

Spatio-temporal patterns of *Campylobacter* contamination in freshwaters: results from the Taieri and Motueka Catchments

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Extended Abstract

1. INTRODUCTION

New Zealand has a history of rapid ecosystem change since the arrival of humans, resulting in a predominantly agricultural landscape. Non-point source pollution from pastoral land use causes microbial contamination of freshwaters and compromises their suitability for contact recreation. New Zealand has one of the highest rates of campylobacteriosis in the developed world (334 cases per 100,000 people), yet only a few surveys for *Campylobacter* in freshwaters have been carried out. This study investigates the influence of land use and other environmental variables on spatio-temporal variation in *Campylobacter* concentrations in two distinct river catchments (the Taieri and Motueka) of the South Island, New Zealand.

2. METHODS AND RESULTS

The Taieri catchment is predominantly rural, with land use including farming (dairy, cattle, sheep and deer), cropping, market gardening, and forestry. The distribution of *Campylobacter* in freshwaters is investigated at a variety of spatial scales in the Taieri river catchment. First, *Campylobacter* concentrations in second order streams within distinct land uses were investigated, and dairy and deer farms showed relatively high concentrations compared to sheep farms and ungrazed tussock. Second, a range of stream sizes (from second to fifth order) within two small agricultural catchments that encompass a mix of land uses were used to investigate the relationship between catchment development, stream order and *Campylobacter* and faecal coliforms. No significant correlation was detected between catchment development and *Campylobacter*, but a significant correlation between stream order and *Campylobacter* suggested a cumulative impact of land use on *Campylobacter* concentrations. The relationship between ecosystem change and *Campylobacter* was further investigated at mainstem (sixth order) sites on the lower Taieri River. Longitudinal variation in *Campylobacter* at these sites was related to inputs from small tributaries and agricultural drains, and

outputs such as settling and cell death. Median concentrations of *Campylobacter* in the lower Taieri River were highest during summer months, when recreational use of the river is most common.

The Motueka catchment provides a contrast to the agricultural Taieri catchment, due to the dominant land use types being native and exotic forest. *Campylobacter* concentrations in the Motueka River were investigated in relation to both time (seasonality) and place (stream size). Seasonal effects on *Campylobacter* concentrations were investigated in a region with distinct wet and dry seasons, and a range of stream sizes were included, from small streams to major tributaries and main stem river sites. *Campylobacter* concentrations in the lower Motueka River were relatively low compared to the Taieri River, despite higher concentrations in tributaries associated with specific land uses (sheep and dairy farming), suggesting that dilution of contaminants by relatively clean water from forested sub-catchments was occurring. *Campylobacter* was isolated more frequently in winter and less frequently in summer in the Motueka Catchment.

3. CONCLUSION

The study shows that *Campylobacter* is widely distributed in streams and rivers of the Taieri and Motueka catchments, particularly in agricultural areas. Results from the Motueka catchment suggest that public health benefits can arise from limiting agricultural development in catchments and protecting forested areas, particularly with respect to maintaining the microbial quality of rivers for drinking water and recreational activities. Continuing ecosystem change through land use intensification in New Zealand may lead to further increases in microbial contamination of freshwaters, and an associated increase in waterborne enteric diseases such as campylobacteriosis.

Keywords and phrases: Water Quality, *Campylobacter*, Land-Use, Seasonality, Public Health Risk