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Diabetic nephropathy and dioxin and dioxin-like compounds

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Abstract

Nephropathy, or kidney disease, is a major, potential complication of diabetes. We assessed the association of 6 chlorinated dibenzo-*p*-dioxins, 9 chlorinated dibenzofurans and 8 polychlorinated biphenyls (PCBs) in blood, with diabetic nephropathy in the 1999-2004 National Health and Nutrition Examination Survey (unweighted N=2,588, population estimate=117,658,357). Diabetes was defined as diagnosed or undiagnosed (glycohemoglobin ≥6.5%), and nephropathy defined as urinary albumin to creatinine ratio >30 mg/g, representing microalbuminuria or macroalbuminuria. For the 8 chemicals analyzed separately, values above the 75th percentile were considered elevated, whereas for the other 15 compounds, values above the maximum limit of detection were considered elevated. Seven of 8 dioxins and dioxin-like compounds, analyzed separately, were found to be associated with diabetic nephropathy. The chemicals associated with diabetic nephropathy were: 1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin; 1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin; 2,3,4,7,8-entachlorodibenzofuran; PCB 126; PCB 169; PCB 118; and PCB 156. In contrast, only 2 of the 8 dioxins and dioxin-like compounds were associated with diabetes without nephropathy. When 4 or more of the 23 chemicals were elevated the odds ratios were 7.87 (95% CI=2.34-26.49) for diabetic nephropathy, and 1.95 (95% CI=0.88-4.33) for diabetes without nephropathy. As the kidneys function to remove waste products from the blood, diabetic nephropathy could be either the cause or the effect (or both) of exposure to dioxins, furans and dioxin-like PCBs. Diabetes with and without nephropathy should be analyzed as independent outcomes in future cross-sectional and longitudinal investigations.

Biography

Olivia M. Thompson, PhD, MPH is an Assistant Professor in the Public Health Program at the College of Charleston and a Research Assistant Professor at the Medical University of South Carolina. She publishes in the areas of chronic disease epidemiology, public health policy, and systems science.

Charles J. Everett, PhD is Affiliate Faculty in the Master of Environmental Studies Program at the College of Charleston. He has published 79 articles and book chapters in the fields of environmental epidemiology, medicine and soil science.