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# Assessing Arsenic Bioaccessibility as a Result of Weathering in Empire Mine, California and its Implications on Public Health

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The mining industry has long played a significant role in California's history due to the abundance of valuable minerals. As mining activity slowed, an increasing number of mines became inactive, leaving behind sites containing large volumes of processed mine tailings elevated levels of potentially toxic metal(loid)s. Arsenic (As), a naturally occurring metalloid, persists in precious metal mine tailings and poses a health risk when ingested. As poses significant risk when a region features high levels of bioaccessibility (proportion of soluble As). However, As bioaccessibility varies greatly between locations, therefore further study of As bioaccessibility will help better predict risk and mitigation between specific areas.

The Kim Environmental Geochemistry Lab (KEG) focuses on the Empire Gold Mine located in northern California. Mine samples were collected from multiple Empire Mine sites as bulk samples and sieved through stainless steel sieves to obtain particle sizes ranging from >2780 µm to ≤20 µm. In order to simulate ingestion of As, the ≤250 µm size fraction of multiple samples were exposed to simulated gastric fluid (SGF) extraction, filtered and then analyzed through an inductively coupled plasma-optical emission spectrometer (ICP-OES). Samples were also measured with a BET surface area analyzer to calculate the %As released per m² of particle surface. In order to simulate natural weathering at mine sites, we used a shatterbox to grind mine samples of different size fractions and then repeated the SGF extractions, calculating and plotting the % change in As bioaccessibility after grinding.

The Empire Mine sites exhibit a range of positive slopes representing increasing As bioaccessibility with grinding as particle size increases (Figure 1). The EM20 and EM08 sites both exhibit similar (low) increases; however, the EM05 site exhibits far greater change between ground and unground samples, suggesting the presence of As located inside the particle›s and representing a greater long-term risk of As release.

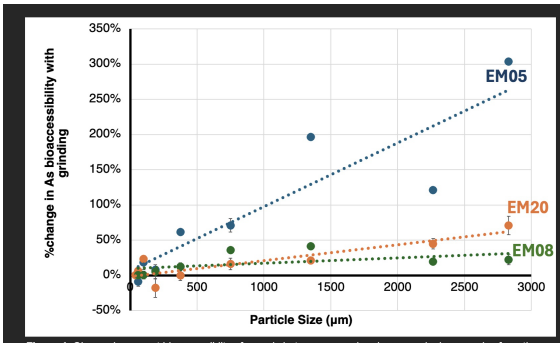


***Figure 1**: Change in percent bioaccessiblity of arsenic between ground and unground mine samples from three different locations at the Empire Mine, CA.*