



Environmental drivers of antimicrobial resistance – cadmium contamination & antibiotic resistance in soil samples from a rural airstrip.

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INTRODUCTION

- Application of superphosphate fertilizers results in accumulation of cadmium (Cd) in agricultural soil. This leads to induction of metal-resistance in soil bacteria, and may co-select for resistance to antibiotics.
- This may increase health risks for both humans and livestock, and impact on primary industry production.
- An airstrip used for fertiliser application in Belmont Regional Park near Wellington has a gradient of Cd contamination

AIM: To investigate resistance of soil-borne bacteria sampled from a rural airstrip.

RESULTS

- Bacterial counts declined with higher levels of Cd contamination (Fig. 1)
- The proportion of bacterial populations resistant to Cd (Fig. 2) or tetracycline (Fig. 3) increased with higher levels of Cd contamination.
- NGS of 16S rDNA of bacterial from 3 sites revealed differences in the genetic diversity correlating with Cd levels in soil (Fig. 4).

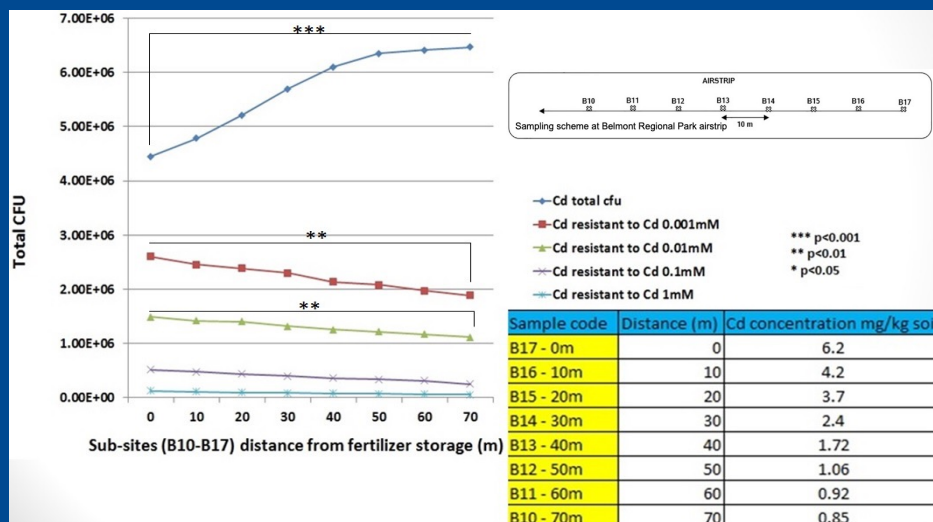


Fig. 1. Belmont Park soils' bacterial counts on plates containing a range of concentrations of CdCl₂.

CONCLUSIONS

- The Belmont Park airstrip has a gradient of Cd contamination of soil due to superphosphate input.
- Both resistance to Cd and antibiotics were positively correlated with Cd levels along the airstrip.
- Coselection of antibiotic and metal resistance due Cd contamination is suggested.
- Bacterial diversity was significantly different between high- and low-level Cd contaminated sites.

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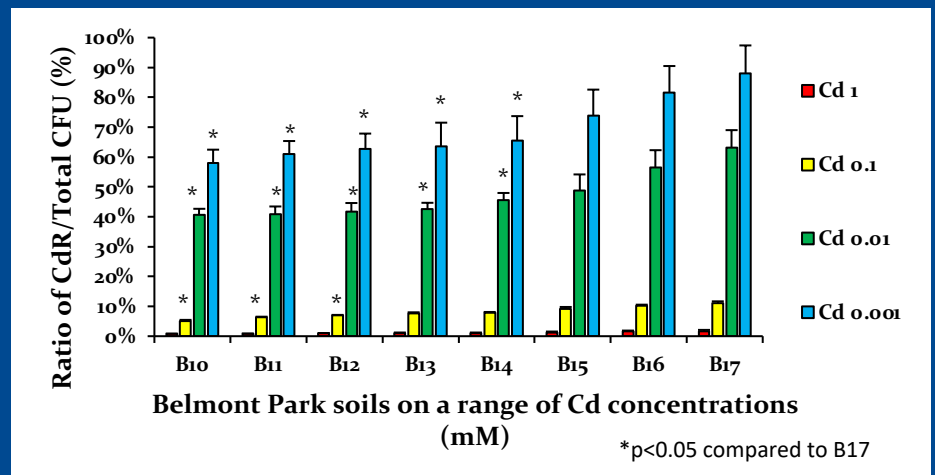


Fig. 2. Mean ratios of CdR/total CFUs, selected on a range of Cd concentrations, for Belmont Park sub-sites' soil samples.

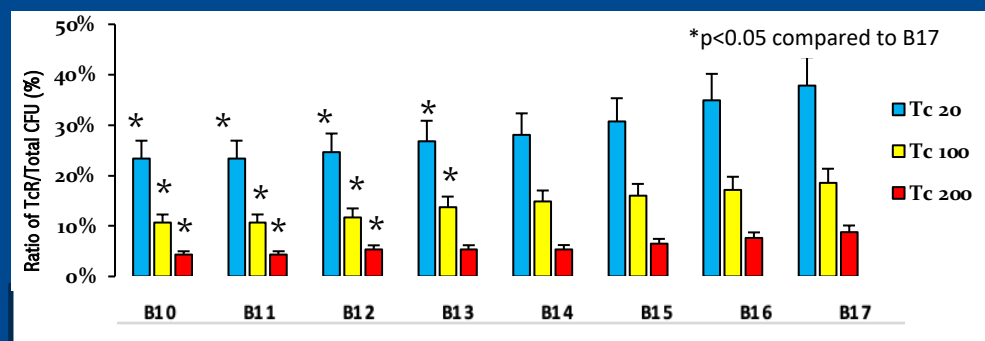


Fig. 3. Mean ratios of TcR/total bacterial CFUs, selected on a range of Tc concentrations, for Belmont Park sub-sites' soil samples.

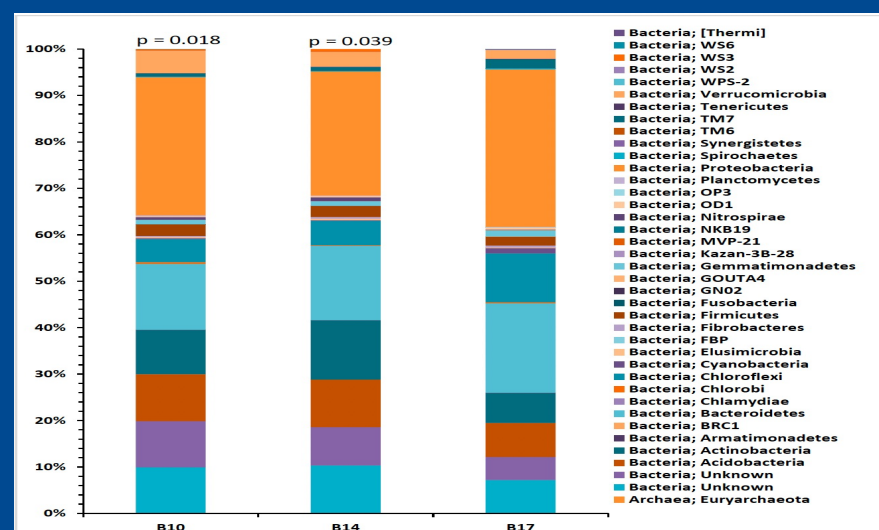


Fig. 4. Assignment of 16S rDNA sequences to bacterial phyla for selected sub-site soil samples