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Hind's doctoral thesis examines the relationship between traffic-related air pollution and the development of atopy and asthma using two complementary Canadian birth cohorts where the impact of different exposure assessment approaches on observed associations was evaluated.

Hopanes in house dust, collected in the Canadian Healthy Infant Longitudinal Development (CHILD) birth cohort study, were evaluated as markers of indoor infiltrated traffic-related air pollution by measuring their correlation with geographic predictors of outdoor concentrations of nitrogen dioxide. This correlation was dependent on the inclusion of behavioral characteristics, hindering the utility of measuring hopanes in settled dust for exposure assessment.

As an alternative approach to assess exposures in CHILD, city-specific land use regression models, questionnaires and home assessments were used to model personal exposure, including accounting for indoor/outdoor infiltration and time-activity patterns, in relation to early atopy. Spatio-temporally adjusted exposure in the first year of life was positively associated with sensitization to common food or inhalant allergens at age 1 (Odds ratio [95% confidence interval] per interquartile increase in nitrogen dioxide = 1.16 [1.00 – 1.41]).

Because atopy is often a precursor for allergic asthma, 10 years of longitudinal data from the Border Air Quality Study population-based birth cohort linked to health administrative data were used to evaluate the role of air pollution on asthma development. An interquartile range increase in nitrogen dioxide, adjusted for temporal and spatial variability, increased incident asthma among preschool (age 0-5) children by 9% (95% confidence interval: 4 – 13%). Surrounding residential greenness mitigated this effect. In further analysis, the course of asthma was found to follow three trajectories: transient asthma, early-, and late-infancy chronic asthma, the latter two being significantly associated with fine particulate matter and nitrogen dioxide.

This dissertation highlights the importance of integrating temporal and spatial variation in traffic-related air pollution exposure assessment and clarifies the role of early exposures on atopy and asthma initiation.