Investigation of arsenic and various elements in garden soils and vegetables from Yellowknife

Elevated concentrations of arsenic and other mine related contaminants found in regional soils in Yellowknife have resulted in the investigation of their long-term environmental impacts in the community. Contamination from arsenopyrite-bearing gold has resulted in soil concentrations much higher than Canadian guidelines *(1,2)*. This has led to the investigation of arsenic uptake from garden soils into vegetables grown in Yellowknife and the potential human health risk from the consumption of these vegetables.

Risk assessments allow for the systematic description and estimation of the likelihood of potential risks (i.e., adverse health effects) to humans resulting from exposure to environmental contaminants. A realistic risk assessment accounts for the bioaccessible fraction of potential contaminants. Bioaccessibility measurements allow the determine of the fraction that may become bioavailable in the worst case scenario, which is the amount of contaminant that is absorbed into the bloodstream where toxic effects may ensue *(3)*. Simulated gastrointestinal processes using artificial gastrointestinal fluids are performed in vitro, and potentially toxic elements are then determined in the bioaccessible fraction.

As part of the study of arsenic and mining related elements, data were also collected on concentrations of essential nutritional elements in Yellowknife garden soils and vegetables. This allows the consideration of the benefits of consuming garden vegetables, as essential nutrients such as Ca, Fe, K, and Zn are important for maintaining good health, and the consumption of vegetables is an essential part of a healthy diet.

The work presented will look at the total arsenic and the bioaccessible arsenic content in Yellowknife garden soils and vegetables. Bioaccessibility measurements were performed in accordance with an in vitro bioaccessibility assay (IVBA) developed by the United States Environmental Protection Agency (USEPA), which uses an inductively coupled mass spectrometer (ICPMS) for measuring elemental concentrations. Total concentrations of nutritional elements and bioaccumulation/transfer factors (TFs) in various types of garden vegetables are also presented, along with comparisons to baseline nutritional elemental content in vegetables obtained from online sources.

Literature Cited

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