Microbiome and Bioresource Research: Synthesis and expression of Streptomyces-derived novel anti-MRSA protein for in vitro and in vivo studies

About the Research Project:

The project is funded by Fundamental Research Grant Scheme (FRGS) awarded by Ministry of Education in late 2019. The project Main Research Domain is Clinical and Health Sciences, Sub Research Domain is Basic Medical Sciences. The National Priority Area is Healthcare and Medicine.

Project Description:

The emergence of methicillin-resistant Staphylococcus aureus (MRSA) has resulted in critical demand for new natural products and chemical compounds in pharmacology. Streptomyces had made significant contribution to mankind for its ability to produce various natural products of significant importance (e.g. antibiotics). Currently >900 species have been described for *Streptomyces*, making it the largest genus in the domain 'Bacteria'. Researchers observed that poorly explored mangrove environments contained high populations of novel Actinobacteria that are prolific producers of valuable compounds. Our preliminary data showed a novel *Streptomyces* strain A, exhibited effective anti-MRSA properties, with anti-MRSA activity higher compared to positive control [vancomycin (30 µg)]. Another *Streptomyces* strain B of the same species with A did not produced such antibacterial properties. The complete whole genome of strain A and B were obtained via next generation sequencing technology. Comparative genomic analysis detected one bacteriocin gene clusters and predicted to be responsible for the production of a group of bioactive metabolites which have been reported for anti-MRSA activities. One of the predicted gene was selected for gene synthesis and expression to obtain the purified protein (ProteinA_#1) used for anti-MRSA screening. Preliminary anti-MRSA screening revealed significant reduction of MRSA after treatment of ProteinA_#1. To further examine the application potential of the anti-MRSA ProteinA_#1, we proposed to de novo synthesized the gene for expression study that could increase the yield of purified protein, so that we could use to perform more extensive in vitro and in vivo animal testing to examine the effectiveness of ProteinA_#1 in managing MRSA infection. The outcome of this project could contribute significantly to the pharmaceuticals and biotechnology sector, a subsector in the healthcare industry that has been identified by the Malaysia government as one of the National Key Economic Areas (NKEA).

Supervisory Team

PhD Main Supervisor: Assoc Prof Dr Lee Learn Han
Homepage: https://www.monash.edu.my/jcsmhs/staff/academic/lee-learn-han

PhD Co-Supervisor: Dr Vengadesh Letchumanan

Homepage: https://www.monash.edu.my/jcsmhs/staff/academic/vengadesh-letchumanan#tabs__2241409-04

PhD Co-Supervisor: Dr Goh Bey Hing
Homepage: https://www.monash.edu.my/pharmacy/about/academic-staff/dr-goh-bey-hing

Eligibility:

Candidates must meet the minimum admission requirements (for academic and English language proficiency) to be offered admission in the PhD degree. For consideration of scholarship, candidates must possess academic standing equivalent to a high distinction average (H1 or First Class Honours) from a recognised university. Selection for a scholarship will be based on comprehensive ranking of academic achievement, research publications, and research experience or research-related awards as determined by Monash University Malaysia.

Required Skills:

- Experience in molecular biology and microbiology lab skills
- Experience in handling next generation sequencing data
- Hardworking, keen, and willing to learn
- Passionate in scientific investigation
- Ability to work well with team member

Academic Background:

Education in Medical Science, Biomedical Science, Biotechnology, Molecular Biology, Microbiology and Health Sciences

Source of Funding:

FRGS