

HIGH-VALUE  
NUTRITION

Ko Ngā Kai  
Whai Pāinga

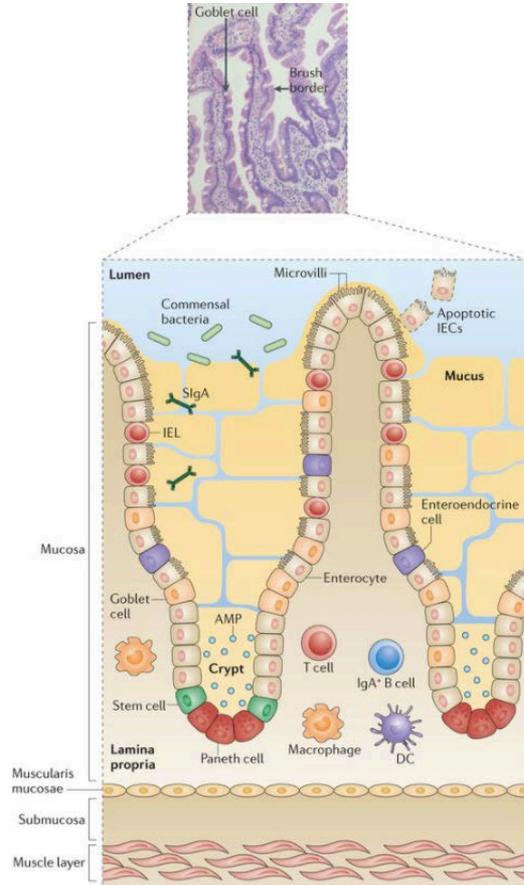
# Enhancing influenza vaccine efficacy with functional foods

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Masters Student

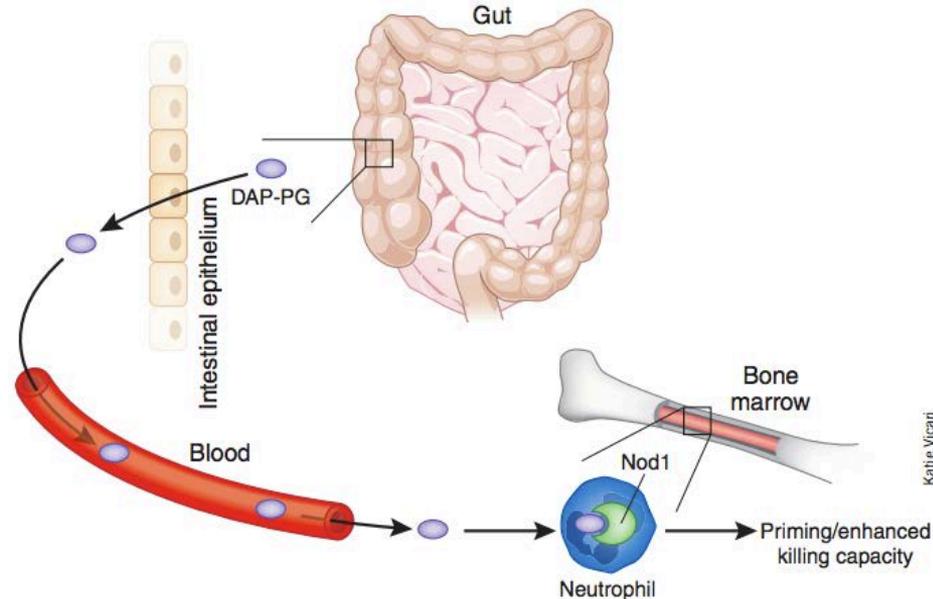
Host Institution



# The gut is an immune-rich organ



# The gut microbiota influences immunity at sites distal from the gut

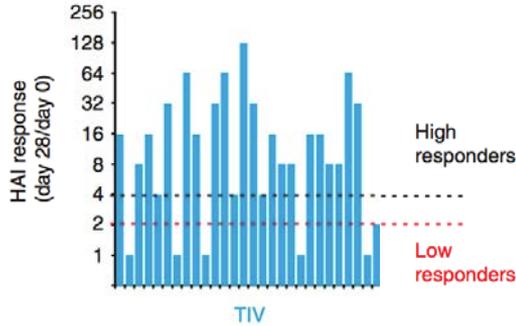


Katie Vicari

Clarke et al. 2010, Nature Medicine

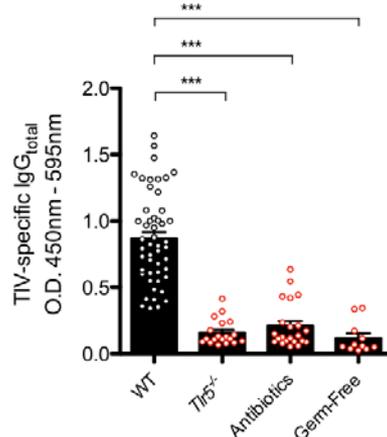
# Sensing of gut microbes regulates antibody responses to influenza vaccination

IgG antibody  
blocks binding receptor and can block fusion event



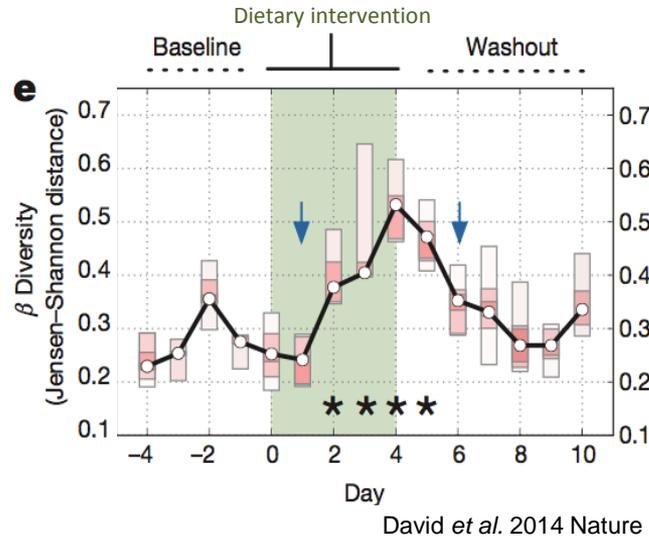
Nakaya et al. 2011 Nat. Immunol.

→ **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

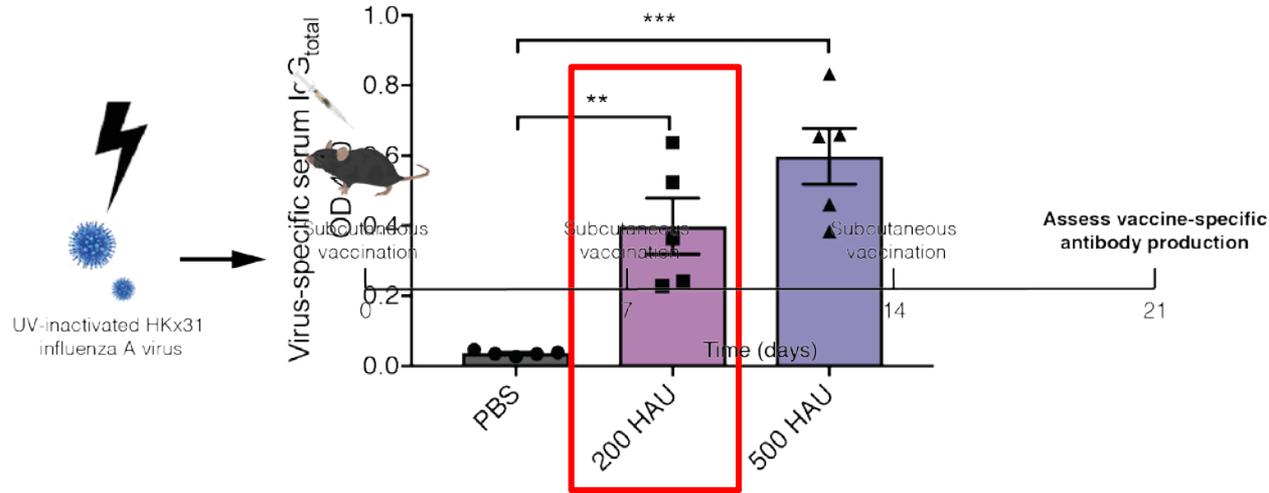


→ Nutrition is an effective, safe and cost-effective mechanism to alter gut microbiota → modulate influenza vaccine responses?

# Study aims

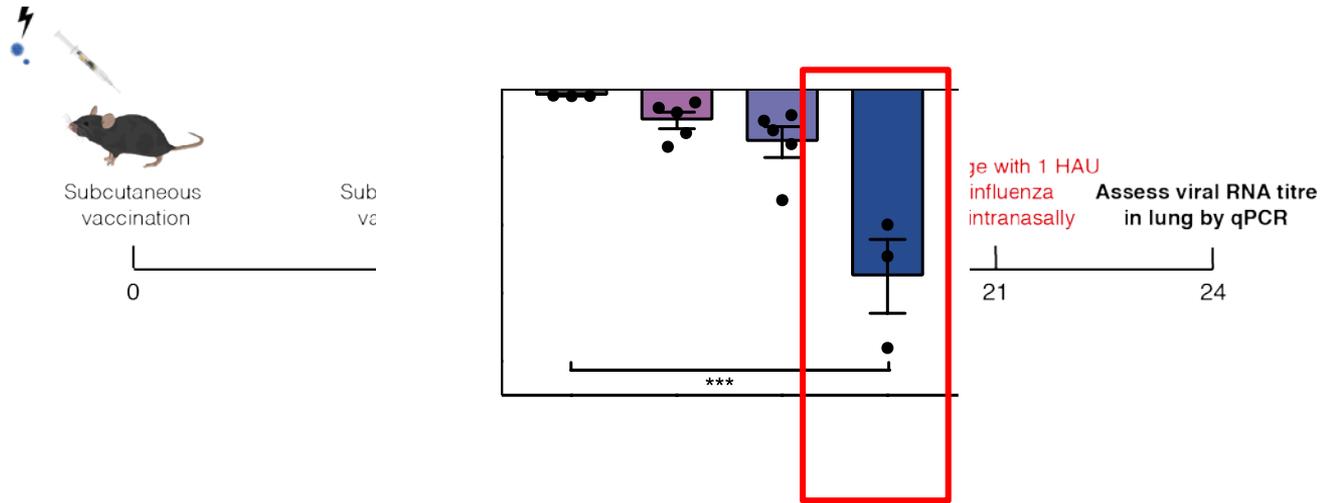
- To develop a suboptimal mouse model of influenza vaccination, representing low-responders in human populations  
→ IgG antibody + protection against infection
- Utilise model to investigate the impact of functional foods on immune response to influenza vaccination

# Inactivated influenza vaccine induces serum antibody production



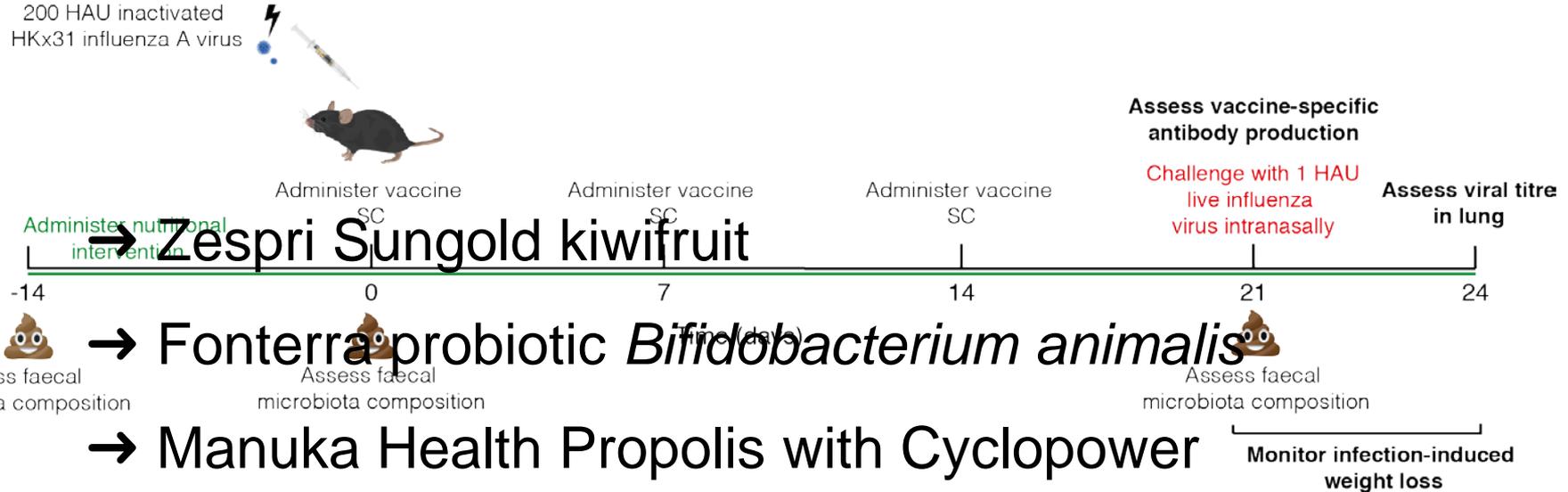
→ 200 HAU dose provides a suboptimal antibody response

# Inactivated influenza vaccine elicits protection from infection



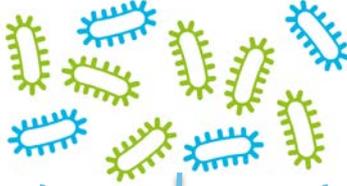
→ 200 HAU vaccine dose provides a suboptimal protection against subsequent infection

# Suboptimal influenza vaccination model



# Dietary fibre fuels gut microbes

Dietary fibre

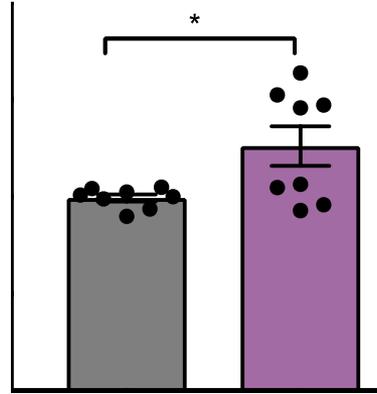


Short-chain fatty acids

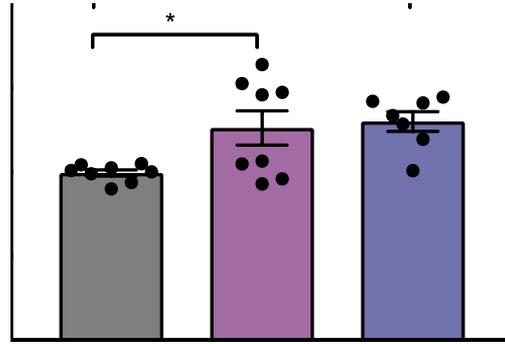
Immune modulation

**Flu vaccine antibody responses?**

# Fermentable fibre deprivation is detrimental to vaccine-specific antibody production

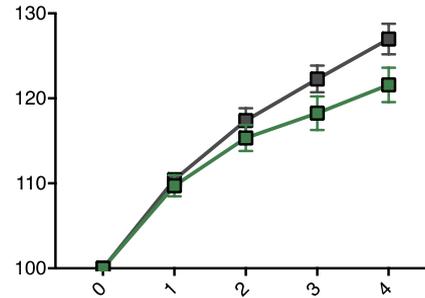
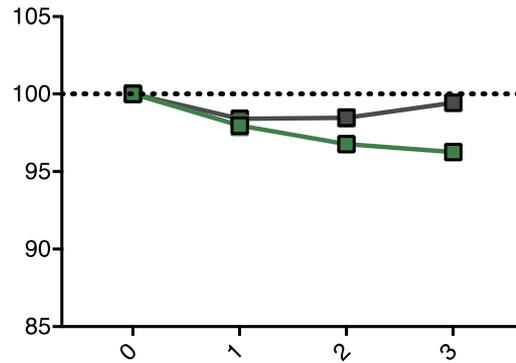
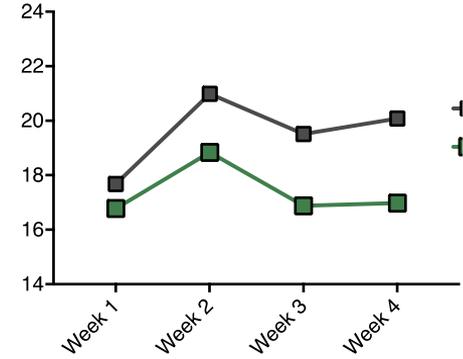
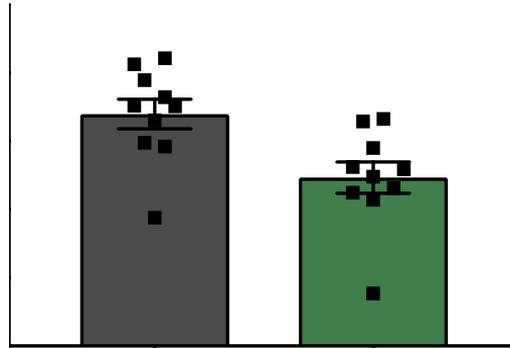


# Bacterial metabolites restore antibody production in fibre-deprivation

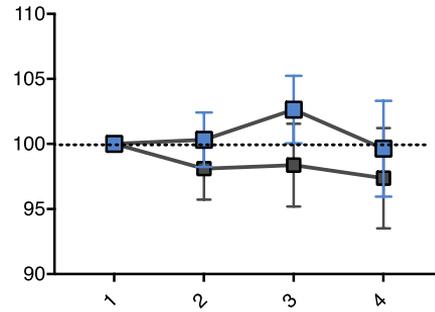
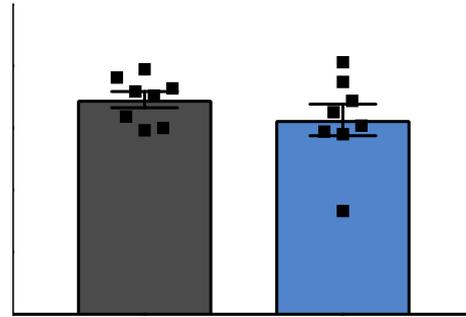


→ Fibre intake may drive antibody production to influenza vaccination through short-chain fatty acids

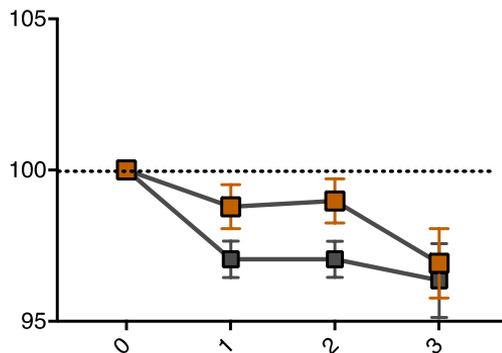
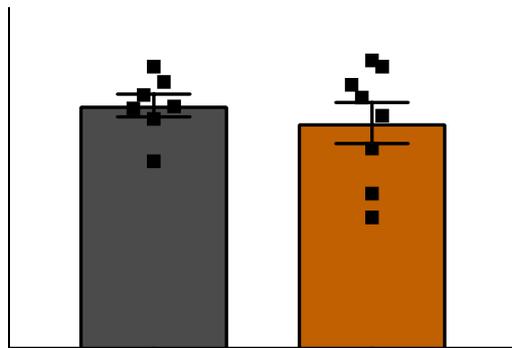
# Zespri Sungold Kiwifruit



# 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?