Janis E Campbell et al., J Pollut Eff Cont 2017, 5:3(Suppl)
DOI: 10.4172/2375-4397-C1-008

Air pollution and childhood acute leukemia in Oklahoma

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Background: Despite numerous epidemiologic studies, the etiology of childhood cancer is still largely unknown. Benzene is a known carcinogen in adult acute myeloid leukemia (AML). In addition, ambient air pollution has been classified as a Group 1 carcinogen, but studies have not established whether air pollution is associated with childhood leukemia. The goal of this study was to determine if children with acute leukemia have higher odds of exposure to benzene compared to controls, accounting for other sources of ambient pollution, specifically, traffic-related air pollution.

Methods: We conducted a case-control study matched on week of birth using the Oklahoma Central Cancer Registry as our source for acute leukemia cases diagnosed from 1997-2012 (n=307, including 79 AML and 228 acute lymphoid leukemia) and birth certificates to identify controls (n=1,022). Census tract-level benzene estimates were obtained from the 2005 National-Scale Air Toxics Assessment (NATA) and assigned using maternal residence at delivery. Ambient concentrations of nitrogen dioxide (NO_2) were obtained as a marker of traffic-related air pollutants and estimated using a satellite-based land-use regression model. To determine if benzene, categorized by quartile, was associated with acute leukemia after adjustment for NO_2 and other potential confounders, we used multivariable conditional logistic regression.

Results: We observed no differences in benzene exposure between cases of any acute leukemia and controls in the univariate analysis or after adjusting for maternal education and NO_2. However, when evaluating benzene stratified by leukemia type, the estimates for children with AML after adjustment for NO_2 and maternal education (4^{th} vs. 1^{st} quartile OR: 2.10, 95% CI: 0.62, 7.10) were stronger than among those with acute lymphoid leukemia (4^{th} vs. 1^{st} quartile OR: 1.05, 95% CI: 0.50, 2.16), though the estimates for AML were less precise and none were statistically significant.

Discussion: Using the NATA estimates to measure benzene allowed us to assess a specific pollutant at the census tract level, which provided an advantage over the use of monitor or point source data. In addition, adjustment for NO^2, an indicator of traffic-related air pollution, increased the magnitude of the OR estimates, but harmed precision. This indicates that sources of benzene separate from traffic may be driving the association between benzene and AML.

Biography

Janis E Campbell is an Associate Professor of Research at the University of Oklahoma Health Sciences Center, College of Public Health, Department of Biostistics and Epidmiology and Adjunct Faculty with the Department of Geriatric Medicine. She has over 25 years of history working in disease surveillance in Oklahoma; much of that was working in mixed methods. For ten years, she was the PI for the Oklahoma Central Cancer Registry.

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