Fort Collins commuters VOC exposure and real-time instrument validation

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Introduction

People are exposed to air pollution from traffic sources while commuting to and from work. Volatile organic compounds (VOCs) are a class of traffic-related air pollution of particular concern because of their potential adverse health effects. This study will quantify VOC exposure for bicycling and driving commuters on high- and low-traffic roads.

Methods

Commuters living and working in Fort Collins, Colorado will wear a backpack containing instruments designed to measure traffic-related air pollution and a GPS to determine their location at 10-second resolution. A photoionization detector (PID) will be included in the backpack to record VOC concentrations. Commuters will follow predetermined high- and low-traffic routes via two modes: bicycling and driving.

The PID is not a well-validated method for traffic-related VOC measurement, so we will couple the PID with a standard method for validation. This standard method uses a canister to sample air and provides one time-weighted average (TWA) VOC concentration for each commute. Concentrations measured by the PID and canisters will be compared to evaluate whether the PID method is suitable for measuring VOCs from traffic sources.

Anticipated Results

The manufacturer's reported accuracy and response specifications of this PID suggest it should measure VOC concentrations relevant to on-road conditions. We expect the TWA VOC concentration measured by the PID and canister will be within 80% of each other. We anticipate reduced VOC exposure when bicycling and when travelling on low-traffic routes.

Conclusions

Validating a PID for spatiotemporal monitoring will advance the field of VOC exposure assessment. This study may identify commuting alternatives with reduced VOC exposures, which may eventually lead to improved public health.

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