

The Incidence of Breast Cancer Associated with Long-Term Average Concentrations of Ambient Air Pollution. Results from the AHSMOG Study

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Breast cancer is still the most common nonskin cancer diagnosed in women in the U.S. each year accounting for approximately 30 percent of all female incident cancers. It has been estimated that over 203,000 U.S. women will develop breast cancer and almost 40,000 will die of it in 2002. There are marked geographic differences in the occurrence of breast cancer among the states suggesting possible environmental factors in the etiology of this disease. Some investigators have noted that the female breast is anatomically embedded in a major fat depot which stores and concentrates polycyclic aromatic hydrocarbons and can metabolize these hydrocarbons to carcinogenic metabolites. Respirable particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}) proves a mechanism whereby toxic chemicals can be delivered into the deep lung where they can become systemic.

[Methods] A cohort of 6338 Non-Hispanic white California residents was followed prospectively from 1977 to 1992 to study the health effects of long-term cumulated ambient air pollution. The subjects completed a lifestyle questionnaire at baseline which included questions on diet, pregnancy characteristics, exposure to birth control pills and post-menopausal estrogens. The cohort was followed for cancer incidence and all cause mortality as well as ascertainment of monthly residence and work location zip codes. Individual monthly indices of ambient air pollution based on fixed-site monitoring stations were linked to individual health effects. Cancer incidence for the cohort was ascertained using a combination of two methods: 1) computer-assisted record linkage with local and statewide cancer registries and 2) medial records from self reported hospitalizations. Cox proportional hazards regression was used to estimate relative risk (RR) adjusting for age and other covariates.

[Results] A total of 122 incident breast cancers were identified. For cumulated long-term mean concentration of PM_{10} , an increase of one interquartile range (IQR) was associated with increased risk of breast cancer (RR=1.60; 95% confidence interval (CI): 1.24-2.07). Risk of breast cancer was also elevated for all investigated exceedance frequencies (40 – 100 ug/m^3). For example, an increase of one IQR in days per year exposed to ambient levels greater than 40 ug/m^3 was associated with increased breast cancer risk (RR=1.54; CI: 1.14-2.08). Similarly, for PM_{10} in excess of 100 ug/m^3 , the risk of breast cancer was also elevated (RR=1.32; CI: 1.08-1.62). No association was observed for mean concentration of ozone or other pollutants.

[Conclusion] A positive association was found between risk of developing breast cancer and ambient particulate air pollution. It is possible that chronically breathing polluted air containing hydrocarbons may make one more susceptible to development of different diseases, including cancer. However, more studies are needed to assess the components of ambient particulate matter and whether the observed associations are causally related to the development of breast cancer in post menopausal women independent of the traditional breast cancer risk factors.