Doctor Bartender: Phage Cocktails To Treat Multi-Drug Resistant Mycobacterium abscessus

Wen, Jamie (School: Dunman High School)

Singapore’s rapidly aging society increases the population’s vulnerability to M. abscessus infections. This is an alarming trend as M. abscessus is notoriously difficult to treat due to extreme antimicrobial resistance and frequent human-pathogen contact. Furthermore, the viability of antibiotics as the default treatment has been waning due to misuse and toxicity complications. Hence, this study proposes the use of novel multi-phage cocktails to increase effectiveness of treatment against M. abscessus infections. Both strains, smooth and rough, which present differing threats and phage susceptibility, were examined. It was observed that individual phages, while effective initially, had a dwindling efficacy possibly due to resistance. Conversely, multi-phage cocktails seem to have a reduced vulnerability to M. abscessus acquiring resistance. Phage NiK, which was amplified on M. smegmatis, performed poorly (<90% reduction), highlighting the difficulty of cross-species infection, an important consideration for future applications. Significantly, multi-phage cocktails with clarithromycin outperformed all mixtures tested, with 100% removal of M. abscessus in a number of cases. They also had a statistically significant decrease in CFU compared to current antibiotics alone. As resistance can present a hurdle for phage therapy, PCR was conducted to identify lysogeny, a mode of resistance. Interestingly, potential occurrence of pseudolysogeny was observed. In short, multi-phage cocktails present a valuable asset in our arsenal against antibiotic resistance and these results may lead to key insights for consideration in the development of phage therapy. Further investigation includes validation of results in animal models and genetic manipulation of phages to reduce resistance.

Awards Won:
Third Award of $1,000