NEW ZEALAND
AGRICULTURAL GREENHOUSE GAS
Research Centre

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha

Fungal Biosynthesis of Bacteriocins for Enteric Methane Mitigation

More than 80% of New Zealand methane emissions are attributed to enteric fermentation in ruminant livestock and New Zealand is at the forefront of research identifying compounds that can be used as inhibitors of enteric methane production.

Bacteriocins, bacterially produced antimicrobial peptides, are highly effective rumen modifiers, capable of significantly reducing enteric methane production at low concentrations through direct inhibition of ruminal methanogens without exerting negative effects on feed digestibility. However, existing bacteriocin production methods are low yield and cost prohibitive, limiting commercial usage. Additionally, New Zealand's agricultural landscape presents a significant barrier to effective methane inhibitor delivery with 40% of land accounted for by non-native grasses used for livestock grazing.

This project will address these issues by developing dual filamentous fungal bacteriocin manufacturing methods, including a fungal factory system for large-scale inhibitor production and a novel delivery system. Advanced molecular and analytical chemistry techniques will be employed to engineer bacteriocin biosynthetic pathways into fungal hosts.

The scholarship will offer comprehensive training in synthetic biology to reconstruct bacterial biosynthetic pathways in filamentous fungal hosts for bacteriocin production. This will involve experience in molecular biology techniques, fungal microbiology and genetics to generate and verify genomically modified fungal strains. Additionally, you will have the opportunity to develop entrepreneurial skills to assist the team in the future commercialisation and translation of the research from the laboratory to the farm to ensure the real-world impact of the research to decrease methane emissions.

Preferred candidate skills experience: The candidate will have a strong background in natural product biosynthesis, fungal genetics, molecular biology and biochemistry. Proficiency in synthetic biology techniques such as molecular cloning, experience with fungal strain engineering and analytical chemistry is desirable. Candidates should demonstrate experience in laboratory-based research, including experimental design, data analysis and interpretation. Strong communication skills, both written and oral, are essential for effectively presenting research findings and collaborating with interdisciplinary teams.

Required skills and experience for the position:

- Proficiency in synthetic biology techniques such as molecular cloning
- Experience with fungal strain engineering
- Experience in analytical chemistry
- Demonstrated laboratory-based research experience
- Communication skills, both written and oral

Host institute(s) and location(s): University of Canterbury, Christchurch.

Project leader(s)/research supervisor: Primary supervisor - Dr Sarah Kessans, Senior Lecturer in the School of Product Design, Canterbury University.