Arsenic Chemistry, Mineralogy, Speciation, and Bioavailability/Bioaccessibilty in Soils and Mine Waste from the Empire Mine, CA, USA

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The goal of this study is to determine correlative relationships between *in vitro* bioaccessibility *or in vivo* bioavailability data and measureable parameters in soils and mine waste from the Empire Mine State Historic Park. This site is typical of thousands of inoperative lode gold mines in CA where arsenic (As) is the primary contaminant of human health concern. We have used bulk and microbeam chemical, mineralogical, and x-ray absorption spectroscopic (XAS; As and Fe K-edge) datasets for the analysis described here. Significant ($p < 0.05$) negative correlations (Pearson) between the abundance of arsenopyrite and/or arsenian pyrite and *in vitro/in vivo* datasets were found for XRD, QEMSCAN, and bulk XAS datasets (both As and Fe). Significant positive correlations with *in vivo/in vitro* datasets were found for the relative abundance of As(V)-ferrihydrite (by bulk XAS), the absolute amount of As in ferrihydrite (electron microprobe), and the abundance of Fe (hydr)oxides (bulk XRD and Fe XAS). Significant positive correlations were also found for the relative abundance of As(V and III) associated with Al hydroxide, gibbsite, or kaolinite (by bulk As XAS). The quantity of ferrihydrite (FH) and/or As concentration in FH are two lab-measureable sample parameters that correlate strongly with *in vitro* bioaccessibility and/or *in vivo* bioavailability data from Empire Mine samples.