Leighton Payne

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Microbiology and Immunology
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Present Research

Microbial communities are the biological foundation of all ecosystems on Earth, and the structure of these communities are shaped largely by the ever-present viruses that infect and kill bacteria. Currently, I am researching the molecular 'defence systems' that have evolved in bacteria to protect against viral infections, with an emphasis on developing tools to identify and discover novel types of defence systems. Through understanding defence systems, we hope to more effectively utilise viruses to eliminate pathogenic bacteria in healthcare and agricultural applications.

Education

2020 – 2023 **PhD in Microbiology**, University of Otago, New Zealand
Thesis: The antiviral defence systems of bacteria and archaea

2019 – 2020 **BSc (Hons; 1st class) in Microbiology**, University of Otago, New Zealand
Dissertation: Mesorhizobium symbiosis islands encode diverse bacteriophage defence systems

2008 – 2009 **BBiomedSc in Infection and Immunity**, University of Otago, New Zealand

Awards & Honors

2022 Dnature® sponsored **Poster Prize** ($200), presented at the New Zealand Microbiological Society Conference, New Zealand

2022 New Zealand Microbiological Society **Student Travel Grant** ($850) to present at the New Zealand Microbiological Society Conference, New Zealand

2022 Department of Microbiology and Immunology **Student Travel Grant** ($2,000) to present at the Viruses of Microbes Conference, Portugal

2022 Division of Health Sciences **Student Travel Grant** ($2,000) to present at the Viruses of Microbes Conference, Portugal

2021 DT Jones Microbiology **Student Travel Grant** ($470) to present at the Federation of Asian and Oceanian Biochemists and Molecular Biologists Congress, New Zealand (virtual)

2020 – now University of Otago **PhD Research Scholarship** ($76,500)

2019 GlycoSyn® sponsored **Summer Research Scholarship** ($5,000)
Project: How do soil bacteria protect themselves against viruses?

Teaching

Undergraduate

2020 – 2022 MICR336: Microbial Ecology
Teaching R programming for microbial community analysis (senior demonstrator)
University of Otago, New Zealand

2020 – 2022 MICR335: Molecular Microbiology
Teaching fundamental molecular microbiology techniques (demonstrator)
University of Otago, New Zealand

Student supervision

Honours

2022 Joel Haste, University of Otago, New Zealand.
Supported supervision of student's postgraduate lab work.
Dissertation: The type II Thoeris system has two distinct defence mechanisms

Undergraduate

2021 Jai Tarn, University of Otago, New Zealand
Assisted in introducing student to postgraduate study, with a focus on bioinformatics.

Publications

Peer-reviewed Papers

2021 **Payne, LJ**, Todeschini, TC, Wu, Y, Perry, BJ, Ronson, CW, Fineran, PC, Nobrega, FL, Jackson, SA. Identification and classification of antiviral defence systems in bacteria and archaea with PADLOC reveals new system types. *Nucleic Acids Res*. doi:10.1093/nar/gkab883

2022 **Payne, LJ**, Meaden, S, Mestre, MR, Palmer, C, Toro, N, Fineran, PC, Jackson, SA. PADLOC: a web server for the identification of antiviral defence systems in microbial genomes. *Nucleic Acids Res*. doi:10.1093/nar/gkac400

Open-source Software

2019 – now **PADLOC** | www.padloc.otago.ac.nz
A tool and web server for identifying defence systems in microbial genomes
Role: Creator, main developer

Presentations

Talks

2022 **Payne, LJ**. The uncharacterised genes embedded in defence systems encode new types of defence. *University of Liverpool*, Liverpool, United Kingdom.

2022 **Payne, LJ**. Expanding on the ever-growing arsenal of antiviral defences in prokaryotes. *University of Otago, Microbiology & Immunology Postgraduate Symposium*, Dunedin, New Zealand

Posters

2022 **Payne, LJ**, Hughes, T, Fineran, PC, Jackson, SA. Identification of new antiviral defence mechanisms to advance our understanding of bacterial immune systems. *New Zealand Microbiological Society Annual Conference*, Wellington, New Zealand.

2022 **Payne, LJ**, Todeschini, TC, Wu, Y, Meaden, S, Mestre, MR, Palmer, C, Toro, N, Perry, BJ, Hughes, T, Ronson, CW, Fineran, PC, Nobrega, FL, Jackson, SA. Identification of CRISPR-Cas and novel phage defence systems to expand our molecular toolkit. *Queenstown Research Week CRISPR Technologies Satellite*, Queenstown, New Zealand.

2022 **Payne, LJ**, Todeschini, TC, Wu, Y, Meaden, S, Mestre, MR, Palmer, C, Toro, N, Perry, BJ, Hughes, T, Ronson, CW, Fineran, PC, Nobrega, FL, Jackson, SA. The Prokaryotic Antiviral Defence LOCator (PADLOC) for the identification and discovery of diverse novel defence systems. *Viruses of Microbes Conference*, Guimarães, Portugal.

2021 **Payne, LJ**, Todeschini, TC, Wu, Y, Perry, BJ, Ronson, CW, Fineran, PC, Nobrega, FL, Jackson, SA. Identification and classification of antiviral defence systems in bacteria and archaea with PADLOC reveals new subtypes. *Federation of Asian and Oceanian Biochemists and Molecular Biologists Congress*, Christchurch, New Zealand. doi:10.6084/m9.figshare.17058113.

2020 **Payne, LJ**, Perry, BJ, Ronson, CW, Fineran, PC, Jackson, SA. Mesorhizobium symbiosis islands encode diverse bacteriophage defence systems. *Genetics Otago Symposium*, Dunedin, New Zealand. doi:10.6084/m9.figshare.16442001.

2019 **Payne, LJ**, Perry, BJ, Ronson, CW, Fineran, PC, Jackson, SA. Mesorhizobium symbiosis islands encode diverse bacteriophage defence systems. *Microbiology and Immunology, and Biochemistry Research Symposium*, Dunedin, New Zealand. doi:10.6084/m9.figshare.16442001.

Miscellaneous

Professional society affiliations

2022 – now Queenstown Molecular Biology Society (QMB) member

2022 – now Maurice Wilkins Centre (MWC) affiliate investigator

2021 – 2022 American Society for Microbiology (ASM) member

2020 – now New Zealand Microbiological Society (NZMS) member

2020 – now New Zealand Society for Biochemistry and Molecular Biology (NZSBMB) member

Glossary

These are the meanings of the symbols used throughout this document:

- Indicates that a publication is open-access
- Link to a code repository on GitHub
- Link to an open-access PDF
- Link to a poster