The Effect of Black Carbon on Antibiotic Resistance

Cotter, Amy (School: Kennett High School)

Black carbon (BC), a carbon accounting for much of observed global warming to date, negatively affects human respiratory health. Thus, the purpose of this experiment was to determine the effect BC has on the antibiotic resistance of certain bacteria, specifically Escherichia coli, Micrococcus luteus, and Staphylococcus epidermidis to chloramphenicol, penicillin, and vancomycin respectively. It was hypothesized that if resistance of these bacteria to these antibiotics was tested in the presence of BC, then the bacteria would experience increased resistance to its antibiotic, as BC can thicken a bacterial biofilm. Using crushed soot as a BC substitute, the bacteria were plated with and without antibiotic and with three levels of BC. The zones of inhibitions were measured, and the median results in millimeters were as follows: M. luteus results with increasing levels of BC were 74.00, 66.00, and 65.00, S. epidermidis results were 21.75, 21.25, and 21.00, and E. coli results were 30.25, 29.50, and 28.50. These results, using a two-way ANOVA test, support a statistically significant difference in bacterial resistance with BC. The p-value for the three levels of BC was 0.004, with these results supporting a positive correlation between the presence of BC and bacterial resistance. The implications of this suggestion includes need for action against increasing BC levels, and further research on the effect of BC on bacterial and biofilm structure, which bacteria BC affects, and difference in BC levels by location.