

Concerns Regarding Vegetables Grown with Tetrachloroethylene Contaminated Water

In March 2014, the Environmental Epidemiology Program (EEP) of the Utah Department of Health (UDOH) was asked by the Department of Veteran's Affairs (VA) to provide an assessment of the potential health effects of consuming home-grown vegetables irrigated with spring water contaminated with tetrachloroethylene (also known as perchloroethylene, or PCE).

Tetrachloroethylene was first detected in the area around 700 South 1600 East in Salt Lake City in 1990 during routine sampling of the Mount Olivet Cemetery irrigation well (EPA, 2013). This site is known as the 700 South 1600 East PCE Plume, and was added to the National Priorities List in 2013 (EPA ID: UTD981548985). In 2010, PCE was discovered in several residential springs located downgradient of the plume during assessment of the Red Butte Creek oil spill (ATSDR, 2012). This new site is called "East Side Springs," and the PCE contamination, which ranges from 2.5 – 40.4 parts per billion (ppb), is likely to be hydraulically connected to the 700 South 1600 East plume (ATSDR, 2012; DERR, 2011; EPA, 2013). These springs are privately owned and located on residential property. As all residences are connected to the municipal water system, water from the springs is not likely to be a source of drinking water, though it is used for irrigation (DERR, 2011).

Tetrachloroethylene is a synthetic chemical that is widely used for fabric dry cleaning, metal degreasing, and as a starting material for other chemicals (ASTDR, 1997a). It is a nonflammable liquid at room temperature that evaporates easily and has a sharp, sweet odor. Due to its high volatility, much of the PCE that gets into water and soil will evaporate into the air, and the most common route of exposure is via inhalation (ATSDR, 1997a; EPA, 2012). However, as PCE does not bind well to soil, that which does not evaporate may move through the ground and enter groundwater. If PCE enters underground water supplies, it can persist for many months (ATSDR, 1997a; AU DEQ, 2001). Exposure to high concentrations of PCE (particularly in air) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty speaking and walking, loss of consciousness, and death. Most exposures to high levels of PCE are occupational (ATSDR, 1997a). The U.S. Department of Health and Human Services has determined that PCE may reasonably be anticipated to be a carcinogen (ATSDR, 1997b).

While not well studied in plants, most data suggest that PCE has a low potential for bioaccumulation (ATSDR, 1997a; AU DEQ, 2001; ECB, 2005). Although uncommon, small amounts of tetrachloroethylene have been found in food (ATSDR, 1997a). The presence of PCE in fruits and vegetables may indicate bioaccumulation, but it is often unclear whether accumulation took place during growth or at some point after harvesting. Due to the lipophilic nature of PCE, it can bind to lipid molecules and is more likely to be found in relatively fatty foods (e.g., margarine, oils, and meats). Much of the contamination of food is the result of contact with PCE in the air; food stored near dry cleaning facilities in particular has been found to have elevated levels of PCE (ATSDR, 1997a; EPA, 2012). In general, food is not considered to be a major route of exposure to PCE (EPA, 2012).

Given the high volatility of PCE, its low potential for bioaccumulation, and the relatively low lipid content of most fruits and vegetables, it is unlikely that fruits and vegetables irrigated with PCE-contaminated spring water from the East Side Springs site would harm people's health.

REFERENCES

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