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Treasures from mangrove forest: Discovery of novel streptomycetes and their bioactive potentials

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The emergence of multidrug resistant bacteria or "superbug" has called on the scientific community to search for more potent, effective drugs to keep these pathogens under control. At the forefront of the production of bioactive metabolites, microorganisms have been recognized as mini-factories which are capable of synthesizing interesting bioactive natural compounds with reasonable cost. Under the family of Actinobacteria, the genus *Streptomyces* stands out in terms of manufacturing bioactive metabolites reserves, contributing over 10,000 bioactive compounds with high pharmaceutical values. As a matter of fact, the discovery of antibiotic streptomycin from soil bacterium, *Streptomyces griseus* has bestowed Professor Waksman and his team with the award of the Nobel Prize in Physiology or Medicine in 1952. In continuing the fight against deadly infections, the search of novel *Streptomyces*-derived bioactive compounds was further bolstered with the numerous beneficial implications behind. Mangrove forest is termed as the intertidal region located between the land and the sea. Despite the constant exposure to harsh conditions, some Actinobacteria isolated from these ecosystems have exhibited interesting bioactivities, including anti-MRSA, antifungal and so on. *Streptomyces pluripotens* MUSC 135T was isolated as novel species from the poorly explored mangrove sediment (East Coast, Peninsular Malaysia). As an attempt to study the bioactive potential of this strain, MUSC 135T was subjected to fermentation before conducting antibacterial assays using traditional agar well diffusion method and high throughput screening method with 96-well microplates. Intriguingly, the inhibition zone of MUSC 135T crude extract against MRSA (10.5 mm) was larger than that of the positive control, a vancomycin disc (30 μg), which exhibited an inhibition zone of 9 mm. A deeper investigation using next generation sequencing has revealed some fascinating bioactive potential of strain MUSC 135T (NCBI accession: CP021080.1); a total of 4 biosynthetic gene clusters related to production of bacteriocin has been identified from MUSC 135T with genome size of 7.34 Mbps using bioinformatics tool BAGEL4. Among these cluster, one of them was predicted to be responsible for the production of Linear Azol(in)e-containing Peptides (LAPs), a group of bioactive metabolites which have been reported for anti-MRSA activities. Subsequently, one of the predicted genes was selected for expression study using *E. coli* model and the purified protein (Protein135_#1) was then used for anti-MRSA screening. Preliminary anti-MRSA screening has revealed significant reduction of MRSA after the treatment of Protein135_#1. Altogether, these findings highlight the importance in novel strain from underexplored area, like mangrove forest, particularly in the search of useful bioactive compounds.

Biography

Learn-Han Lee is the Principle Investigator of Novel Bacteria and Drug Discovery Research Group in the School of Pharmacy, Monash University Malaysia Campus. He was awarded the prestigious Professional Registers of Chartered Biologist (CBiol) from the Royal Society of Biology (RSB), UK in 2017. Currently, his research focuses on food safety and novel bacteria discovery and bio-prospecting of secondary metabolites with bioactive properties. He is the lifetime Member of Bergey's International Society for Microbial Systematics (BISMiS) and a Member of Royal Society of Biology (MRSB, UK). Furthermore he is the Chief Editor for *Progress in Microbes and Molecular Biology* (Inno Publisher, USA) and Associate Editor for *Frontiers in Microbiology* and *Frontiers in Pharmacology*. He has two patents and published two academic books, three book chapters and 81 international articles, with a total citation of 1124 and H-index of 19 (Google scholar citation).

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