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DEVELOPMENT AND INITIATION OF AN INTEGRATED MONITORING PROGRAM FOR TOXIC AIR POLLUTANTS

RONALD HARKOV

ROBERT FISCHER

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
TRENTON, NEW JERSEY

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Abstract

The Office of Cancer and Toxic Substances Research, New Jersey Department of Environmental Protection is responsible for multimedia analysis and assessment of environmental toxic and carcinogenic substances. As part of this effort, the Project on Airborne Organic and Toxic Substances was initiated to establish the following information: background levels of selected toxic air pollutants (TAP); source assessment; evaluation of TAP dynamics and distribution; health/risk assessment and to use the knowledge acquired for site-specific investigations. The TAP selected for inclusion in this program were choosen using a variety of methods; relative toxicity/carcinogencity production and use in New Jersey, source specificity, suspected environmental concentrations, inclusion in air pollution regulations and available monitoring and analytical technology. The following airborne particulate parameters are being assessed at four sites in the state; IPM, FPM, nine trace metals, sulfates, three organic fractions, twelve polycyclic aromatic hydrocarbons, and alkylating activity and Ames mutagenicity response are being measured or the three organic fractions. In addition, at three of these sites we are monitoring for 27 volatile organic substances. Three of actual monitoring sites were located in residential areas and one serves as a background site. Besides the establishment of acceptable siting criteria, an extensive quality assurance program was developed to insure that the highest quality data is obtained in the project. In toto, this project represents the most comprehensive monitoring effort for airborne toxic substances ever initiated by a federal or state agency.

Introduction

The Office of Cancer and Toxic Substances Research (OCTSR) of the New Jersey Department of Environmental Protection is involved in multimedia analysis and assessment of toxic pollutants in our state. OCTSR initially began as a result of the public outcry following the release of 1974 NCI report (Mason and McKay 1974) on nation-wide cancer rates. This report revealed that New Jersey lead the nation in cancer mortality incidence in general and also at a number of specific organ sites. Since the beginning of 1976, OCTSR has initiated a number of comprehensive and exploratory studies in New Jersey on a wide variety of environmental issues including, but not limited to; surface and groundwater contamination, locating abandoned hazardous waste sites, surveying industrial use disposal and emissions of selected pollutants, analysis of health statistics and investigation of site specific pollution problems concerned with As, Hg and chlordane. In addition to these studies, a program for monitoring and analysis of ambient air for toxic and/or carcinogenic air pollutants was implemented. As with most of our initial studies, we began our air monitoring activities with a degree naivety concerning the concentrations, distribution, dynamics and measurable health impacts of the selected contaminants, however our current efforts represent the most extensive toxic air pollution activities in the U.S.

Analysis of the air-environment in New Jersey is an important step in understanding the relationship between pollution and human health in our state. The significance of air pollution can be hypothesized by analysis of the NCI report of 1974 which included the years 1950-1969, and a more recent report covering the years of 1970-75 (Louis and Steenland 1981). This information indicates that cancer mortality rates at a number of specific sites in both New Jersey and the U.S. are decreasing, yet certain cancer types, most notably lung cancer, are increasing in importance. The lung cancer mortality rates in New Jersey are amongest the highest in the U.S. and this phenomena cannot be explained by differences in smoking patterns (Louis and Steenland 1981). It would not be unreasonable to assume that toxic air pollutants play a significant, if not fundamental, role in this increased disease incidence. The current OCTSR air program has been designed and implemented to gather the largest data base possible concerning toxic air pollutants in New Jersey. Ultimately, this information will be analyzed from a variety of environmental health aspects, including lung cancer incidence.

I. Compound Selection Process

One of the initial considerations for the toxic air pollution program was the selection of target compounds and/or elements. As can be seen in Table 1, the universe for toxic air pollutants is large and includes organic and inorganic particles and gas-phase contaminants. Preliminary assessments of toxic air pollutants in New Jersey seemed to indicate that the average citizen in our state inhaled over 50 potential carcinogens in every breath. Thus after much analysis, five selection criteria were used to choose the pollutants to be included in our study (Table 2).