THE INTERACTION OF RADIATION AND COPPER ON THE INCIDENCE OF ANTIBIOTIC RESISTANCE

Christian A. Dicks[1,2], J Vaun McArthur[2,3]
[1]1Claflin University, Orangeburg, SC 29018
[2]UGA Savannah River Ecology Laboratory, Aiken, SC 29802
[3]Odum School of Ecology, University of Georgia,
Athens, GA 30602

Mentor: J Vaun McArthur

Christian in the lab.

The effects of legacy heavy metals and low dose ionizing radiation from nuclear production include previously unsuspected impacts on microbial communities. Previous studies have demonstrated increased levels of antibiotic-resistant microorganisms are more likely to be found in conditions with higher exposure to either metals or radiation than in uncontaminated reference sites. Here, we report the screening of different isolates from 2 different locations on the Savannah River Site and examine the combined effects of ionizing radiation and copper exposure on incidence of antibiotic resistant bacteria. We hypothesized that antibiotic resistance levels in aquatic bacteria will increase to higher levels with exposure to copper sulfate (Cu_2SO_4) and ionizing radiation than similar bacteria exposed to either radiation or copper. Water from Pond B was filtered-sterilized, and used to prepare all treatments which included controls and two concentrations of Cu_2SO_4. Bacteria collected from Pond B and Fire Pond biofilm plates were inoculated to treatment flasks, incubated and 20 isolates obtained from each treatment. Each isolate was screened against 23 different antibiotics and these results used in a discriminant and classification analysis. Patterns of antibiotic resistance were significantly different based on source of biofilm and Cu treatments. For the controls and low Cu the patterns differed depending on where the inoculum was obtained. Bacteria from Pond B had unique patterns of resistance when compared to Fire Pond bacteria in the same treatments. There was considerable overlap in the patterns of resistance of bacteria grown under the 0.5 Cu treatment from the two ponds. Classification analysis found that isolates could be correctly classified into site and treatment with > 85% accuracy. Some combinations were 100% correctly classified based on their antibiotic resistance patterns. Exposure to copper has differing impacts on levels of antibiotic resistance depending on the previous exposure to ionizing radiation.