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Assessing Arsenic Speciation and Contaminant Risks in Great Salt Lake Dust

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As a terminal lake, the Great Salt Lake is a natural accumulation point for contaminants like arsenic. Dust emissions from dried lakebed playas can serve as a gateway for these contaminants to impact surrounding populations. With more than 800 square miles of exposed lakebed and elevated concentrations of arsenic in the sediment, the surrounding valley's 2.5 million residents are at risk of arsenic-related disease. Despite the potential human health impact of exposure to As in dust, the form and bioavailability of As in the dust from the lakebed and in the surrounding population centers is poorly understood. This research combines geospatial analysis of arsenic concentrations in the exposed lakebed with in situ arsenic speciation in the dust and lakebed sediments via synchrotron-based X-ray absorption near-edge spectroscopy. Geospatial data shows As concentrations in the lakebed far exceeding EPA residential and industrial standards. The highest arsenic concentrations are found closer to the shoreline, near mining operations, and near evaporation ponds. Sequential extraction on Wasatch Front dust shows variable As sorption. As is primarily carbonate and Mn/Fe associated, which had a moderate positive correlation with GSL sources. The lowest fraction, 12.14%, is weakly sorbed. Preliminary speciation findings show heterogeneous As speciation – reduced and oxidized forms - across and within sites. Within the lakebed, arsenic might be associated with sulfur and iron and therefore less mobile. This has important implications for public health, since the mobility and bioaccessibility of As depends on its oxidation state and which minerals it is associated with. In vitro tests with synthetic lung fluid will be conducted to test arsenic desorption after inhalation, giving some indication of arsenic sorption behavior. These findings will improve future decision making by providing more accurate insight into the health risks of arsenic-laden dust emissions, providing information on not only contamination, but also risk. This will allow for more educated policy making that can provide relevant information and effective solutions to those affected.