

Arsenic contamination: Environmental assessment through human hair in rural villager of India

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Abstract

It is a common practice to use well water as potable water especially in a rural area of India where concepts of basic infrastructure is different than other parts of the world. This investigation focuses on the northern part of India, where arsenic contamination levels are still not determined well enough to assess adverse health effects. We have selected three rural villages of near Allahabad, Uttar Pradesh, India: Kanua, Chota Kanjasa, and Bada Kanjasa as investigation sites. Ground water samples were analyzed with colorimetric arsenic analysis kit and ORP and pH for the arsenic concentration and estimation of oxidation status. Human hair samples from local residences were obtained and analyzed by PIXE to measure wide range of elements; and only arsenic was further analyzed with an atomic absorption spectrometer. A combination of these measurements is selected to mainly establish a link between the arsenic contaminated ground water and possible accumulation in exposed human body to assess the health risk of the villagers in India. The results indicated that Bada Kanjasa had significantly higher concentrations of arsenic level in ground water and human hair than Kanua and Chota Kanjasa villages ($P < 0.05$). It clearly indicated that higher arsenic concentration in ground water directly reflects the accumulation of arsenic in Bada Kanjasa villagers. Although the actual health effects and more detailed exposure mechanisms are still need to be investigated to provide risk assessment of arsenic poisoning. In addition, PIXE analysis revealed unusually high concentration of lead concentration in human hair samples from Chota Kanjasa village. The level is about 36 times higher than the most polluted period in recent Japanese history: 1951-1960 when air pollution associated with usage of leaded gasoline in automobile combustion exhaust caused much of health issues in Japanese citizens. Furthermore, investigation associated with lead pollution in these villages to understand the exposure routes are proposed.