An Inside Job: The Transformation of Escherichia coli K-12 with aiiA Encoded Plasmids and Their Translative Effects as Quorum Sensing Inhibitors

Smith, Jason (School: Plano West Senior High School)
Katzer, Austin (School: Plano West Senior High School)

Antibiotic resistance has become a pressing topic in modern medicine, and many scientists are seeking solutions to eliminate the need for antibiotics. Bacteria communicate to each other to form biofilms through quorum sensing; they release hormone signals and use density dependent receptors to trigger a group response. By inhibiting a prokaryote's ability to quorum sense, the bacteria would think that it is alone and not perform a response, even if it is surrounded by other bacteria. The molecule N-acyl homoserine lactone is used as a messenger signal for bacteria to trigger biofilm formation. It can be broken down by the enzyme N-acyl homoserine lactonase. The methodology of this project was to transform E. coli with engineered plasmids containing the gene that translates this enzyme: aiiA. Using 5 different plasmids containing the aiiA gene, biofilm thicknesses were recorded, and ultimately it was discovered that the plasmid pC239 reduces biofilm formation the most, showing that it would be the most promising plasmid to prevent the spread of pathogenic infections caused by E. coli and other bacteria. These findings are ultimately a precursor to furthering the elimination of antibiotics in modern medicine and helping eliminate bacterial infections, such as those produced by E. coli O157:H7 (the pathogenic cousin of E. coli K12).