Heavy-metal biosorption capacities of bacteria isolated from a South African mine.

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Human activities, such as mining operations and the discharge of industrial wastes, has resulted in the accumulation of metals in the environment. Heavy metal ions such as Zn^{2+}, Cu^{2+}, Co^{2+} and Ni^{2+} are essential for microbial growth at low concentrations but toxic at high concentrations. However, microorganisms have become adapted to polluted environments by the acquisition of specific resistance systems [1]. The conventional chemical methods for treating heavy-metal polluted water bodies and environments are not economical and eco-friendly. The demand for eco-friendly technologies has led to the search for low-cost alternatives such as biosorption using living or dead microbial biomass [2].

Recently, six aerobic bacterial strains were isolated from Murchison Antimony Mine in South Africa. Two of the isolates (GM 16 and GM 17) showed different degrees of resistance to Cu^{2+}, Co^{2+}, Zn^{2+}, Cd^{2+} and Ni^{2+} in TYG media at 37^{o}C in shake flask cultures. The biosorptive capacities of the isolates were also evaluated in Mueller-Hinton broth containing $CuCl_2$ and $CdCl_2$ (50 or 100 mg/l). Using atomic absorption spectroscopy to measure the residual concentrations of metal ions in the media, isolate GM 16 was capable of removing 65% of Cu^{2+} and 48% of Cd^{2+} from the medium within 48 h, whereas GM 17 removed only 25% Cu^{2+} and 27% of Cd^{2+} within the same period when the initial metal concentrations were 100 mg/l. These results suggest that GM 16 has the potential for detoxifying Cu^{2+} and Cd^{2+} contaminated water.

1. Gadd, GM. (1990). Experientia 46: 834-840

2. Gupta, R., Ahuja, P., Khan, S., Saxena, R.K and Mohapatra, H. (2000). Curr Sci 78: 697-973