
A probabilistic framework for assessing health risk associated with arsenic intake from drinking water in Southern Taiwan

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Abstract

Groundwater is widely used for drinking in the Pingtung Plain, Taiwan. However, monitoring results proved that a considerable portion of groundwater quality at the monitoring wells has As concentration higher than the safe drinking water regulation of $10\mu\text{g/L}$. Considering residents of the Pingtung Plain continue to use groundwater for drinking, this study presents a probabilistic risk assessment for inorganic arsenic intake from drinking groundwater for local residents in Southern Taiwan. Besides the As concentration is considered as a probability distribution, the consumption rates and daily water intake rate and body weight are also treated as probability distributions to account for the variability of individuals. Monte Carlo simulation is thus utilized to conduct the exposure assessment of inorganic As daily intake from drinking water as probabilistic outputs. The health risk from drinking groundwater are evaluated based on the hazard quotient (HQ) and target risk (TR) established by the U.S. Environmental Protection Agency. The results shows that the 95th percentile of HQ exceeded 1 and TR is above the safe value of threshold value of 10-5. The results implies that groundwater use for drinking can places people at As exposure risk. The government must adopt appropriate measure to provide safe drinking water for residents of the Pingtung Plain. Moreover, this study provides a general framework for probabilistically assessing the health risk of inorganic As intake and characterize the uncertainty of risk assessment.

Keywords: Arsenic, Groundwater, Health risk assessment, Monte Carlo simulation

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