The Effects of Mississippi River Pollutants on the Growth of Microcystis aeruginosa

Morris, Emerson (School: St. Patrick Catholic High School)

In 2019, Microcystis aeruginosa, a cyanobacterium found in eutrophic environments, bloomed along the Mississippi Gulf Coast due to a sudden deluge of freshwater from the opening of the Bonnet Carre Spillway in St. Charles Parish, Louisiana. M. aeruginosa is an ecological and public health concern due to its production of neurotoxins (lipopolysaccharides) and hepatotoxins (microcystins), and ingestion causes vomiting, diarrhea, and lethargy. Vibrio vulnificus, a flesh eating, pathogenic bacteria, thrives from the availability of M. aeruginosa and its organic qualities. V. vulnificus infections have a 31% mortality rate from seafood exposure (i.e. raw shellfish, crab, and shrimp). This experiment measures the growth of Microcystis aeruginosa with the addition of common pollutants in the Mississippi River: calcium hydroxide Ca(OH)2, lead nitrate Pb(NO3)2, cow manure, nitrogenous soil, and iron metal. A solution of sodium chloride and water was created in a BSL-1 lab; this solution was combined with M. aeruginosa and each additive and was incubated for 96 hours. This experiment proves the presence of pollutants enhances the growth of Microcystis aeruginosa. Cultural eutrophication of the Mississippi River is caused by centuries of unmonitored dumping from industrial, agricultural, and wastewater industries. Eutrophication prevention can be implemented through Crassostrea virginica beds (non-edible), wire filtration devices, and more screening from the Environmental Protection Agency (EPA). An algorithm is being developed to alert engineers and policymakers when favored conditions arise for an M. aeruginosa bloom.

Awards Won:

Fourth Award of $500