

A Critical Examination of Assumptions Used in Risk Assessments of Dioxin Contaminated Soil

D. J. PAUSTENBACH,¹ H. P. SHU, AND F. J. MURRAY

Syntex (USA) Inc., 3401 Hillview, Palo Alto, California 94303

Environmental standards for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (dioxin, TCDD) are currently being considered by regulatory agencies worldwide. Among these are limits for tap water, soil at industrial sites, residential soil, fish, ambient air, and fly ash. Thus far, in the United States, no standards have been promulgated but a few have been suggested. This paper critically evaluates several aspects of previously proposed approaches to setting limits for TCDD in residential soil and soil within industrial sites. Factors and assumptions which significantly affect the predicted degree of hazard associated with exposure to soil contaminated with low levels of dioxin are discussed. This paper shows how different, more justifiable assumptions than those used by the Centers for Disease Control (CDC) regarding the quantities of soil typically consumed by children, TCDD's nongenotoxicity, dermal exposure to soil, the concentration of airborne soil particles, dioxin's bioavailability in soil, and extrapolation of the dose response curve can profoundly affect the results of the risk assessment and, subsequently, the magnitude of the recommended limits. Two case studies which quantitatively illustrate the effect of these assumptions on the risk estimates are presented. Non-U.S. regulatory agencies have considered TCDD's nongenotoxicity in estimating that the virtually safe dose (VSD) or acceptable daily dose for dioxin is approximately 10 pg/kg/day (10,000 fg/kg/day). These approaches are compared and contrasted with the method used by the United States EPA whose risk estimates are higher and whose VSD is approximately 1000-fold lower. Alternative approaches to interpreting the cancer data indicate that a VSD of 130 pg/kg/day is more scientifically justified than risks estimated using standard approaches. This assessment indicates that a soil concentration of TCDD considerably in excess of 1 ppb should be acceptable for residential and nonresidential areas.