

Arsenic in Asia Water at Its Worst

Arsenic contamination of drinking water is a global problem, but nowhere is the problem more severe than in Bangladesh and West Bengal, India, where over 112 million reside in areas where groundwater concentrations exceed the World Health Organization's (WHO) maximum permissible level of 50 micrograms per liter ($\mu\text{g/L}$) and its lower recommended concentration of 10 $\mu\text{g/L}$. Arsenic exposure is associated with health effects such as skin lesions and lung, liver, and bladder cancers. In this issue, Uttam K. Chowdhury and other researchers from the School of Environmental Studies at Jadavpur University in Calcutta join with colleagues from the Dhaka Community Hospital Trust in Bangladesh and the Calcutta Medical College and Hospital to report their findings that arsenic contamination of drinking water is more severe in Bangladesh than in West Bengal, but that some of the preliminary health effects associated with arsenic-contaminated water can be reversed with a healthy diet and uncontaminated water [EHP 108:393–397].

Forty-two districts in Bangladesh, with a population of 79.9 million, have groundwater with arsenic concentrations in excess of 50 $\mu\text{g/L}$. Nine districts in West Bengal, with a population of 42.7 million, have concentrations in excess of the WHO's maximum permis-

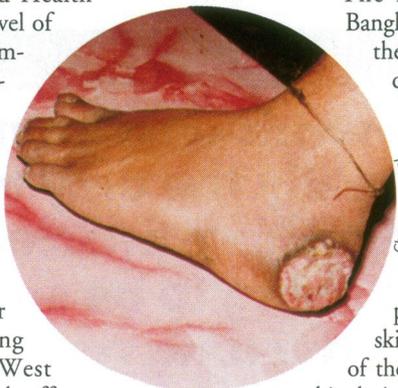
sible level. Over 90% of the residents in Bangladesh and West Bengal use groundwater for drinking and cooking. To determine the extent of drinking water contamination, the researchers collected nearly 11,000 water samples over a four-year period from districts in Bangladesh and discovered that 59% of those samples exceeded 50 $\mu\text{g/L}$. Of 58,166 samples from West Bengal, 34% exceeded 50 $\mu\text{g/L}$.

The levels of contamination also run higher in Bangladesh. Of the samples from Bangladesh exceeding the WHO maximum permissible level, nearly one-quarter were contaminated with concentrations of 100–299 $\mu\text{g/L}$. Nearly 11% of the samples contained concentrations of 300–499 $\mu\text{g/L}$, while 8.7% contained concentrations of 500–1,000 $\mu\text{g/L}$. Only 14% of the samples from West Bengal contained 100–299 $\mu\text{g/L}$, and only 3.9% had concentrations of 300–1,000 $\mu\text{g/L}$.

Similarly, the researchers found that a higher percentage of villagers in Bangladesh suffer from skin lesions than in West Bengal. Nearly one-quarter of the 11,000 villagers surveyed in Bangladesh suffered skin lesions, compared to slightly more than 15% of the 29,000 villagers surveyed in West Bengal. During 10 years of field surveys in West Bengal and 5 years in Bangladesh, the researchers observed that concentrations in excess of 300 $\mu\text{g/L}$ were associated with arsenical lesions, although lesions also occur at lower concentrations when nutrition is poor, the volume of water consumed is high, or contaminated water is consumed for an extended period.

The group also observed that concentrations as high as 400 $\mu\text{g/L}$ may not produce lesions if those exposed eat a nutritious diet. Arsenical skin lesions in their earliest stages can be reversed with safe drinking water and proper nutrition. Keratosis, a skin condition that accompanies more severe toxicity, may not disappear, but it can be reduced with safe water and nutritious food. More severe keratosis may, however, lead to skin cancers.

After years of research in West Bengal and Bangladesh, Chowdhury and colleagues have found that as new districts are surveyed, additional arsenic-affected villages are identified. For this reason, they believe their research reflects only the tip of the iceberg in identifying the extent of arsenic contamination. —Karen Breslin



Assessing arsenic. Exposure to arsenic in groundwater is severe in Bangladesh and West Bengal, India. New research shows, however, that a nutritious diet may reduce some of the health effects of chronic arsenic exposure.