Logan Collins

Testing Artificial Genes Designed to Inhibit the Growth of E. coli as an Alternative to Traditional Antibiotics

The CDC states “antibiotic resistance is one of the world's most pressing public health threats”. Bacteria too easily defeat traditional antibiotics by rendering their narrowly targeted attacks ineffective. This research explores a novel alternative to traditional antibiotics; specially designing artificial genes coding for toxic polypeptides to broadly disrupt bacterial systems through aggregation and exhaustion of intracellular resources.

Hydrophobic residues were extensively used in the genes to avoid recognition by chaperones and proteases, combaters of uncontrolled aggregation. One was highly hydrophobic (H). The other was highly hydrophobic and highly acidic (HH). These genes were delivered to bacteria in pET11a plasmid vectors through artificial transformation. A liquid growth media experiment was conducted. Nine groups, based on the type of transformant (H, HH, untransformed) and the amount of IPTG used (1 mM, 0.1 mM, none), were cultured and data was collected on their growth via spectrophotometry.

Partial growth inhibition was observed in the groups with IPTG. Promisingly, with the H gene at 1 mM IPTG, nearly total growth inhibition occurred. Weakening the bacteria by this technique would likely allow the natural immune system to eradicate the remaining bacteria. Though artificial transformation is not a usable delivery system in the human body, promiscuous bacterial conjugation shows promise for using the human bacterial flora as plasmid donors. Promoters that are active only in pathogens would be used. If resistance developed, the toxic genes could be mutated giving a selection of newly effective versions and thus, overcoming the bacterial adaption. Antibiotic resistance may finally be conquered.