Escherichia coli as a detection and killing system against pathogenic microbes and implications towards antibiotic therapy

Alarmingly, pathogenic bacteria are becoming increasingly resistant to common antibiotics. One of the ways bacteria become resistant to antibiotics is by mutation of key amino acids in the target protein or enzyme that an antibiotic interacts with, such that there is a decreased affinity and/or kinetics at the interaction site. Melittin is an antimicrobial peptide found in bee venom, which non-specifically creates pores in lipid membranes resulting in cell death. Bacteria are less likely to develop resistance against melittin because the structure of a cellular membrane cannot change easily by mutation. Here, we engineered *Escherichia coli* to detect and kill *Pseudomonas aeruginosa*, a pathogenic microbe. *E. coli* was transformed with the melittin gene extracted from *Apis mellifera* and a quorum sensing circuit, rhl, similar to that found in *P. aeruginosa* such that only in the presence of *P. aeruginosa* melittin would be expressed. Because melittin forms non-specific pores, it can attack the pathogenic bacterial cells in the environment. This approach of engineering bacterial cells to detect and kill pathogenic bacteria using a quorum sensing system and a cytolytic agent, can be used as a new antibacterial therapy. Future efforts will seek to improve method of melittin secretion and explore how to increase melittin specificity to decrease off-target effects.