

## VINYL CHLORIDE CONTAMINATION IN AQUIFERS AT U.S. NPL SITES CORRELATED WITH INCIDENCE OF LIVER CANCER

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National Priority List (NPL) sites designated by the U.S. Environmental Protection Agency (USEPA) as having vinyl chloride monomer (VCM) contamination in nearby ground-water aquifers pose an excess cancer risk to residents in the vicinity. The target organ for vinyl chloride is the liver, as indicated by higher incidences of liver cancer for workers in plants polymerizing polyvinyl chloride (PVC). PVC sludge wastes containing some un-polymerized VCM were disposed indiscriminately, infiltrating permeable substrate to contaminate local aquifers. Some dumping was sanctioned by government regulators, who, before the 1980s, did not recognize the carcinogenicity of VCM and did not demand containment of the leachate. Residents drank the VCM-contaminated water from their wells until health dangers were realized starting in the 1980s. Now, thirty years later, higher incidences of liver cancer have been recorded in these areas.

VCM contamination (USEPA data) was compared with liver cancer incidence (Center for Disease Control and Prevention (CDC) data) in several U.S. states. Of the ca. 1300 NPL sites, 524 have VCM as the contaminant of concern. Data were evaluated considering possible exposure scenarios. When plotted, a linear trend was noted indicating increasing rates of liver cancer incidence compared with the location of nearby VCM contamination at NPL sites. The U.S. states studied, Maryland, Delaware, Pennsylvania, Ohio, Massachusetts, New Jersey, and Washington State, all showed this correlation.

Although other causes of liver cancer could be responsible, namely arsenic, diabetes, cirrhosis of the liver, and heredity, nevertheless, it would be prudent to limit ingestion of ground water down gradient from NPL sites having VCM. Private wells are normally not regularly tested for VCM or other organic contaminants. Public wells are normally not tested regularly for VCM unless a problem is anticipated. Even when tested for VCM, the analytical detection limit is normally higher than needed to assure health protection. The Maximum Contaminant Level (MCL) for VCM used by the USEPA as a standard for public water supply testing is 2 ug/L, whereas an excess cancer risk of one in 100,000 is possible with a concentration of 0.24 to 0.48 ug/L.

This study underscores the potential danger of long-term ingestion of water from aquifers in areas that have VCM concentrations, even at levels that meet drinking-water standards.

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