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Ashlee Balcerzak

Environmental Science, Water Science

Advisor: Dr. Steven Lower

The Use of Magnetotactic Bacteria to Remove Phosphorus from Eutrophic Conditions

Eutrophication or excess nutrients in rivers and lakes is a problem in the Midwest commonly caused by high levels of phosphorus in runoff from agricultural land. Magnetotactic bacteria (MTB), a magnetite-containing microorganism found in aquatic ecosystems, may contain intracellular inclusions of phosphorus. This study will test how effective MTB is at removing high concentrations of phosphorus from eutrophic conditions. The hypothesis for this project is that MTB will have some capability to remove phosphorus from their water environments, offering a microbiological solution in places where eutrophication occurs. Methods include growing the type strain of MTB, Magnetospirillum magneticum, AMB-1, in media spiked with concentrations of phosphorus at 0.01 mg/L, 0.025 mg/L, and 0.06 mg/L. These concentrations were selected to mimic, respectively, Canada's target level of phosphorus for Lake Erie, the US Environmental Protection Agency's target level of phosphorus in lakes, and the peak phosphorus levels found in the western Lake Erie basin in 2010. A colorimetric analysis was used to measure phosphorus in solution at different time points. A centrifuge was used to separate the cells from the media. Results indicate that when phosphorus-containing media is inoculated, concentrations of phosphorus decrease in the media after two days. Samples with higher concentrations of phosphorus experience more rapid decreases in solution phase phosphorus. Phosphorus was recovered from the cell pellet, indicating phosphorus was removed and stored in AMB-1 cells. Results indicate this technology may hold some promise for limiting eutrophic conditions such as those that occur in northwest Ohio and Lake Erie.

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