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Fate and Transport of Antimony on the Sb-resistant Bacterial Growth Isolated from Contaminated Soil

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Antimony (Sb) has been investigated as an emerging pollutant in soil and the soil contamination is commonly found in the mining sites, vicinity of smelters, and shooting ranges. Increasing industrial need for Sb in the manufacture of electronic devices such as batteries and diodes, flame retardants, pigments, and catalysts aggravate the concerns of Sb contamination in soil. Antimony species exist as metalloids in natural environments and are often considered to behave in a similar to Arsenic (As). Since the orbital electron configurations of both As and Sb are the same, with s^2p^3 in their outermost shell, they display a wide range of oxidation states (-3 to +5) and most commonly exist as either a trivalent or pentavalent oxyanion. Bioremediation technique is to isolate new strains of microorganisms and develop successful protocols for reducing metal toxicity with Sb tolerant species. The present study collected Sb contaminated soil and characterized for Sb contents. ICP-AES analytical results showed that the collected soil samples were highly contaminated with Sb ($\sim$14,000 ppm). In this study, 2 bacterial strains, *Arthrobacter* sp. and *Aminobacter* sp., capable of resisting the Sb were isolated from the Sb contaminated soils by selective enrichment and characterized the growth patterns using flow cytometry and CellaSys to apply for the bioremediation. The results showed that antimonate (pentavalent antimony) was oxidized to Sb_2O_3 or SbO_4 in the presence of the isolated strains in Sefr1 medium corresponds to growth rates. The Sb oxidizing products were confirmed by XRD and SEM-EDS analysis. Further, the transport and fate of Sb on the growth of the isolated bacteria strains were determined in liquid cultures or soil column tests with two different redox phases. The microbial community change was also monitored by culture-independent pyrosequencing. These results demonstrate that the isolated Sb-resistant bacterial strains could play a significant role in changing the redox state of Sb in the environment and potentially be used in the soil bioremediation from highly Sb contaminated soil.