



Second Hand Smoke Exposure at UW-EC

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Introduction

Secondhand cigarette smoke is associated with a spectrum of lung diseases including lung cancer, as well as cardiovascular disease. While designated smoking areas on campus have been established to protect smokers' rights, secondhand exposure to others is common along walkways and in buildings where smoke enters through air intake vents. Recent Student Senate discussions include a campus-wide smoking ban proposal.

Purpose & Hypothesis

- Purpose: Compare outdoor measurements of PM 2.5 with indoor measurements, and levels known to cause adverse health effects.
- Hypothesis: There will be a significant difference in PM 2.5 and CO levels while someone is smoking a cigarette compared to after the area is cleared of smoke.

Materials & Methods

The two types of materials we used were the DustTrak aerosol monitor and the Q-Trak IAQ (Indoor Air Quality) monitor. The DustTrak monitor is a laser-photometer that measures and records airborne dust concentrations. The Q-Trak measures the most important parameters for initial IAQ studies; temperature, humidity, carbon dioxide and carbon monoxide. All measurements are taken simultaneously via a single probe.



For measuring particulate matter (PM) given off by outdoor smokers we used the DustTrak, calibrated at PM 2.5. While simultaneously running the Q-Trak meter to measure carbon monoxide (CO). We stood approximately 6 inches to 3 feet from the smoker and sampled for three minutes. Average and max readings were obtained for both PM 2.5 and CO readings. The average PM 2.5 and CO left after the smoker/smoke had cleared the area was also documented.

Map

This map shows the locations where our samples were obtained on lower campus of UW-EC. The points are marked with an X. All these points are designated **NO Smoking** areas on campus.



Data

	During		After	During		After
	Average PM 2.5	Max PM 2.5	Average PM 2.5	Average CO	Max CO	Average CO
Range Low	0.018 mg/m ³	0.041	0.002	0 ppm	1	0
Range High	19.7	44.2	0.007	6	12	1
Average	4.57	15.71	0.003	2.1	3.3	0.4
Standard Deviation	7.22	20.15	0.002	2.28	3.53	0.52

Results

A paired t-test was used to analyze whether the means of the average measurements during and after were statistically different from one another. An alpha level of 0.05 was used to test the hypothesis.

Average PM 2.5 t-test p value = 0.031
Average CO t-test p value = 0.022



Conclusion

• The results of the paired t-tests revealed that there was a statistically significant increase in PM 2.5 and CO levels during cigarette smoking compared to after the air had cleared.

• According to the U.S. Environmental Protection Agency the adverse health effects from second hand smoke exposure are determined by the size of the particulate matter and duration of exposure. The current EPA standard for PM 2.5 daily exposure average is 35 µg/m³. Although the average PM 2.5 levels measured outdoors while a cigarette was being smoked were much higher than 35 µg/m³, the daily average of a non-smoker walking around campus being exposed to second hand smoke occasionally (e.g., 10 seconds at a time, up to 6 times) is much less than 35 µg/m³. The current EPA standard for CO average over 1 hour is 35 ppm, much higher than the levels measured in this research.

• Compared to previous student research conducted measuring PM 2.5 levels from cigarette smoke indoors, both average and max PM 2.5 levels outdoors were lower. However the air cleared more quickly outdoors as compared to indoors.

• Due to the relatively short exposure time to second hand smoke outdoors on the UW-EC campus, the issue may not be the adverse health effects caused by second hand smoke, but instead issues such as non-compliance with No Smoking areas, litter caused by cigarette butts, and the nuisance of smelling cigarette smoke on campus. Non-compliance with No Smoking areas can lead to particulate matter and the smell of smoke being drawn up into buildings air flow systems. For these reasons a campus wide smoking ban may be necessary.