Optimal lactate concentration on microbial leaching of arsenic from contaminated soil using *Shewanella* sp.

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Surface, agricultural soils which are contaminated with heavy metals and As are considered as one of major environmental problems, since the soils support plant nutrition and growth. The toxic elements may ultimately pose hazards to human health if they are transferred to a range of foods through food web. Leaching technology can be employed to remove As and heavy metals from contaminated surface soil using chemical leachants or acidophilic microorganisms such as *Acidithiobacillus* spp. Though the methods may lead to high efficiency of the toxicant removal, they can possibly degrade the quality of agricultural soil since the chemically strong extractants likely remove soil nutrients and significantly change soil environment including pH, ultimately destroying soil ecosystems.

This study was conducted to investigate the removal of As from As-contaminated surface soils using an iron-reducing bacterium *Shewanella* sp. We expected that As which had been adsorbed on or coprecipitated in Fe(III) oxides or hydroxides might be released to solution after microbial reductive dissolution of Fe minerals in the soil. Lactate was used as a carbon source during the essays, and the effects of a wide range of initial lactate concentrations (5 to 30 mM) on bacterial leaching of As were examined. Dissolved Fe(II) concentration increased and reached the highest level of 35.6 mg/L when 5 mM of lactate was supplied. Microbial reductive dissolution of Fe(III) minerals resulted in the increase of dissolved As from the soil. The highest concentration of 200 µg/L of soluble As was observed when the soil was amended with 5 mM of lactate. Sequential extraction analysis revealed that the amount of the extracted As accounted for 85% of As in crystalline Fe oxyhydroxides fraction. After microbial leaching processes, the pH of the treated soil was still circumneutral and soil organic content was unaltered when compared with the initial soil. Our results suggested that *Shewanella* sp. has a high potential to apply for removal of As from As-contaminated soil in a safe and eco-friendly way.

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