Department of Biochemistry and Molecular Biology

PhD Oration

Friday 17th of August
3:30-4:30pm
Bio21 Institute Auditorium
30 Flemington Road, Parkville

Yu Wan

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Detecting horizontal co-transfer of antimicrobial resistance genes in bacteria using a network approach

Acquired multidrug resistance (MDR) in bacteria, which is disseminated through horizontal gene transfer (HGT), is a fast evolving and global threat to infection control and public health. In this study, I am interested in mobile antimicrobial resistance genes (ARGs) that are physically linked in the same DNA molecule, because they are prone to co-mobilise into the same recipient bacterium in a single HGT event, making it an efficient way to spread MDR between bacteria even when they are distantly related. Particularly, I aim to detect horizontally co-transferred ARGs in a large amount of bacterial isolates of the same species using whole-genome sequencing (WGS) and a computation approach, and to identify their vectors using genome assemblies and spatial-temporal information. This oration is comprised of three primary sections. First, I will explain my methodology that integrates association modelling, genomic physical distances and network analysis for collecting evidence of co-transferred ARGs. Next, I will present an implementation of the method as a software package GeneMates and demonstrate validations of this tool using published data sets of *Escherichia coli* and *Salmonella* Typhimurium. Finally, I show an application of GeneMates to a larger data set, a global collection of *Klebsiella pneumoniae*, for the inference of horizontally co-transferred ARGs as well as tracing their configurations with country and year information. In conclusion, this study provides us with a flexible approach for investigating the co-transfer and vectors of acquired ARGs using various WGS data, such as those routinely collected in national diagnostic laboratories for surveillance of antimicrobial resistance. Further, under a proper study design, my approach is applicable to other kinds of bacterial genes and species to address different questions.

ALL WELCOME. Please join us for Pizza to celebrate this PhD Oration!
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