Next-Generation Antibiotics: Isolating and Screening Novel Bacteriocins

Shaquib, Rishit (School: Vanguard High School)

The natural production of antimicrobial substances by living organisms as part of their defense mechanisms has been well-documented. Among these substances, bacteriocins, a diverse class of bactericidal peptides or proteins produced by bacteria and archaea, have gained considerable attention for their possible role as an alternative to antibiotics. In recent years, research has demonstrated the protective effects of LAB bacteriocins on the gastrointestinal tract, effectively eliminating pathogens and supporting gut health. Most recently the FDA approval of nisin has demonstrates the ability for bacteriocins to be commercially grown and utilized. Additionally, bacteriocins are hyper-specific: a single species of bacteria can produce a broad range of bacteriocins based on its subtype. This investigation aims to further research into the properties and potential of bacteriocins as antibiotic substitutes, isolating cultures from raw cultures of caprine and bovine dairy, precipitating bacteriocin proteins and isolating them, and testing their activity against common sources of pathogenic infection such as E. coli and S. aureus. The resulting proteins will be purified through size-exclusionary filtration and the strains which have demonstrated efficacy will be sequenced for subspecies based on 16S subunit sequencing. Of the 16 samples taken from dairy, 156 different strains were tested, 6 of which demonstrated effective zones of inhibition against the growth of S. aureus and E. coli. This activity remained visible at a range of pH values 4-7 after undergoing the process of filtration. These results are promising in the development of new treatments to combat antibiotic resistance.

Awards Won:
Third Award of $1,000
China Association for Science and Technology (CAST): Award of $1,200
London International Youth Science Forum CIC: Full scholarship to attend the London International Youth Science Forum, and a $1,500 cash stipend for travel expenses.
London International Youth Science Forum CIC: Cash stipend for travel expenses associated with travel to and from LIYSF 2024