



2019 PhD Proposal – China Scholarships Council and New Zealand – China Water Research Centre Joint PhD Programme Application

Information to be published on NZ – China Water Centre website if proposal is selected	
Project title	Will long-term application of biosolids drive the diversity of antibiotic resistance genes in the soil-water environments?
Supervisors titles and names	Dr Jianming Xue (Scion), Professor Hong J. Di, Dr Louise Weaver (ESR), Professor Zhaojun Li (CAAS, China) and Professor Keith Cameron
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Link to Supervisor's research page	http://www.lincoln.ac.nz/Lincoln-Home/About-Lincoln/Staff-Profiles/?sti=1&StaffID=Di%20Hong http://www.cibr.org.nz/the-cibr-team/soil-science/
Project outline Please outline the PhD project in 300 words (approx)	<p>Antibiotic pollution has become a global environmental problem, threatening aquatic ecosystems and human health. Prior research has shown that land application of biosolids and animal manure can cause residual antibiotics and antibiotic resistance genes (ARGs) to enter the soil and food chain and increase environmental antibiotic resistance. In both China and New Zealand there is a pressing need to address this issue through developing sustainable approaches to minimise the risk of antibiotic resistance transmission from municipal and livestock wastes to humans or animals via the soil-water environments.</p> <p>The dissemination of ARGs depends mainly on the growth of microbes. The ARG profile and bacterial community may co-evolve with a changing territorial environment. However, various bacterial phyla are found to be related to the evolution of ARGs. The horizontal gene transfer of plasmids may contribute to the dissemination of ARGs. This suggests that there will be higher risks of the prevalence of ARGs following application of biosolids. Previous studies have focused on the risks of biosolids application regarding changes in the abundance of ARGs, but have not addressed the evolution of ARGs, especially under the multiple stresses of other biosolids-derived contaminants (e.g. heavy metals, microplastics) in the soil environment.</p>

	<p>This PhD project aims to profile the evolution and distribution of ARGs driven by biosolid application. The specific objectives are to (1) quantify the residual antibiotics and ARGs in biosolids and aquatic receiving environments, (2) investigate the impacts of biosolid application on the abundance and structures of ARGs in the rhizosphere and bulk soils, (2) study the distribution of ARGs in edible plants, and (4) explore the main patterns of the evolution and distribution of ARGs following application of biosolids.</p>
References for further reading (optional)	
Please indicate if research operational funding is available to support the project, and if so, the sources of funding.	<p>The research operational funding from a MBIE-funded project is available to support this PhD project</p>