EXECUTIVE SUMMARY

This project will evaluate how common garden vegetables exposed to contaminated water, soil, and air uptake trichloroethylene (TCE) and its potential metabolites of microbial degradation. Carrots (Nante variety), spinach (Melody variety), and tomatoes (Micro-tom variety) will be grown from germination to maturity in continuous air-flow plant bioreactors. Reactors will be operated in a controlled laboratory environment designed to simulate field conditions ear Hill Air Force Base, Utah. ^{14}C (uniformly) labeled TCE will be introduced as a tracer in TCE-contaminated irrigation water. Two levels of TCE contamination (100 and 1,000 µg/l) representing the range of *in situ* conditions will be tested. The primary mechanisms influencing the fate of the added ^{14}TCE (i.e., vegetative uptake and translocation through evapotranspiration or folliar sorption of contaminated air, microbial degradation, adsorption onto soil or reactor walls, and advection or diffusion in evacuated air) will be separately quantified to fully close the mass balance for the ^{14}C label. Liquid scintillation (LS), gas chromatography (BC), and high performance liquid chromatography (GC) and high performance liquid chromatography (HPLC) with an on-line radiochromatographic detector will be used to investigate the fate of TCE in different environmental compartments. LS will be used to count total radioactivity in extractions from different media. GC will be used to quantify the total (radiolabeled + cold) concentrations of TCE and its potential metabolites. HPLC with on-line radiochromatographic detector will be used to unequivocally establish whether TCE is the parent compound of potentially uptaken metabolites (e.g., vinyl chloride). Edible portions of each plant type will also be analyzed at the midpoint of the growth period to assess whether the plants are accumulating detectable concentrations of TCE at this point of the experiment. All environmental compartments and different mature plant organs will be analyzed after harvest to gain an insight into the translocation pathway of TCE and its potential metabolites in different crop families. Control reactors (without plants) will be used to evaluate the effect of vegetation on soil adsorption and microbial degradation of TCE. No-treatment controls (plants irrigated with clean water) will be used to assess the effect of TCE exposure under simulated field conditions on plant growth and vegetable yield. Health risks will be calculated from the experimental results and standard EPA exposure factors.