Mining wastes – Water quality deterioration and its impact on environment in Southern India

H.K. RAMARAJU

Professor and Head of Civil Engineering Department, Dayananda Sagar College of Engineering, Kumaraswamy Layout, Bangalore-560078, Karnataka, South India, (ramarajudr@yahoo.com)

Water is the basic amenity of life which is finite and precious. India's sanitation systems both in urban and rural areas are water based. Rapidly growing population and rising income levels have put severe pressure on natural resources. Karnataka state contains vast major mineral deposits of gold, silver, platinum, iron etc. Land degradation is one of the significant impacts arising out of mining and quarrying activity which is mainly in the form of alteration of land structure due to excavation, stacking of top soil and loss of land due to dumping of mine waste and overburden soil. The continuous mining activity of the last 100 years in this area has resulted in stress, deteriorated and contaminated with heavy metals from historic mining and mineral processing operations. A field study was carried out in Kolar Gold Field mining residential area. The main objective of this study is to assess the impact of mining. It is observed from results that the quality and quantity of surface /ground water got affected through various factors like surface hydrology, soil texture, terrestrial vegetation and huge dumps of mining waste depending on the quality of leachates generated from the overburden material whether acidic in nature or rich in mineral content, thereby warranting adoption of appropriate control measures. Interventions are needed to ease the human pressure on natural resources and to ensure sustainable –use. In this paper, we have attempted to understand the process of overdevelopment of groundwater and its impact on environment in the mining area, agriculturally and industrially advanced district of Kolar, in the southern part of India.

The genetic pathway for high level chromium resistance in *Shewanella* sp. strain ANA-3

JEANIE RAMOS[1] AND CHAD SALTIKOV[2]

University of California, Santa Cruz, Santa Cruz, CA 95064, USA (jramos@ucsc.edu, saltikov@ucsc.edu)

Hexavalent chromium [Cr (VI)] is highly soluble in groundwater and toxic to most organisms. Cr (VI) reduction to Cr (III) is proposed to be a remediation strategy for Cr (VI) polluted water because Cr (III) tends to form insoluble oxides at neutral pH. Cr (VI) can be directly reduced by bacteria or indirectly by reacting with Fe (II) produced by Fe (III)-reducing bacteria. We are investigating the metal-reducer *Shewanella* sp. ANA-3 as a model Cr (VI) bioremediation organism. ANA-3 was shown to resist Cr (VI) exposures up to 2 mM. Moreover, direct Cr (VI) reduction was also observed in cultures grown aerobically. Other *Shewanella* species showed considerable sensitivity to Cr (VI) relative to ANA-3. Anaerobically grown cultures of ANA-3 were extremely sensitive to Cr (VI). No growth was detected at Cr (VI) concentrations above 2.5 micro molar in anaerobic cultures grown with fumarate. Genetic work in ANA-3 showed that aerobic Cr (VI) resistance was conferred by the *chrA* gene, which encodes for a chemiosmotic pump the extrudes chromate out of the cell. The *chrA* gene appears to be present only in ANA-3 and not other *Shewanella* strains with sequenced genomes. Moreover, *chrA* is associated with a mega-plasmid and is part of a putative operon, *chrBAC*. Gene expression studies indicated that *chrA* was inducible by Cr (VI) relative to no chromate. These results point to *chrA* as a key component in ANA-3 to withstand chromium toxicity. Current work is aimed at understanding why ANA-3 exhibits acute anaerobic sensitivity to Cr (VI). This work contributes to the possibility of using microbes to sequester Cr from contaminated sites.