Can Bacteria Effectively Reduce the Toxicity of Mine Drainage?

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Biogenic Mn(II) oxidation holds great potential to reduce the toxicity of soluble mine waste in the environment at low cost. Abandoned mine waste sites, such as those in Arizona, pose a risk to public water supplies and nearby aquatic environments. Bacteria may offer a cost-effective method to reduce this risk by oxidizing toxic, soluble Mn(II) to insoluble and less toxic Mn(IV) oxides. Additionally, the resulting oxides hold the potential to scavenge an array of different toxins and metal ions from the environment including ions of Zn, Ni, Pb, and As. This experiment explores the potential L. Cholodnii SP-6 offers to survive and produce Mn(IV) oxides under adverse conditions containing metal ions between 2.5μM and 250μM. Bacterial growth and Mn(II) oxidizing activity was recorded throughout the exposure period using a spectrophotometer. The absorbance at 600nm, with 800μM ascorbic acid to dissolve Mn oxides, was measured every 12h to follow the bacterial density change over time. Additionally, the absorbance at 620nm using the indicator Leuco Berbelin blue was measured every 24h and quantified relative to standards of $KMnO_4$. Overall, this study begins to investigate the potential that L. Cholodnii holds to help cost-effectively reduce the toxicity of areas contaminated by mine effluent.

Awards Won:

Fourth Award of $500