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The Tolerance of Chromium (VI) by *Delftia acidovorans*

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Delftia acidovorans, formly called comamonas acidovorans, is an aerobic, non-fastidious, non-fermentative gram-negative bacillus, which is famous for producing solid gold from soluble gold (Johnston et al., 2013). However, *Delftia acidovorans*, owing to their ability to survive from Au^{3+}, may offer opportunities for bioreduction of heavy metals. *Delftia acidovorans* are cultured, harvested and rinsed before introduced into K_2CrO_4 solution.

A full-scale experiment was designed to determine the ability of *Delftia acidovorans* to reduce Cr^{6+} under optimal growth conditions. Cells in the exponential phase were combined with oxic, filter sterilized stock solution of potassium chromate, K_2CrO_4, to final Cr^{6+} concentrations of 0, 0.2, 0.4, 0.90, or 1.80 mM in 50 mL centrifuge tubes. For each Cr^{6+} concentration, a contrast without cells was set up. 96 hours were given to the full-scale bioreduction experiment (Singh et al. 2013).

Aqueous Cr^{6+} concentration was measured with spectroscopy at 540 nm using the 1,5-diphenyl carbazide (DPC) colorimetric method. The bioreduction of Cr^{6+} are tested as given in Fig.1. The reduction extent decreases with increasing in Cr^{6+} concentration, varying from 30% to 99%. The highest reduction extent was achieved at 0.2 mM concentration. With Cr^{6+} concentration of 1.8 mM, the reduction was only achieved 30%, illustrating *Delftia acidovorans* couldn't reduce Cr^{6+} any more.

To investigate the effect of Cr^{6+} on *Delftia acidovorans*, microscopic analysis were applied. Bacteria were embedded in resin after series of fixation, dehydration and infiltration. Ultrathin-sections were collected onto Cu-grids for transmitted electron microscopic analysis (Fig.2). The TEM photograph doesn't show changes of cells after exposure to Cr^{6+}. Most of cells still maintained good shape, indicating high tolerance of Cr and Cr^{6+} acting as an extracellular electron acceptor.

References:

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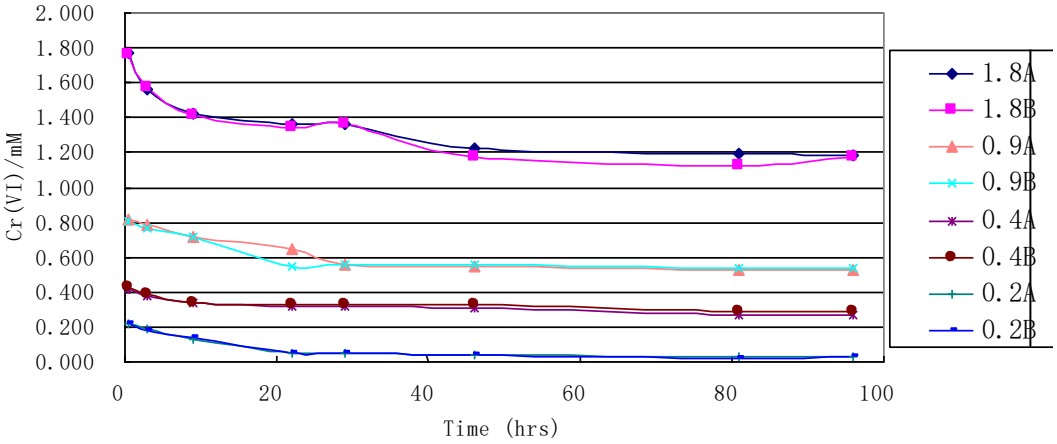

Figure 1. Bioreduction of Cr^{6+} by *Delftia acidovorans* at various concentrations. 99% reduction was achieved at concentration 0.2 mM, but bioreduction extents were low at 0.4 mM, 0.9 mM and 1.8 mM.

Figure 2. TEM image of *Delftia acidovorans* treated with 1.8 mM Cr^{6+}, showing no significant change in the shape of cells.

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