

Human health risk assessment science continues to mature with bioavailability-based risk assessment frameworks being developed and/or considered for implementation in the U.S., Canada, the European Union, Australia and other countries. Incidental ingestion is an important exposure pathway in these frameworks for assessing human health exposure and risk associated with contaminated soils. The bioavailability of Pb, As, and other soil contaminants can be determined by conducting dosing trials using acceptable surrogate animal models. To overcome the difficulty and expense associated with *in vivo* dosing trials, *in vitro* gastrointestinal (IVG) methods have been developed that simulate human gastrointestinal conditions. Bioaccessible Pb and As determined by several IVG methods have been shown to be correlated with *in vivo* bioavailability data. Soils must have a very high contaminant concentration, often > 500 or 1000 mg/kg, to accurately measure bioavailability from animal dosing trials. Most contaminated soils are not *highly* contaminated. These moderately contaminated soils require risk assessment but are below the "detection limits" of animal models. IVG methods will be the only methods that can be used for exposure assessment of moderately contaminated soils. Thus, for most contaminated soils, IVG methods are the only option for assessing contaminant bioavailability. Soil chemistry, mineralogy, and other geomedial properties may have more influence on contaminant bioavailability in moderately contaminated soils than highly contaminated soils. Recent advances using a concert of soil chemical, mineralogical, and toxicological approaches to support the use of IVG methods in moderately contaminated soils will be presented.