The pathway to precision pest control: using genomics data for species-specific toxin development

Brian Hopkins[1*], Andrew Veale[1], Kat Trought[2], Erica Hendrikse[3]

[1]Manaaki Whenua Landcare Research, Wildlife Ecology & Management, Lincoln, New Zealand
[2]Manaaki Whenua Landcare Research, Biocontrol & Molecular Ecology, Lincoln, New Zealand
[3]Manaaki Whenua Landcare Research, Wildlife Ecology & Management, Auckland, New Zealand
*email of corresponding author: hopkinsb@landcareresearch.co.nz

Pest control of invasive mammalian species is a key priority for New Zealand to prevent further decline of our native species, and to support the Predator Free 2050 initiative. One limitation of current vertebrate toxins for pest control is that they are relatively broad spectrum, with associated risks to non-target species. With increasing restrictions being imposed on the most commonly used toxins, globally the 2nd generation anticoagulants and in New Zealand sodium fluoroacetate (1080), there is a critical need to expand our toxin toolbox by developing more pest-specific toxins.

The genomes of important New Zealand pest species (stoat, ship rat and possum) have recently been sequenced, providing diverse new research opportunities. Using these genomes and those of non-target species, we are able to computationally compare protein sequences, with the goal of identifying potential novel toxin targets for pest-specific toxin development. Our initial focus is on the protein family of G protein-coupled receptors, as these receptors are commonly used as therapeutic targets for human medicine and as such many are well characterized with associated ligands that could be used as lead compounds in the toxin development process. Applying target identification and validation techniques from drug discovery represent an innovative strategy for the development of new vertebrate toxins, using genomics data.