Research Title

Uncovering Drivers of Viral Spillover

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Summary
My research currently focuses on understanding viruses carried by waterfowl and seabirds, and how environmental sampling can help Aotearoa prepare for future infectious diseases. This work aligns closely with Te Niwha's mission to build national capability in pathogen genomics, strengthen partnerships with communities, and support the country to be ready for new or re-emerging diseases. My PhD project will build on my postgraduate research, creating linked work centred on environmental surveillance and community needs.

Work completed during my PGDipSci investigated the diversity of viruses present in urban waterfowl in public parks and botanical gardens. I collected faecal samples from waterfowl to identify the range of viruses present. The study showed that waterfowl carry a wide variety of viruses, including several not previously reported in Aotearoa. Because these birds live in close contact with people, pets, and other wildlife, the project provided insight into viral presence in busy public areas. The study highlighted the potential for environmental DNA (eDNA) and RNA (eRNA), to be used as non-invasive tools for pathogen monitoring. These methods will form a core part of my PhD research and support Te Niwha's goals by expanding local viral data, showing how genomic tools can be applied in community settings, and highlighting the value of surveillance at the human and wildlife interface.

My PhD extends this work through two main research streams. The first focuses on a long-term study of urban waterfowl environments. The second is a community-focused environmental sampling project guided by local rūnaka priorities.

For the long-term study, two locations used in my earlier research were selected: the Dunedin Botanic Gardens (DBG) in Dunedin and Anderson Park Gardens (APG) in Invercargill. Within DBG, sampling took place in three areas: the duck feeding site, the Otaru Teien Japanese garden, and the Clive Lister garden. These sites represent different types of bird activity and visitor use, helping to track how viruses appear and change. I have completed extractions for both sets of waterfowl samples, providing the foundation for the next stages of laboratory work.

The community-focused component involves collaboration with the Royal Albatross Centre (RAC), Ōtākou rūnaka, the East Otago Taiāpure (EOT), and the Karitane rūnaka. This work arose from specific community concerns. At the EOT, the main concern is avian influenza. At the RAC, concerns focus on water contamination, as they cannot use tank water because of gull activity, and the potential spread of avian influenza via red-billed gulls to the albatross colony. GeneXpert testing at the RAC was previously carried out by staff using water samples. My work will retest the GeneXpert with additional environmental samples, from the DBG including sediment, faecal matter, and water, and spike these samples to confirm the device can accurately detect avian influenza and COVID-19. Environmental sampling at the EOT may include

species other than birds, depending on community priorities. Extraction methods for faecal, water, and sediment samples have already been optimised in previous studies.

Partnerships and permissions are essential. The Dunedin City Council is reviewing permissions for sampling in the botanic gardens. The RAC and Ōtākou rūnaka specifically requested our support, and the EOT and Karitane rūnaka have approved discussions to plan sampling. As the research does not involve taking samples directly from animals, formal animal ethics approval is not required. I actively participate in monthly meetings with the EOT and continue discussions with all community partners to ensure the research responds to their needs. My literature review has recently been completed and will be discussed with my advisory panel at my upcoming progress meeting.

Although still early in my PhD, the project is producing valuable outcomes. It adds to Aotearoa's environmental, viral data, strengthens relationships between researchers and communities, and contributes towards practical tools for real-time pathogen detection. The results will be useful for communities, rūnaka, conservation groups, councils, and scientific partners who need reliable ways to understand pathogen presence. This supports improved decision-making for public health, wildlife health, and the management of sites important for recreation and food gathering.

The next stages will involve analysing all waterfowl samples, carrying out the next round of GeneXpert environmental tests, and working with community partners at the EOT to plan future sampling. As the project develops, it may lead to more targeted sampling, further phases of long-term work, or aligned studies to address knowledge gaps identified through scientific findings and community priorities.

This programme contributes directly to Te Niwha's mission by strengthening Aotearoa's genomic surveillance capability, improving readiness for emerging infectious diseases, and ensuring communities are active partners in how pathogen knowledge is gathered, interpreted, and applied.