

# Updates on EPA Method TO-11a for the Measurement of Airborne Carbonyls

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# Background and Motivation

- Carbonyl compounds are important to ambient air quality
  - Formaldehyde
  - Acrolein
- Method TO-11a is the 'gold standard'



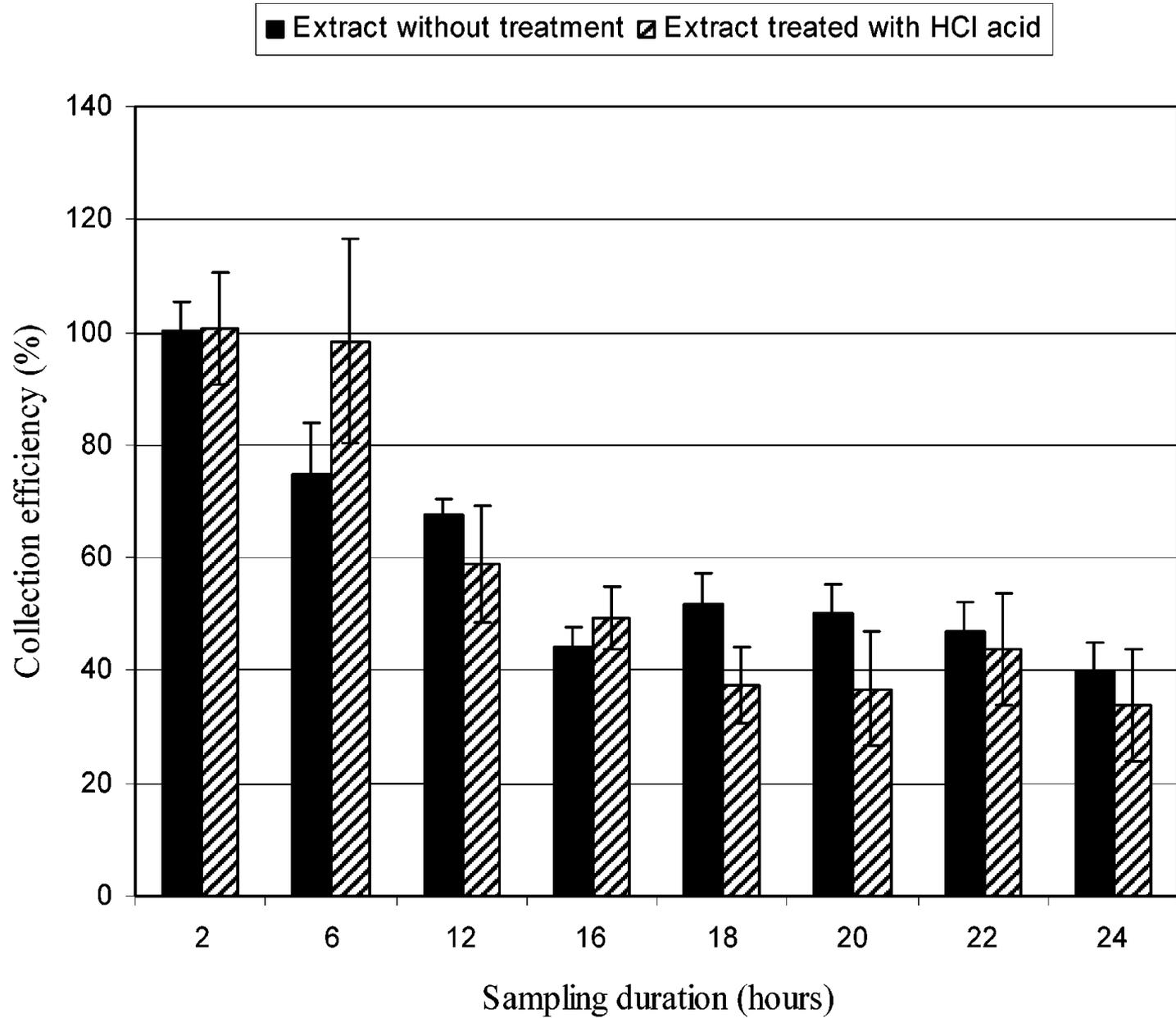
# Background and Motivation

- NATTS Network
  - Monitor long-term trends in HAPs concentrations
  - VOCs, carbonyls, PAHs, metals, hexavalent chrome
  - 27 sites around US



# Background and Motivation

- Issues with US EPA Method TO-11a
  - Acrolein
  - Interferences with
    - Ozone
    - Nitrogen dioxide
    - Water
  - Potentially poor, or unknown, collection efficiencies



# Objectives

- Evaluate the effect of ozone, nitrogen dioxide, and water on Method TO-11a for the measurement of formaldehyde, acetaldehyde, propionaldehyde, benzaldehyde
- Determine optimal collection efficiency for use over a 24 hour sampling period
- Ultimate goal: provide updated guidance on the implementation of Method TO-11a

# Experimental design

- Part 1: Evaluate ozone scrubber for capacity and ability to handle  $O_3$  transients
  - 2 types of KI denuders
  - 150 ppb at 1 L/min for 30 days, in duplicate
  - First at ~30% RH
  - Then at ~65% RH
  - Continuous upstream and downstream ozone monitoring
  - Transient high (>200 ppb) levels



# Experimental design

- Part 2: Evaluate NO<sub>2</sub> interference and start collection efficiency assessment
  - Carbonyls generated at 1 to 10 ppb using permeation tubes
  - Both style of DNPH cartridges, in series, in duplicate
  - 1 L/min for 24 hours @ 25°C
  - With KI denuder present
  - Modify HPLC method to address DNPA interference, if observed
  - Confirm applicability of modified method at higher humidity

Relative Humidity (%)	NO <sub>2</sub> (ppb)
30 ± 5	0
30 ± 5	25
65 ± 5	0
65 ± 5	25

# Experimental design

- Part 3a: Collection efficiency assessment
  - Carbonyls generated at 1 to 10 ppb using permeation tubes
  - Both style of DNPH cartridges, in series, in duplicate
  - Without NO<sub>2</sub> or O<sub>3</sub>
  - ~0.3, ~0.5, ~0.75, ~1.25 and ~1.5 L/min
  - 24 hours sampling
  - 30% RH @ 25°C
- Goal: balance maximizing CE with maintaining required MDLs

# Experimental design

- Part 3b: Final method optimization
  - Carbonyls generated at 1 to 10 ppb using permeation tubes
  - Both style of DNPH cartridges, in series, in duplicate
  - 24 hours @ optimal flow rate for maximized CE
  - 25°C, with KI denuder present

Relative Humidity (%)	O <sub>3</sub> (ppb)	NO <sub>2</sub> (ppb)
First at 30, then at 65	0	0
	30	0
	100	0
	0	10
	0	25

# Timeline

- Begin experimental work in September, results by spring 2015

# Acknowledgement

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