Metal biouptake by actively growing cells of metal-tolerant bacterial strains

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Abstract

Metal uptake potentials of *Pseudomonas aeruginosa* CA207Ni, *Burkholderia cepacia* CA96Co, *Rhodococcus* sp. AL03Ni, and *Corynebacterium kutscheri* FL108Hg were studied to determine their competence in detoxification of toxic metals during growth. Metabolism-dependent metal biouptake of the bacteria revealed appreciable uptake of the metals (57–61, 10–30, 23–60, and 10–16 mg g dw^{-1} of Ni^{2+}, Cr^{6+}, Co^{2+}, and Cd^{2+}, respectively) from medium, after initial drop in pH, without lag phase. The bacteria exhibited 95–100 % removal efficiency for the metals from aqueous medium as 21 (±0.8)–84 (±2.0) concentration factors of the metals were transported into the bacterial systems. Passive adsorption onto the cell surfaces occurred within 2-h contact, and afterwards, there was continuous accumulation for 12 days. Biosorption data of the bacteria were only fitted into Langmuir isotherm model when strains AL96Co, CA207Ni, and AL03Ni interacted with Ni^{2+}, achieving maximum uptake of 9.87, 2.72, and 2.69 mg g dw^{-1}, respectively. This study established that the actively growing bacterial strains displayed, at least, 97.0 % (±1.5) continuous active removals of metals upon adsorption. The bacteria would be good candidates for designing bioreactor useful in the detoxification campaign of heavy metal-polluted systems.

Keywords: Biouptake, Heavy metal, Bioaccumulation, Bacteria, Detoxification

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