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Chronic exposure to low-dose arsenic in drinking water compromises the immune response to respiratory infection

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Abstract text

Arsenic (As) exposure is a significant worldwide environmental health concern. In many areas of the United States, such as New England, As is naturally found at levels higher than the EPA standard of 10 ppb and a significant portion of the population is drinking excess As chronically, by contamination of private wells, which are not regulated by the EPA standard. In addition, it is becoming increasingly clear that significant biological effects of As can be observed in cell culture and animal models at and below the current 10 ppb standard. Through mechanisms that have yet to be elucidated, chronic As exposure via the drinking water has been associated with a variety of diseases, including an increased incidence of pulmonary disease. We have recently found that environmentally relevant levels (10 and 100 ppb) of chronic As exposure significantly alters the inflammatory response in mouse lung. Our findings led us to investigate the effect of chronic As exposure on respiratory Influenza A infection. Respiratory infections with influenza are a significant public health concern and a major cause of morbidity and mortality worldwide. It is estimated that 5-15% of the population will contract influenza infection annually, resulting in over 3-5 million hospitalizations and between 250,000 and 500,000 deaths worldwide. We have found that mice exposed to environmentally relevant levels of As had a significant increase in morbidity and were significantly impaired in their ability to respond properly to influenza infection. Our data indicate that chronic As exposure may be a significant contributor to the susceptibility and pathogenesis of respiratory viral infections. Moreover, these results suggest that chronic arsenic exposure, even at low levels commonly found in drinking water in the U.S., may compromise immune responses to various infectious challenges. (NIH-NIEHS SBRP P42 ES007373 P2)