

2019/20 PhD Proposal – CSC-NZ-CFPN CRCC Joint Funding Programme

Information to be published on NZ-CFPN CRCC website if proposal is selected	
Project title	Comparative metagenomics of raw milk: implications for production and public health
Supervisors title and name	Distinguished Prof. Nigel French (Primary supervisor, Massey University, New Zealand) Professor Kent Wu (Co-supervisor, Jinan University, China) Dr Tony Mutukumira (Co-supervisor, Massey University, New Zealand) Dr Tanushree Gupta (Co-supervisor, AgResearch Ltd, New Zealand)
Department	Hopkirk Research Institute
School / Centre	School of Veterinary Science
University	Massey University
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Link to Supervisor's research page	https://www.massey.ac.nz/massey/expertise/profile.cfm?stref=219830
Project outline 150-300 words (approx) describing a possible PhD project, which has a link with an existing or potential research partner in China	<p>The sale of raw, unpasteurized milk is permitted in New Zealand, provided standards set by the food safety regular are met. Although there is an increasing demand for raw milk from consumers, consumption has been linked to outbreaks of foodborne illness, such as campylobacteriosis and infections with shiga toxin-producing <i>E. coli</i>.</p> <p>This project will use the latest metagenomics approaches to characterize the microbial community of raw milk on farms that sell both directly to customers and to large dairy companies for subsequent pasteurisation. The influence of season on the community profile will be determined, as well as the effect of different hygiene levels used to collect and store milk intended for direct sale or pasteurization.</p> <p>This project will involve preliminary work, comparing the performance of different approaches to assessing community profiles of raw milk, including: standard culture and isolation, whole shotgun metagenomics deep sequencing, 16S amplicon sequencing, and restriction site-associated DNA sequencing (RadSeq/genotyping by sequencing). This will be followed by a comparative metagenomics study of raw milk taken from different production systems at different times of the year. Particular research questions include:</p> <ul style="list-style-type: none"> • How does the microbial community profile change over the seasons? • How does it vary between milk produced for retail as raw milk (under ultra-strict hygiene) compared to milk produced for pasteurisation (under standard hygiene regulations) on the same farm unit? • Is there a relationship between hygiene levels and the presence of genes associated with resistance to antimicrobial agents, including sanitisers? • What implications does the above have for food safety? <p>The student will be co-supervised by scientists with considerable experience of microbiology and molecular biology and the application of genomics, including metagenomics, technologies. The work will be carried out in a specialised molecular and genomics laboratory in the Hopkirk Research Institute.</p>
References for further reading (optional)	<p>Andrews, K., et al., <i>Harnessing the power of RADseq for ecological and evolutionary genomics</i>. Nat Rev Genet, 2016. 17(2): p. 81-92.</p> <p>Metzger, S., et al., <i>Understanding the Milk Microbiota</i>. Vet Clin North Am Food Anim Pract, 2018. 34(3): p. 427-438.</p> <p>Porcellato, D., et al., <i>Microbial diversity of consumption milk during processing and storage</i>. Int J Food Microbiol, 2018. 266: p. 21-30.</p> <p>Taponen, S., et al., <i>Bovine milk microbiome: a more complex issue than expected</i>. Vet Res, 2019. 50(1): p. 019-0662.</p>
Additional information to be used in proposal selection process	
NZCFPN CRCC priority area to which proposal is aligned (see list below)	Risk assessment and mitigation
Brief outline of Supervisor's current research links with China or interest in developing them	Nigel French is Director of the New Zealand-China Food Protection Network and has coordinated a number of food safety and food security relationships with partners in China.