Ribosomal Ribonucleic Acid Targeting using Small Ribonucleic Acid as a Potential Antimicrobial

Marvin, Tess

Bacteria small ribonucleic acids (sRNAs) are important cell regulators. Bacterial cells naturally take up nucleic acids in order to better regulate functions. However, bacterial cells that are unstressed will not produce or uptake extraneous sRNAs. As a result, it has previously never been attempted to use small RNA as possible antimicrobial agents. This study sought to test whether sRNAs delivered to the cells and designed to bind to the ribosome at the hypervariable regions of E. coli 16S rRNA would pull away the region of ribosomal RNA, inducing a stress response within the cell, inhibiting normal ribosomal functions (protein production) within the cell, leading to cell death. This research generated expression vectors that express sRNAs under control of the lac promoter (pET expression vector). This was the mechanism in this work to deliver sRNAs in a controlled manner. The small RNAs inserted into the expression vector were designed to be complementary to a hypervariable region of E. coli 16S rRNA as this would provide a highly target specific approach to inhibit cell growth. The regions tested were V3 and V6. The cells with transformed recombinant plasmids were inserted into a spectrophotometer and growth charts using optical density were contrived over a period of 8 hours, spanning times before and after the inducer molecule isopropyl-beta-D-thiogalactopyranoside was added, triggering the transcription of the sRNA insert. This data was utilized to interpret the effects of the sRNA insert on cell growth. The optical density suggests that sRNA-containing cells were inhibited.

Awards Won: