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Original Contribution

Association of Black Carbon with Cognition among Children in a Prospective Birth Cohort Study

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While studies show that ultrafine and fine particles can be translocated from the lungs to the central nervous system, the possible neurodegenerative effect of air pollution remains largely unexplored. The authors examined the relation between black carbon, a marker for traffic particles, and cognition among 202 Boston, Massachusetts, children (mean age = 9.7 years (standard deviation, 1.7)) in a prospective birth cohort study (1986–2001). Local black carbon levels were estimated using a validated spatiotemporal land-use regression model (mean predicted annual black carbon level, 0.56 $\mu g/m^3$ (standard deviation, 0.13)). The Wide Range Assessment of Memory and Learning and the Kaufman Brief Intelligence Test were administered for assessment of cognitive constructs. In analysis adjusting for sociodemographic factors, birth weight, blood lead level, and tobacco smoke exposure, black carbon (per interquartile-range increase) was associated with decreases in the

vocabulary (–2.2, 95% confidence interval (CI): –5.5, 1.1), matrices (–4.0, 95% CI: –7.6, –0.5), and composite intelligence quotient (–3.4, 95% CI: –6.6, –0.3) scores of the Kaufman Brief Intelligence Test and with decreases on the visual subscale (–5.4, 95% CI: –8.9, –1.9) and general index (–3.9, 95% CI: –7.5, –0.3) of the Wide Range Assessment of Memory and Learning. Higher levels of black carbon predicted decreased cognitive function across assessments of verbal and nonverbal intelligence and memory constructs.

air pollution; child; cognition; intelligence; neurotoxicity syndromes; particulate matter; soot; vehicle emissions

Abbreviations: CI, confidence interval; IQ, intelligence quotient; K-BIT, Kaufman Brief Intelligence Test; SD, standard deviation; WRAML, Wide Range Assessment of Memory and Learning

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