Volatilization and Recovery of Mercury from Mercury-Polluted Soils and Wastewaters Using Mercury-Resistant *Acidithiobacillus ferrooxidans* Strains SUG 2-2 and MON-1

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(Received November 21, 2005; accepted June 29, 2006)

**Key words:** *Acidithiobacillus ferrooxidans*, highly mercury-resistant strain, wastewater treatment, bioremediation, mercury volatilization and recovery

Iron-oxidizing bacterium, *Acidithiobacillus ferrooxidans*, is one of the most important bacteria for the bioleaching of copper and gold ores. In order to use the mercury reducing activity of *A. ferrooxidans* for the bioremediation of mercury, mercury-resistant *A. ferrooxidans* strains SUG 2-2 and MON-1 were screened among 150 strains of iron-oxidizing bacteria isolated from natural environments. It was found that strains SUG 2-2 and MON-1 have a novel ferrous iron-dependent mercury volatilization activity as well as an NADPH-dependent mercury reductase activity. Strain MON-1 has an organomercurial lyase-like activity and grew most rapidly in an iron medium with 0.1 \( \mu \text{M} \) p-chloromercuribenzoic acid among 11 *A. ferrooxidans* strains tested. Nearly 100% of the total mercury in mercury-polluted soil or mercury wastewater was volatilized and recovered by incubating SUG 2-2 or MON-1 cells in 20 ml of an acidified water (pH 2.5) with ferrous iron, suggesting that these mercury-resistant strains can be used for the bioremediation of inorganic and organic mercurial compounds. We show for the first time that MON-1 cells immobilized in polyvinyl alcohol (PVA) resins could efficiently volatilize mercury from 2 L of a synthetic mercury-polluted wastewater (pH 2.5) containing 40 \( \mu \text{M} \) Hg\(^{2+}\) and ferrous iron. The MON-1-immobilized PVA resins were used repeatedly.

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