

A breath of fresh air: breast cancer risk and air pollution

December 20, 2015

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Chang'an Avenue in Beijing

On a recent Monday, the air quality in Beijing dropped so low that Chinese government officials issued an unprecedented “ red alert” , ordering all outdoor construction work to stop and urging schools to close. Air pollution is a major concern in urban areas around the world. Traffic emissions are the major source of air pollutants, and contain many potential carcinogens.

Rates of breast cancer, the most common cancer among women worldwide, have increased over time and are higher in more developed countries. Exposures related to industrialization and modernization, such as air pollutants, could potentially explain this phenomenon. In addition, air pollution can contain endocrine disruptors, chemicals that disrupt normal hormone production. Elevated levels of hormones can influence breast cancer risk and the progression of specific breast cancer subtypes.

While, several studies suggest an association between breast cancer risk and exposure to air pollution, few studies have investigated the effect of air pollution on specific subtypes of breast cancer. To further examine this question, Dr. Kerry Reding (Public Health Sciences Division), Dr. Joel Kaufman (University of Washington, Department of Environmental and Occupational Health Sciences), and colleagues investigated breast cancer risk and potential risk differences by cancer

subtype in relation to components of air pollution. They recently presented their results in *Cancer Epidemiology, Biomarkers & Prevention*.

Study participants included 47,591 women from the Sister Study cohort enrolled from 2003-2009. By 2013, the study accrued 1,749 invasive breast cancer cases with data on air pollution; exposure to air pollution was ascertained from the U.S. Environmental Protection Agency (EPA), with the help of colleagues at The University of Washington. The investigators used Cox proportional hazards and multinomial logistic regression to estimate breast cancer risk with several components of air pollution: inhalable coarse particle (PM₁₀), fine particulate matter (PM_{2.5}), and nitrogen dioxide (NO₂). The following confounders, risk factors associated with both air pollution and breast cancer, were included in the models: race, educational attainment, smoking status, and menopausal hormone therapy

The investigators found that breast cancer cases were more likely to be White, highly educated women, and users of menopausal hormone therapy. There was no association between breast cancer overall and any of the air pollution components: PM_{2.5} (Hazards ratio [HR] = 1.03; 95% CI: 0.96-1.11), PM₁₀ (HR = 0.99; 95% CI: 0.98-1.00), or NO₂ (HR = 1.02; 95% CI: 0.97-1.07). Dr. Reding further describes these results, “ this study, conducted in nearly 50,000 U.S. women, set an upper bound on the risk of breast cancer associated with air pollution as 1.1 (for fine particulate matter, PM_{2.5}). In other words, this study rules out a risk of breast cancer overall above 11% in relation to this component of air pollution.” However, when examining breast cancer subtypes, the researchers found per 5.8 parts per billion of NO₂, a 1.10-fold increased risk of ER+/PR+ breast cancer (relative risk = 1.10; 95% CI: 1.02-1.19).

While their study did not find an association between traffic-related air pollution and overall breast cancer risk, some studies have. The authors mention “ a potential explanation for differences among studies could be differing proportions of ER/PR subtypes, if as our data suggest, NO₂, is only associated with ER+/PR+ breast cancer.” Besides serving as a marker for traffic emissions, NO₂ likely serves as a proxy for endocrine disruptors in air pollution, such as polycyclic aromatic hydrocarbons, which have estrogenic properties. Therefore there is biological plausibility for a differential role of air pollution by hormone receptor status. As the author’s note, “ replication of these results is needed before firm conclusions can be drawn regarding ER+/PR+ breast cancer risk in relation to traffic-related air pollution.”

Funding for this study was provided by the National Institutes of Health, National Institute of Environmental Health Sciences, EPA, and the National Institute of Nursing Research.

[Reding KW, Young MT, Szpiro AA, Han CJ, DeRoo LA, Weinberg C, Kaufman JD, Sandler DP.](#)

2015. Breast Cancer Risk in Relation to Ambient Air Pollution Exposure at Residences in the Sister Study Cohort. *Cancer Epidemiol Biomarkers Prev.* 24(12):1907-1909.