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Cr(VI) reduction by Rhodococcus erythropolis in Cr-contaminated sediments with industrial wastes

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Recently a number of biological treatment methods which use microorganisms for the effective hexavalent chromium removal have been investigated and developed to remediate chromium-contaminated sediment. The major process of hexavalent chromium removal is the biotransformation mechanism, where chromium is reduced from Cr(VI) to Cr(III) through enzymatic reaction or indirect metabolite end products under sulfate- and ferric-reducing conditions. The reduction of hexavalent chromium to trivalent chromium by microorganisms is ecologically beneficial because it lowers chromium toxicity in equivalent concentrations. In this study, an isolated bacterium under aerobic condition in the Cr-contaminated sediment from the area of the pigment manufacturing factories in Korea, which can reduce Cr(VI), was identified as Rhodococcus erythropolis. All procedures during preparation of CRB (chromium-reducing bacteria) medium and manipulations with bacteria were performed under aerobic condition. 5mM of lactate was added to the medium as carbon source. Cells were grown at 30 ąÉ and pH 7.3. Cr(VI) was quantified by the colorimetric diphenylcarbazide (DPC) method at 540 nm. The reduction rate of Cr(VI) by R.. erythropolis decreased with an increase of initial Cr(VI) concentration and a decrease of biomass concentration in CRB mediums with living or heat-killed cells. The reduction rate of Cr(VI) by R.. erythropolis was similar in CRB medium regardless of iron addition. However, in the presence of Mn(IV), the reduction rate of Cr(VI) decreased when compared with the presence of iron. This delayed reduction of Cr(VI) by R. erythropolis is due to the strong oxidizing agent MnO2.