Antibiotic Resistance Dissemination Increased by High Frequency of Conjugating Bacteria in Escherichia coli Populations

Wu, Jennifer (School: Newcastle High School)

According to the World Health Organization, the total societal cost of antibiotic resistance amounts to over $35 billion dollars per year in the United States alone when accounting for lost lives, wages, and extended hospital stays. Bacterial conjugation, a type of horizontal gene transfer, is one of the processes by which antibiotic resistance is disseminated throughout a bacterial population. In the search for methods to inhibit the spread of antibiotic resistance, preventing bacterial conjugation is considered a promising target. However, the degree to which conjugation affects the rise of antibiotic resistance is unclear. This study investigated the effect of different ratios of conjugatory donors to recipients of Escherichia coli on the population's resistance to tetracycline. Strains BB4 and DH5α served as the donor and recipient cultures respectively and were allowed to conjugate before being plated in tetracycline containing agar; resistance was quantified by colony density. Results showed that the presence of conjugating bacteria had a greater relative effect on colony density at higher tetracycline concentration. A donor percentage of 5% (1:19) more than doubled the minimum inhibitory concentration of tetracycline required. At a donor percentage of 20% (1:4), colony density approached levels of an entirely resistant population. This experiment has revealed that even at low levels, bacterial conjugation has the potential to rapidly increase the resistance of a bacterial population and presents conjugation as a crucial target for slowing the spread of antibiotic resistance.