Trichloroethylene Risk Assessment

Cleanup
CU-115

RESEARCH CATEGORY: 6.2 Applied Research

LEAD AGENCY: U.S. Air Force

LAB: Air Force Research Laboratory - Wright Patterson Air Force Base, OH

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FY 1997 COMPLETED PROJECT

OBJECTIVE: The goal of this research was to present the U.S. Environmental Protection Agency (EPA) with an alternative Trichloroethylene (TCE) risk assessment which replaces non-scientific policy assumptions with science-based evaluation.

TCE is among the top-ten priority groundwater contaminants within the Department of Defense (DoD) and nationally, and is present at over 39 percent of Superfund sites. The current required cleanup level in groundwater is low (5 ppb), with compliance costs estimated at billions of dollars. A typical stripping tower operation costs over a million dollars annually to operate, with an expected 15-20 year duration. Required cleanup levels are based on a risk assessment paradigm that includes significant policy-driven assumptions and safety factors. This leads to substantial uncertainty regarding the correlation between the cleanup level and cost-effective protection of human health.

Currently, all carcinogens are evaluated by the U.S. EPA on the basis of assumptions made for mutagenic chemicals but scientific opinion places TCE in a different class of carcinogens: promoters. However, draft revised U.S. EPA Guidelines for Cancer Risk Assessment are based on the premise that each chemical should be evaluated based on the "weight of evidence rather than using a standard approach to all chemicals." They state that "assumptions are to be displaced by facts or better reasoning when appropriate data are available." This project greatly broadens the TCE research data base and incorporate innovative, probabilistic risk assessment approaches. Reevaluation of TCE based on its activity as a promoter, not a mutagen, can reasonably be assumed to result in a remediation level significantly greater than 5 ppb.

BENEFIT: Because the current remediation level (5 ppb) is extremely difficult to achieve, remediation costs are very sensitive to even small changes in this level. Revised TCE remediation goals, which are the likely result of an updated EPA risk assessment, will have a major impact on TCE remediation costs. New remediation goals will make this a dual-use technology with extensive application in the civilian sector.

ACCOMPLISHMENTS: In FY 1997, efforts included the investigation of the reported increase (7-9 percent) in heart malformations of developing rodent fetuses from maternal ingestion of low concentrations of TCE in water. This is the most sensitive non-cancer effect reported for TCE. A cardiac malformation study is near completion to validate or refute previous research findings. Also, work included the finalization of the physiologically-based pharmacokinetic (PBPK) models for rodents and humans for use in dose response assessment.

TRANSITION: The PBPK models for rodents and humans were transferred to the U.S. EPA this year for use in dose response assessment, and three chapters were written supporting the state-of-the-science portion of the new trichloroethylene health assessment document that is under preparation by the U.S. EPA. A draft report of the new trichloroethylene health assessment is expected to be available for public

comment in CY 1998.