

## **A Methodology for Estimating Human Exposure to Perfluorooctanoic Acid (PFOA): A Retrospective Exposure Assessment of a Community (1951–2003)**

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Perfluorooctanoic acid (PFOA) is a persistent chemical that was recently shown to be widely distributed in the ambient environment. Because of concerns about the possible adverse health effects on persons exposed to PFOA, a retrospective exposure assessment was conducted for a population of about 50,000 persons who reside near one of the facilities where this chemical was used. No similar study of any chemical with the properties of PFOA had ever been performed; thus, several novel methods were developed and applied in this analysis. Historical records of the emissions from the facility were the basis for the estimates of the potential intake of (PFOA) by residents over the past 53 yr. Various well-accepted environmental models were dynamically combined in order to estimate the concentrations in all relevant environmental media including ambient air, surface soil, drinking water, and homegrown vegetables. Following considerable analyses, particulate deposition from facility air emissions to soil and the subsequent transfer of the chemical through the soil was determined to be the most likely source of PFOA that was detected in groundwater. The highest off-site environmental concentrations were predicted to occur about 1 mile away. For this approximately  $1\frac{1}{2}$  square mile area, during the time period 1951–2003, the model-estimated average air concentration was  $0.2 \mu\text{g}/\text{m}^3$ , the estimated surface soil concentration was  $11 \mu\text{g}/\text{kg}$ , and the estimated drinking water concentration was  $4 \mu\text{g}/\text{L}$ . Similar data were generated for 20 additional geographical areas around the facility. Comparison of measured PFOA concentrations in groundwater in the various water districts indicated that the models appeared to overpredict recent groundwater concentrations by a factor of 3 to 5. The predicted historical lifetime and average daily estimates of PFOA intake by persons who lived within 5 miles of the plant over the past 50 yr were about 10,000-fold less than the intake of the chemical not considered as a health risk by an independent panel of scientists who recently studied PFOA.