

The menace of dissolved chromium, lead, cadmium and nickel in freshwater bodies-a case study from selected Indian cities

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Motivated and talented undergraduate students of the college are being trained on environmental chemistry related research and education program so that they can take up various environmental issues and challenges for long-term sustainability of the ecosystem. The main goal of this program is to imbibe “responsible citizenship behavior” in them in order to carry forward the huge task of environmental protection through research activities and community awareness programs. As a part of this endeavour, here we report spectrophotometer-based estimation of hexavalent chromium, lead, cadmium and nickel concentrations in different water bodies collected from selected cities of India. The water bodies include river Ganges at Kanpur and Kolkata, river Godavari at Bhadrachalam, lake water from various lakes of Hyderabad and groundwater adjacent to these lakes. One groundwater sample from Bithoor area of Kanpur is also included. Our results indicate that the content of hexavalent chromium ranges from 9.5–337 $\mu\text{g L}^{-1}$, lead varies from 20–158 $\mu\text{g L}^{-1}$, cadmium exhibits a range from below detection limit to 34 $\mu\text{g L}^{-1}$ and nickel shows its abundance from below detection limit to 19 $\mu\text{g L}^{-1}$. Therefore these results indicate that with the exception of nickel, the majority of studied water bodies and aquifers are contaminated to variable degrees as their concentrations are in excess of permissible limits of freshwater recommended by WHO and BIS. The river waters from Ganges in Kolkata and Godavari in Bhadrachalam, however, are characterized by almost less contamination. In view of low geochemical baseline values for chromium, cadmium and lead, the origin of heavy metal pollution in different water bodies is inferred to be anthropogenic, mainly originating from identified industrial activities and indiscriminate dumping of waste materials at these locations. The toxicological data when integrated with published health data, points to the fact that the heavy-metal-polluted water bodies pose serious threat to the human population and the ecosystem. Based on the outcome of this research, a mass awareness program has been organized for the residents living around Nacharam and Babanagar areas of Hyderabad city, where two lakes document high levels of heavy metal contamination. The purpose is to make the public conscious about the menace of heavy metal pollution and take up necessary steps to preserve the ecology of the area.

There are various methods that have been recommended in the literature for removal of dissolved heavy metals in water. Such processes are based either on the principle of adsorption or membrane separation technique or biological separation through use of aerobic or anaerobic microorganisms. Efforts are currently in progress to develop suitable cost-effective method(s) for efficient removal of chromium, lead and cadmium dissolved in water. Such experiments, however, are in the nascent state at present.