

Benzene Toxicity and Risk Assessment, 1972-1992: Implications for Future Regulation

**by Dennis J. Paustenbach, Renà D. Bass, and
Paul Price**

Acute and chronic exposure to benzene vapors poses a number of health hazards to humans. To evaluate the probability that a specific degree of exposure will produce an adverse effect, risk assessment methods must be used. This paper reviews much of the published information and evaluates the various risk assessments for benzene that have been conducted over the past 20 years. There is sufficient evidence that chronic exposure to relatively high concentrations of benzene can produce an increased incidence of acute myelogenous leukemia (AML). Some studies have indicated that benzene may cause other leukemias, but due to the inconsistency of results, the evidence is not conclusive. To predict the leukemogenic risk for humans exposed to much lower doses of benzene than those observed in most epidemiology studies, a model must be used. Although several models could yield plausible results, to date most risk assessments have used the linear-quadratic or conditional logistic models. These appear to be the most appropriate ones for providing the cancer risk for airborne concentrations of 1 ppb to 10 ppm, the range most often observed in the community and workplace. Of the seven major epidemiology studies that have been conducted, there is a consensus that the Pliofilm cohort (rubber workers) is the best one for estimating the cancer potency because it is the only one with good exposure and incidence of disease data. The current EPA, OSHA, and ACGIH cancer potency estimates for benzene are based largely on this cohort. A retrospective exposure assessment and an analysis of the incidence of disease in these workers were completed in 1991. All of these issues are discussed and the implications evaluated in this paper. The range of benzene exposures to which Americans are commonly exposed and the current regulatory criteria are also presented.