

Contamination of groundwater and risk assessment for arsenic exposure in Ha Nam province, Vietnam

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Abstract: The characteristics of arsenic-contaminated groundwater and the potential risks from the groundwater were investigated. Arsenic contamination in groundwater was found in four villages (Vinh Tru, Bo De, Hoa Hau, Nhan Dao) in Ha Nam province in northern Vietnam. Since the groundwater had been used as one of the main drinking water sources in these regions, groundwater and hair samples were collected in the villages. The concentrations of arsenic in the three villages (Vinh Tru, Bo De, Hoa Hau) significantly exceeded the Vietnamese drinking water standard for arsenic (10 µg/L) with average concentrations of 348, 211, and 325 µg/L, respectively. According to the results of the arsenic speciation testing, the predominant arsenic species in the groundwater existed as arsenite [As(III)]. Elevated concentrations of iron, manganese, and ammonium were also found in the groundwater. Although more than 90% of the arsenic was removed by sand filtration systems used in this region, arsenic concentrations of most treated groundwater were still higher than the drinking water standard. A significant positive correlation was found between the arsenic concentrations in the treated groundwater and in female human hair. The risk assessment for arsenic through drinking water pathways shows both potential chronic and carcinogenic risks to the local community. More than 40% of the people consuming treated groundwater are at chronic risk for arsenic exposure. © 2008 Elsevier Ltd. All rights reserved.

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