

A Comparative Review of the Genotoxicants Found in Ambient Air

Larry Claxton¹, Sarah H Warren¹, Peggy P Matthews¹, George Woodall¹, Susan T Bagley², Paul A White³

¹U.S. EPA

²Michigan Technological University

³Health Canada

Although research efforts have associated the induction of cancer in man and in experimental animals with exposure to airborne substances for a long time, major insights into the specific sources, chemicals, and mechanisms of action have emerged mainly since the 1970s. It is now generally accepted that many carcinogens are mutagens, that mutagenic mechanisms are important in the cancer process, and that many airborne compounds are mutagens. Historically, the evaluation of airborne toxicants was done on a pollutant-by-pollutant basis. However, the large numbers of mutagens identified in the ambient air make such assessments difficult. Also, the modeling of risks for constantly changing chemical mixtures presents an enormous challenge. It is apparent that chemical analysis can not effectively monitor for all potentially toxic airborne toxicants or for unknown toxicants. One simple approach is to measure the toxicological activity of total airborne masses. Therefore, the last quarter century has seen a number of studies in which researchers examined the toxicology of actual samples from ambient air and sources that pollute the air. For those interested in cancer, the genotoxicity assays have been used to identify the presence of specific classes of carcinogens and eventually to identify specific airborne carcinogens including PACs. Short-term bioassays also allow the comparison of genotoxic activity by location, meteorological conditions, sources, and by other modifying conditions. Additionally, mutation tests have been used for large, multi-site, and/or time series studies, and for doing site- or source-comparisons for relative levels of airborne mutagens. The purpose of this presentation is to address how mutagenicity assays have provided a means to characterize the toxicology of ambient air affected by many sources under varying conditions. The factors that impact the mutagenic burden of ambient air and what is known about the identity of specific PAC mutagens will be addressed. Moreover, future research needs and opportunities will be outlined. [Abstract does not necessarily reflect the policy of the USEPA.]