with antibody response to flu vaccination



→ Gut microbes enhance antibody response flu vaccination

Diet rapidly alters gut microbial composition and metabolism

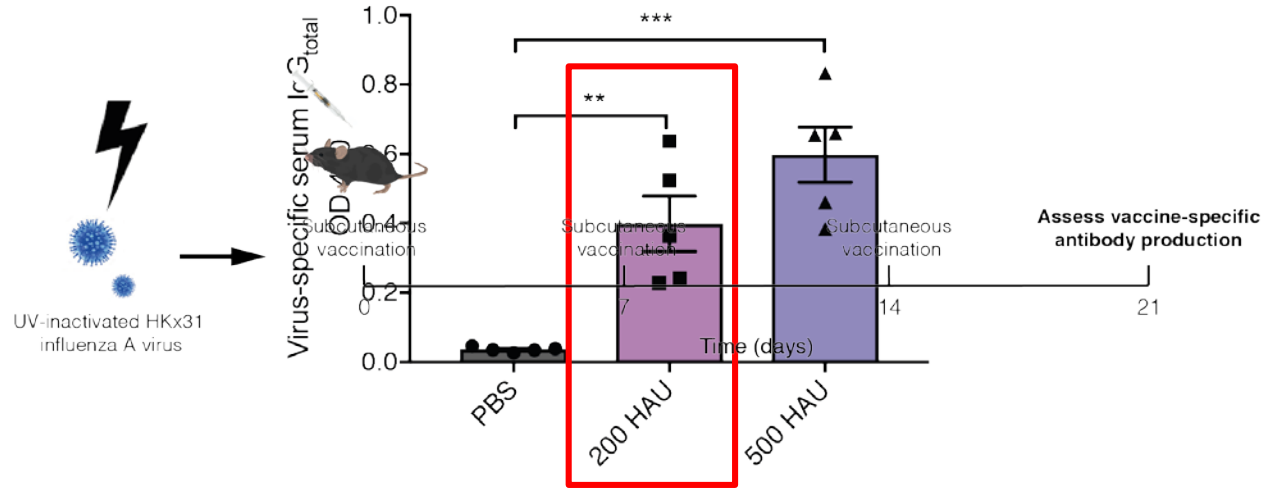


→ Nutrition is an effective, safe and cost-effective mechanism to alter gut microbiota → modulate influenza vaccine responses?

Study aims

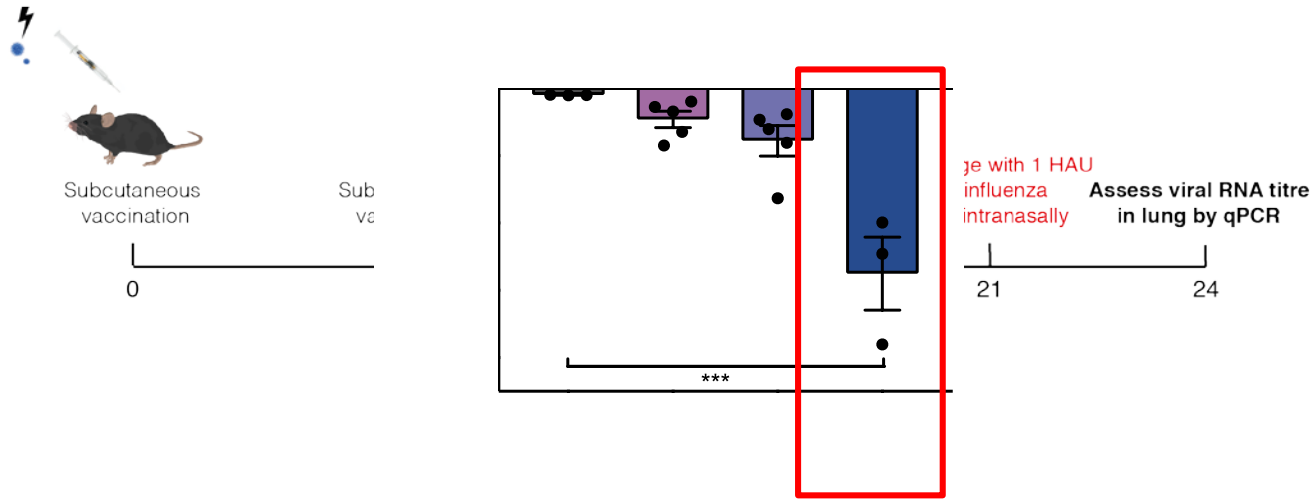
- To develop a suboptimal mouse model of influenza vaccination, representing low-responders in human populations
→ IgG antibody + protection against infection
- Utilise model to investigate the impact of functional foods on immune response to influenza vaccination

Inactivated influenza vaccine induces serum antibody production



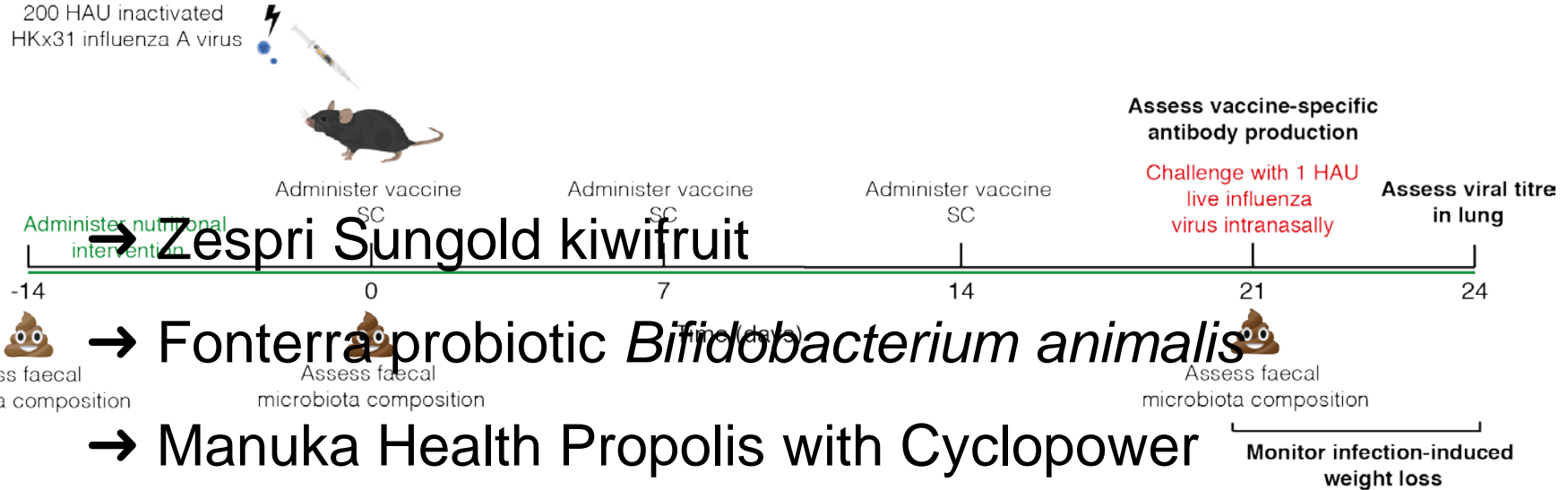
→ 200 HAU dose provides a suboptimal antibody response

Inactivated influenza vaccine elicits protection from infection



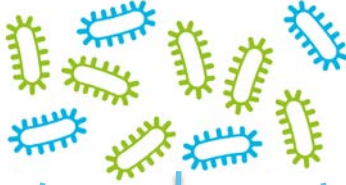
→ 200 HAU vaccine dose provides a suboptimal protection against subsequent infection

Suboptimal influenza vaccination model



Dietary fibre fuels gut microbes

Dietary fibre

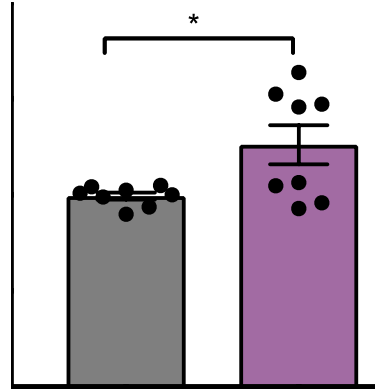


Short-chain fatty acids

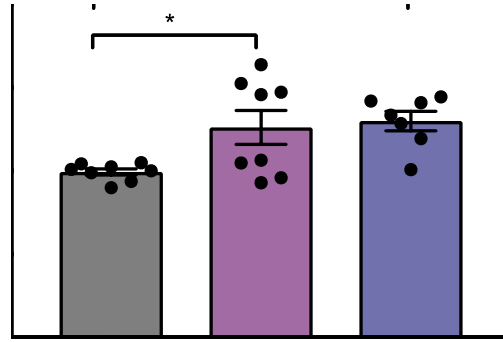
Immune modulation

Flu vaccine antibody responses?

Fermentable fibre deprivation is detrimental to vaccine-specific antibody production

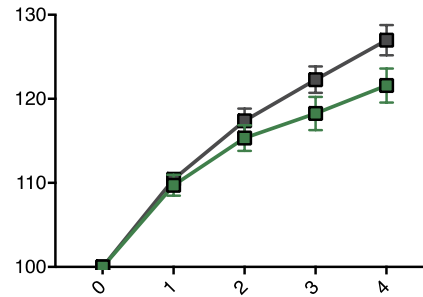
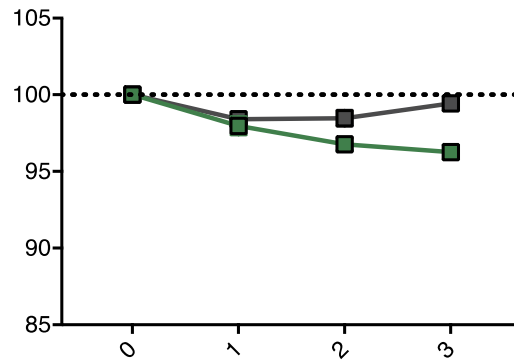
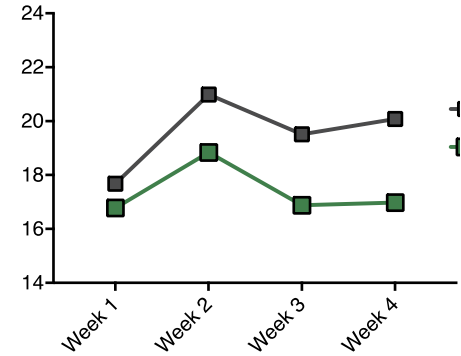
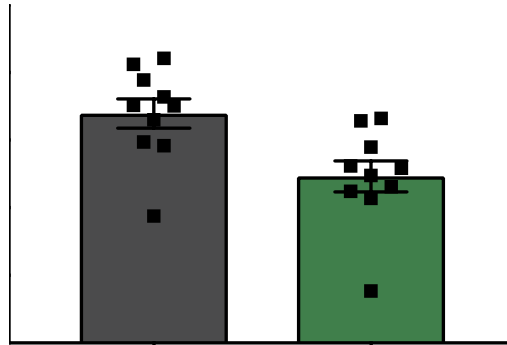


Bacterial metabolites restore antibody production in fibre-deprivation

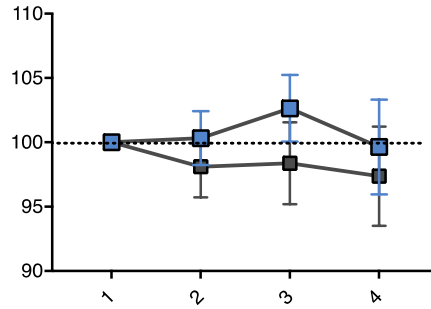
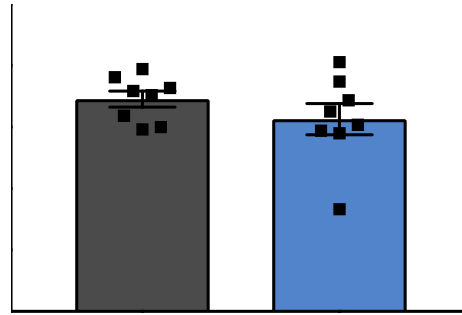


→ Fibre intake may drive antibody production to influenza vaccination through short-chain fatty acids

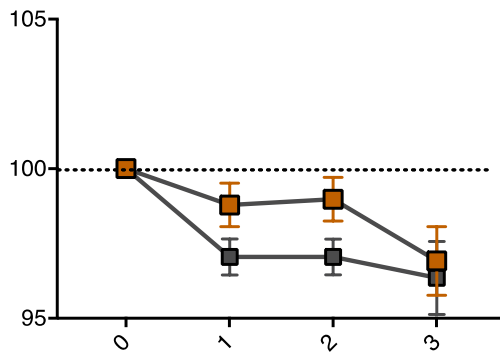
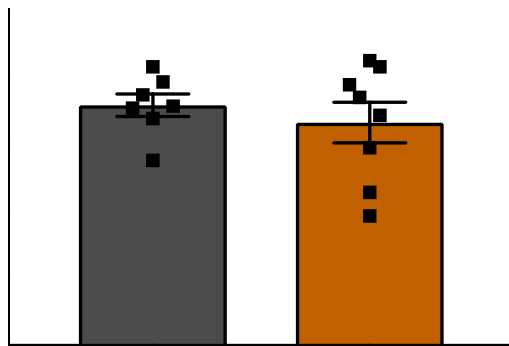
Zespri Sungold Kiwifruit



Fonterra probiotic *Bifidobacterium animalis*



Manuka Health Propolis with Cyclopower



Conclusions and future directions

- Successfully established a suboptimal murine model of influenza vaccination
- Fibre restricted diet was detrimental to vaccine response - rescued by administration of short-chain fatty acids
- No significant improvement in vaccine-specific antibody production in functional food treated mice

Future directions

- Influenza viral titre in lung to be analysed – foods may improve protection by altering other immune parameters
- Further investigate benefit of dietary fibre/ SCFAs on vaccine response

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Thank you for your attention. Questions?