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The cyanobacterium *Synechocystis* sp., PUPCCC 62: A potential candidate for enzymatic reduction of toxic Cr(VI) to less toxic Cr(III)

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The cyanobacterial strain *Synechocystis* sp., strain PUPCCC 62 isolated from the Satluj River, Ludhiana, India was resistant to hexavalent chromium up to 200 µM with IC50 to be 100 µM Cr(VI). The organism removed 250 nmol Cr(VI) mg-1 protein in 8 hours from imidazole-HCl buffer under optimized conditions of pH (6.0), temperature (28±2oC), biomass load (200 µg protein mL-1) and initial metal concentration (100 µM). The Cr(VI) removal by the organism was light/photosynthesis dependent. Kinetics of Cr(VI) removal by the test organism fitted well with the Lineweaver-Burk plot and showed V_{max} of 62.5 nmol Cr(VI) mg-1 protein h-1 and Km of 5.8 µM Cr(VI). Not only pH of the solution, phosphate ions also influenced metal removal as Cr(VI) is taken up by the organism through phosphate transporter. It has been demonstrated that the organism enzymatically reduced Cr(VI) to Cr(III) intracellularly and excreted it outside the cells. The enzyme responsible for Cr(VI) reduction was 50 fold purified through ammonium sulphate precipitation and chromatographic techniques. The purified enzyme has 40 kD molecular weight and shared 69% homology with dihydrofolate reductase of *Bifidobacterium mongoliense*. This cyanobacaterium/its enzyme can be efficiently exploited for bioremediation of Cr(VI) laden industrial effluents before their discharge in to water bodies.

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Environmental pollution in the River Nile, Egypt: Overview

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The River Nile is the principal fresh water resource in Egypt, supplying Egypt with about 98 percent of its fresh water. Pollution in the River Nile's main stem, drains and canals has increased in the last few decades. The River Nile receives wastewater discharges from 124 sources points between Aswan and El-kanater Barrage, of which 67 are agricultural drains and the rest are industrial sources (NWRC, 2000). The Egyptian Environmental Affairs Agency reports that the pollution of the surface water in greater Cairo and the province of Beni Suef is a major hazard to all biological systems (EEAA, 2008). In the last decades nanomaterials (NMs) have attracted a great deal of attention due to their many technologically interesting properties. Nanotechnology applications advanced very quickly while very little has been done to measure and assess the risks of nanoparticles (NPs) to biological systems and to the ecosystems. The small size of nanoparticles and their properties can become easily a vehicle for binding and transport of toxic chemical pollutants. There have been a number of studies showing that NPs and nanotubes can be released in the environment and cause harmful effects to humans and/or living organisms. In the last few years there is a wide debate about the benefits of nanotechnologies for humans and the technological society from the diverse applications of new products but also about the risks of many manufactured nanomaterials (NMs) and consumer products to human health and the environment. The available literature on nanomaterials toxicology and its distribution in the Egyptian environment and its environmental hazards is incomplete. In the given essay we will discuss and evaluate the characteristics of the Nile water system and to identify the major sources of pollution and its environmental and health consequences

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