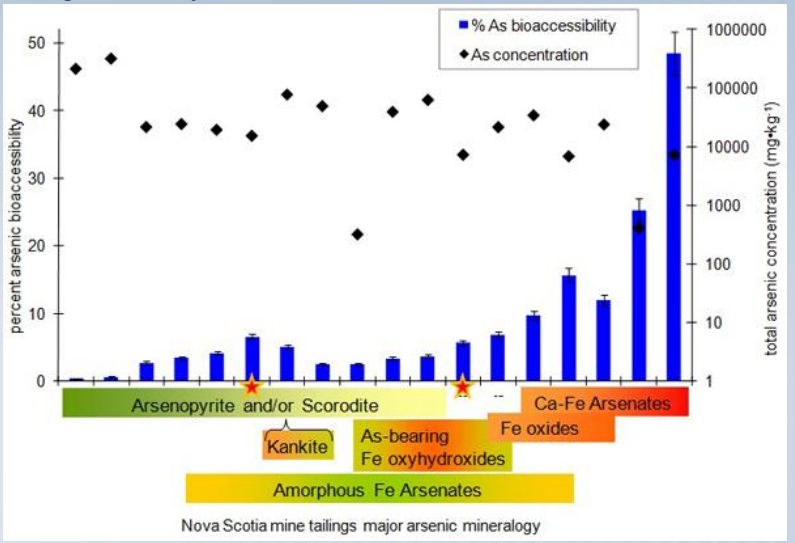
# Assessing the Risk of Arsenic Ingestion with Mineralogy

L. Meunier[1], S.R. Walker[2], J. Wragg[3], M.B. Parsons[4], I. Koch[1], H.E. Jamieson[2], K.J. Reimer[1]
[1]Royal Military College of Canada; [2]Queen's University; [3]British Geological Survey; [4]Geological Survey of Canada

- Using NSLS and Argonne's APS, researchers investigated a method that determines how much arsenic in soil tailings — byproducts of mining — will enter the bloodstream if ingested. This is traditionally measured with bioaccessibility tests, which runs samples through a process that mimics the digestive system.
- To avoid testing numerous samples from a mining site, the scientists wanted to know whether they could predict a soil sample's bioaccessibility based on its mineralogy (the minerals it contains).
- The group determined the mineralogy of a set of samples using synchrotron fluorescence, diffraction, and absorption techniques. They then compared these results to the samples' bioaccessibility.
- Their findings: single arsenic minerals, like arsenopyrite, have lower bioaccessibility — >90 percent of the arsenic would pass harmlessly through the digestive system. This is due to its low solubility, or ability to dissolve. A more soluble compound, arsenic bearing iron(oxy)hydroxides, had 10 times the bioaccessibility.
- But because certain compounds can increase the bioaccessibility of the entire soil sample containing it, the researchers found they still needed a bioaccessibility test to determine potential toxicity.




Mineralogy, percent arsenic bioaccessibility, and total arsenic concentration of samples from Nova Scotia mine tailings. A weak correlation is observed between total and bioaccessible arsenic concentrations. Lower percent bioaccessibility in the majority of samples is associated with sparingly soluble arsenopyrite and scorodite. Higher percent bioaccessibility in some samples is attributed to the presence of calcium-iron arsenates and arsenic-bearing iron oxides. The star denotes the presence of a minor calcium-iron arsenate phase.

*L. Meunier, S.R. Walker, J. Wragg, M.B. Parsons, I. Koch, H.E. Jamieson, K.J. Reimer, "Effects of Soil Composition and Mineralogy on the Bioaccessibility of Arsenic from Tailings and Soil in Gold Mine Districts of Nova Scotia,"* Environ. Sci Technol., ***44,*** *2667 (2010).*

Work performed on NSLS beamline X26A