

Degree and Program (2016):

SM2 Exposure, Epidemiology, and Risk

Organization	Project Abstract
Harvard T.H. Chan School of Public Health	<p><b>Real-time monitoring of VOCs using two photoionization detectors</b></p> <p>Mobile real-time sensors can be valuable tools to detect and measure Volatile Organic Compound. The MiniVOC-TRAQ is an affordable, minimally invasive device that has research potential for quantifying real-time VOC levels for people with Multiple Chemical Sensitivities (MCS). The primary aim of this study is to characterize the qualities of the MiniVOC-TRAQ for use in future research. We tested several common products in different phases in a laboratory setting to record data on response times, decay times and concentrations for the MiniVOC-TRAQ and the 'gold standard' ppbRAE photoionization detector. Data analysis is not complete however; we are finding that the TRAQ has a smaller range with a truncated low end and high end compared to the ppbRAE. Understanding the properties of this device may assist in developing a study design that uses the device while gaining valuable information about a particular micro-environment for a population with MCS finds challenging.</p>
Harvard T.H. Chan School of Public Health	<p><b>Test of two PIDs - RAE and TRAQ</b></p> <p>A few mobile real-time sensors measure Total-VOC; however, their ability to detect and measure VOCs in the field have not been well characterized. The aim of this study is to complete rigorous laboratory testing of two different types of PIDs using a variety of common products found in everyday environments. The ppbRAE3000 (RAE) will be considered our standard device upon which we will compare the MiniVOC-TRAQ (TRAQ). A secondary objective is to determine whether the products detected within a laboratory setting are also detected in the field. /</p>
Harvard T.H. Chan School of Public Health	<p><b>Particle Exposure in Dentistry</b></p> <p>This project aims at evaluating small size particle exposures during drilling procedures and evaluate the effectiveness of wearing a surgical mask in protecting the dentist/dental assistants from particle exposures /</p>
Environmental Health & Engineering,	<p><b>Comparison between two VOC PIDs</b></p> <p>Introduction: Mobile photoionization detectors can be valuable tools to detect and measure VOCs in real time. The MiniVOC-TRAQ (TRAQ) is an affordable, minimally invasive PID that has research potential for people with Multiple Chemical Sensitivities. The primary aim of this study is to characterize the qualities of the TRAQ for use in future research.</p>
Harvard T.H. Chan School of Public Health	<p><b>Particle Exposures in Dental Surgery and Efficacy of Surgical Masks as PPE</b></p> <p>Exposure to particulate matter is of high public health concern due to its association with many adverse health conditions. Certain environments can be more prone to high particle levels due to factors that may lead to the creation and aerosolization of particles. In clinical settings such as dentistry, high-powered drilling tools have the ability to increase particle levels, but few studies have looked at occupational exposures facing dentists and none have tested the efficiency of surgicals mask worn by during procedures. This project evaluated small size particle exposures during dental drilling procedures and the effectiveness</p>

	<p>of wearing a surgical mask to protect against particle exposures. Measurements took place at a dental practice in Framingham, MA and included PM2.5, PM1 and UFP during dental drilling procedures. Mask efficiency was determined by using a duplicate set of instruments fitted with surgical masks. Results showed that levels of all three particle fractions were high compared to a Boston, MA traffic site and EPA NAAQS values. There appeared to be no direct changes in particle levels as a result of periods of drilling during appointment, however, there did seem to be a lag in particle increases followed by a cumulative rise in particle levels throughout the remainder of the appointment. The surgical mask did reduce the particle exposure, but to a lesser extent than promised by the mask certification.</p>
N/A	<p><b>Comparison of 2 Photoionization Detectors of Volatile Organic Compounds in Common Products</b>  Introduction: Mobile photoionization detectors (PID) can be valuable tools to detect and measure VOCs in real time. The MiniVOC-TRAQ is an affordable, minimally invasive PID that has research potential for people with Multiple Chemical Sensitivities. The primary aim of this study is to characterize the qualities of the MiniVOC-TRAQ for use in future research. / Methods: Phase 1: 25 common products (thought to emit VOCs) were simultaneously introduced to the ppbRAE and the MiniVOC-TRAQ to determine response or no response. Phase 2: Products, registering a response in Phase 1 for both devices, were introduced to the sensors for quantitative data collection of peak values, time to peak and time to baseline. Phase 3: products from Phase 2 were used functionally with sensors placed in breathing zone to simulate microenvironment field-testing. / Results: Both devices responded to multiple products. The devices were significantly different with regards to peak concentrations for all products tested in phase 2. Post hoc analysis revealed associations between the devices with response factors between 2.9-3.7. Phase 3 associations were significantly different than the associations with Phase 2. / Discussion: We found that the TRAQ has the potential to be used in the field for simple identification of VOC presence. However, further research is necessary to quantify accuracy in concentration levels and associations between the ppbRAE and the TRAQ.</p>
Boston Fire Department	<p><b>Quantifying Exposure to PM2.5 and PAHs in Boston Fire Stations</b>  Fire fighters are at an increased risk for cancer when compared to police officers and the general population. In this project we sought to describe potentially dangerous exposures to firefighters during their shift spent inside 3 Massachusetts firehouses. We collected paired samples of PM2.5 and PAHs inside and outside the firehouse. We also used continuous monitoring devices to measure PAH's and particle size in three locations at the firehouse, inside the truck bay, the living area, and outside. We then compared the information collected continuously to the call schedule. We found that despite manual exhaust ventilation systems for the truck we still witnessed PM and PAH peaks inside the truck bay after a fire truck leaves or returns from a call. We found that PM levels are consistently higher inside the firehouse compared to the outside air. (Reached significance <math>p &lt; 0.05</math> for one firestation) which is not a typical finding among other indoor workplace environments like offices. We also collected qualitative questionnaire data to inform our hypotheses and compared all PM and PAH levels to national indoor air quality standards. Overall the findings show indoor PM and PAH increases related to diesel exhaust from fire trucks and likely cooking activity.</p>