

Ambient nitrogen dioxide monitoring near a major highway using passive diffusion samplers
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Exposure to nitrogen dioxide (NO₂), a contaminant emitted by fossil fuel combustion, has been associated with an increased risk of asthma, especially in children. However, exposure assessment is an important limitation for large-scale epidemiological studies. The objectives of this pilot study were to assess the validity of passive diffusion samplers used in fixed locations to measure NO₂ concentrations in the vicinity of highways, and to assess the feasibility of using NO₂ passive monitoring to map traffic-related pollution in major Canadian cities. A total of 31 two-sided OgawaTM passive samplers (using triethanolamine as a sorbent) were installed for seven days in groups of two or three at distances ranging from 0 to 1310 meters from a major highway where traffic density exceeds 100,000 vehicles/day. NO₂ concentrations measured ranged from 10.2 to 29.9 ppb, and coefficients of variations between replicates ranged from 5.2% to 18.6%, being lower than 10% in 8 out of 12 sampling locations. NO₂ concentrations significantly decreased with increasing logarithmic distance from the highway ($p < 0.0001$) and were significantly lower upwind than downwind ($p = 0.0013$). The overall R² of the regression model was 0.97. Three samplers located below the air intake of an air monitoring station measured a mean NO₂ concentration of 23.0 ppb (5 valid results; standard deviation 2.2 ppb), while the average of the hourly measurements made by the station during the same period was 28.0 ppb. Passive diffusion samplers used in replicate appear to be a reliable method to monitor ambient NO₂. Also, based on these results, distance from highways appears to be a valid proxy exposure variable for traffic related air pollution in epidemiological studies. However, all these findings will require confirmation in multiple locations.