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Assessing the efficacy of using soil as a probiotic for improving kiwi gut health in hatcheries

Summary Report – 2022

Late in 2020 a research proposal was put forward to study the effects of “wild” soils as a food additive for captive North Island Brown kiwi (*Apteryx mantelli*). However, due to the effects of the pandemic and restrictions on travel, the study target was instead switched to the much rarer Ōkārito kiwi, or rowi (*Apteryx rowi*).

By the time the Ōkārito kiwi hatching season finished around May of 2021, we had collected over 350 samples from captive birds at Willowbank Wildlife Reserve in Christchurch. Additionally, soil and substrate samples from the Ōkārito region on the West Coast as well as from Willowbank were collected for analysis. For the remainder of 2021, we analysed the microbial content of these samples to generate an overview of the microbial community of the rowi as they progressed through their journey as part of Operation Nest Egg.

Results

Illumina sequencing of bacterial and fungal DNA found in faecal and substrate samples revealed some interesting trends. Captive rowi that were exposed to “wild”, or natal, soils in their diet had a significantly altered gut microbial makeup than birds in the control cohort. Overall, beta diversity of bacterial genera decreased with exposure to natal soils, and the predominance of the major bacterial phyla *Firmicutes* and *Proteobacteria* shifted between the two groups of rowi.

The fungal component of the gut microbiome in rowi exposed to natal soils also directly reflected the soils themselves, suggesting that fungi may require less of an establishment period to be detected and are more of a transient coloniser of the gut.

A heavy overlap between the gut microbiome of all captive rowi and natal soils was observed, suggesting that the microbial makeup of natal soils is already quite similar to the rowi gut community compared to other soils and substrates they may be exposed to in captivity.

Tracking changes in growth rates as the birds aged showed a definitive growth curve typical of kiwi. In terms of growth rates, no significant differences were observed between rowi exposed to natal soils versus the control cohort. However, further study is required to reliably determine if using natal soils as a food additive has any lasting benefits on the health of captive kiwi returned to the wild.

Conclusions

This study provided the first exploration of the microbial gut community in captive Ōkārito kiwi. Differences observed in the gut microbiome between treated birds versus controls suggest that introduced “wild” soils can have a significant impact and may provide an avenue for improving the health of captive birds across New Zealand.