

Supporting Information
for

**Field Sampling Method for Quantifying Odorants in
Humid Environments**

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Poultry House: Air samples from a commercial broiler production house located in the southeastern United States were collected between flocks during wintertime conditions. The production house sampled was representative of current commercial broiler systems with dimensions of 13.1 x 155.5 m (43 x 510 ft) and designed to house ~ 25,000 birds per flock. Mechanical ventilation of the house was achieved by either sidewall fans or tunnel fans, depending on the climate and bird age. Management practices included the use of rice hulls as bedding and decaking (removing the caked litter, a mixture of bedding and manure, under the water and feed lines) after each flock. Air samples were collected following the removal of the flock. The air temperature and RH were 0°C and 76%, respectively during the between flock period when the samples were collected. The litter had accumulated for two flocks of production when samples were collected. Samples were taken from side wall fan, tunnel portion of the building and throughout the building along water and feed lines.

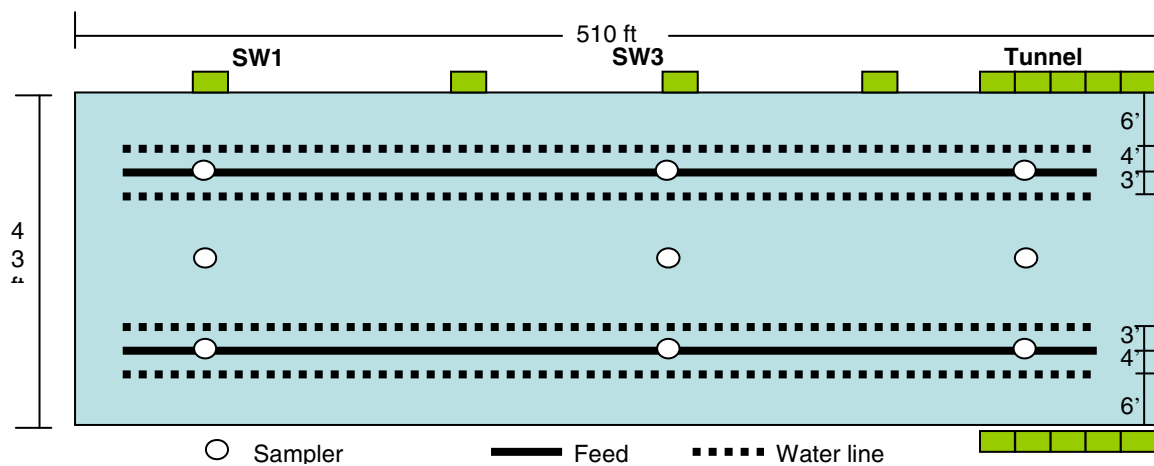


Figure S1. Schematic of commercial broiler house with location of samplers (each location n = 3).

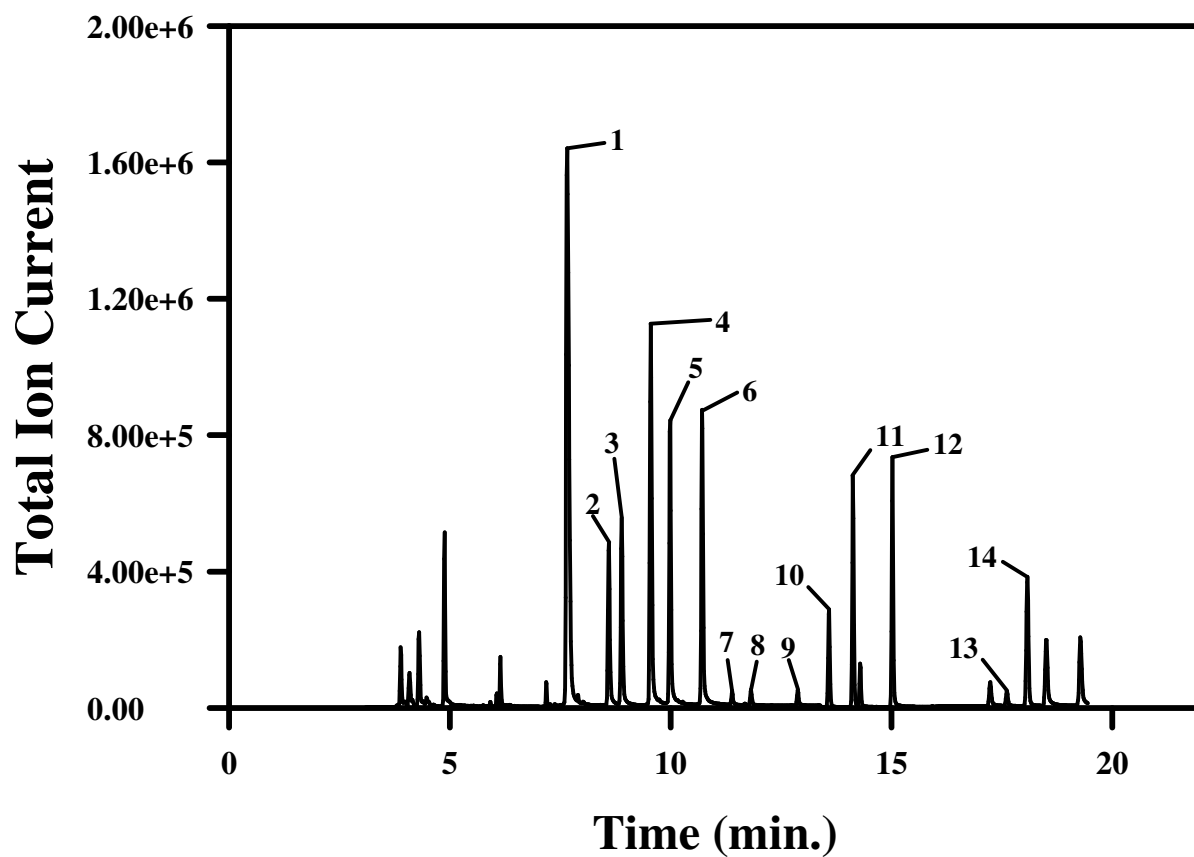


Figure S2. Chromatogram of standards on CP-X sorbent tube analyzed by thermal desorption GC/MS. Compounds identified are as follows: 1) acetic acid; 2) propanoic acid; 3) 2-methylpropanoic acid; 4) butanoic acid; 5) 3-methylbutanoic acid; 6) pentanoic acid; 7) 4-methylpentanoic acid; 8) hexanoic acid; 9) heptanoic acid; 10) phenol; 11) 4-methylphenol; 12) 4-ethylphenol; 13) indole; and 14) 3-methylindole.

The original preparation of the volatile fatty acid (VFA) included dilution in methanol but this resulted in methyl ester formation after standards were stored overnight at 4°C. Standards were prepared in HPLC grade water, but after 1:100 dilution of VFA standard mix from Supleco recovery was low. Afterward, all VFA standard solutions were pH adjusted to less than 2.5 due to the pKa of VFA being approximately 4.7. Diluting in an HCl solution resulted in degradation of the GC column due to the volatility of HCl, and phosphoric acid solution left residue in our ATIS system that affected other standards being spiked onto sorbent tubes. Consequently, formic acid was used to dilute VFA standards, but formic acid contains approximately 0.5% acetic acid. The volatility of the formic acid solution left ATIS system fairly clean after each injection and caused no problems with GC column.

The safe sampling volumes (SSV) were monitored on the basis of recovery of compound, and not on the basis of 10% recovered in back-up tubes following the main tube, which is the typical way SSV is determined. The problem with measuring the breakthrough of a compounds by its appearance in subsequent tube is that in multi-bed sorbent tubes a compound may actually breakthrough a weaker sorbent only to be irreversible or partially irreversibly sorbed to the stronger subsequent sorbent material. This was evidenced by applying analytical standards to the Carbotrap 300 sorbent tubes CMS end first, which resulted in complete lost of most compounds (Figure S3). Measuring SSV using percent recovered in both main and back-up tubes is only valid when sorbent tubes contain a single sorbent material.

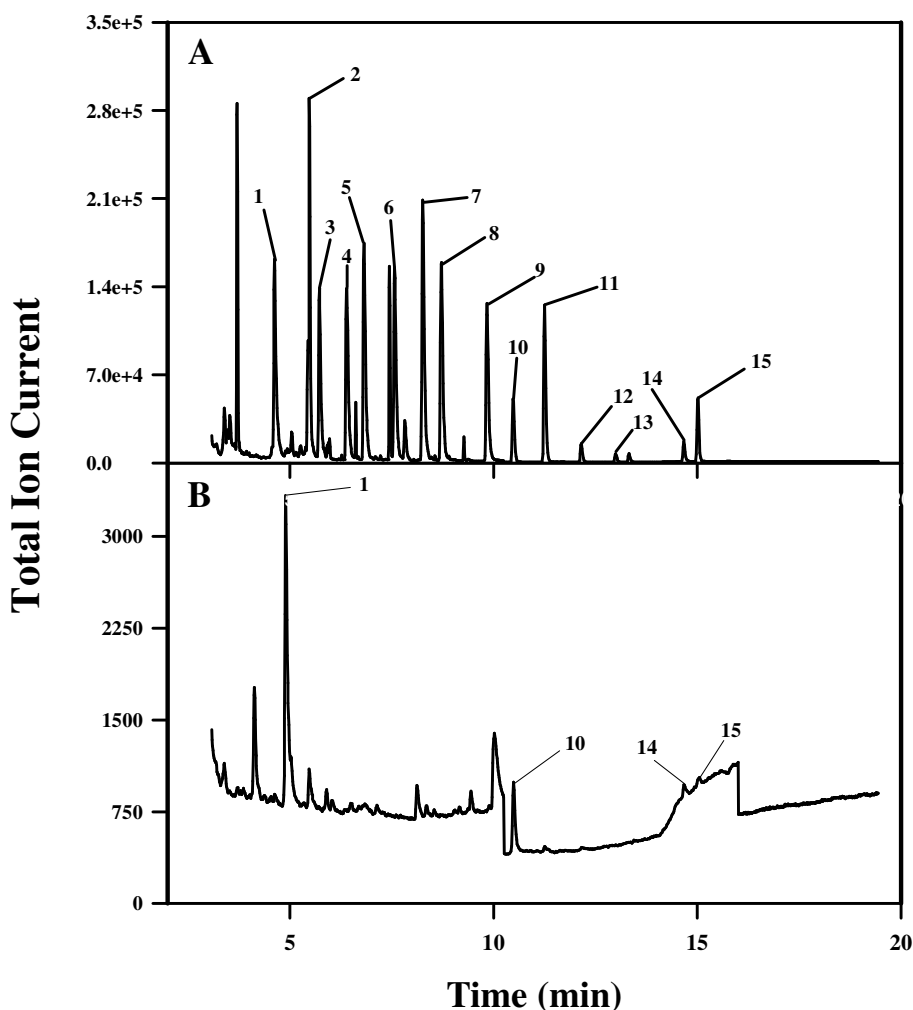


Figure S3. Comparison chromatograms of standards loaded onto Carbotrap 300 sorbent tubes from either the front (A) or back (B). Compounds identified are as follows: 1) acetic acid; 2) propanoic acid; 3) 2-methylpropanoic acid; 4) butanoic acid; 5) 3-methylbutanoic acid; 6) pentanoic acid; 7) 4-methylpentanoic acid; 8) hexanoic acid; 9) heptanoic acid; 10) phenol; 11) 4-methylphenol; 12) 4-ethylphenol; 13) 4-propylphenol; 14) indole; and 15) 3-methylindole.

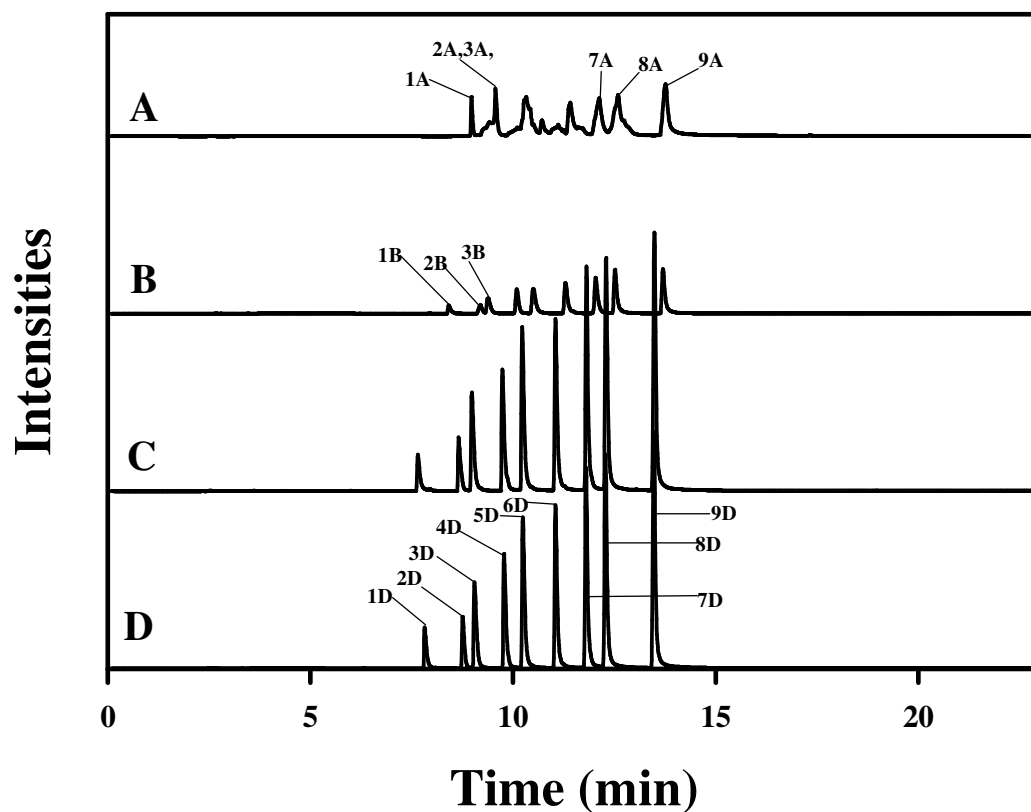


Figure S4. Chromatogram of Carbotrap 300 sorbent tubes loaded with volatile fatty acid mixture and passage of 2 L of various relative humidity (RH) air. (A) 80% RH; (B) 50% RH; (C) 25% RH; and (C) Dry standard spike (250 mL). Compounds identified are as follows: 1) acetic acid; 2) propanoic acid; 3) 2-methylpropanoic acid; 4) butanoic acid; 5) 3-methylbutanoic acid; 6) pentanoic acid; 7) 4-methylpentanoic acid; 8) hexanoic acid; 9) heptanoic acid.

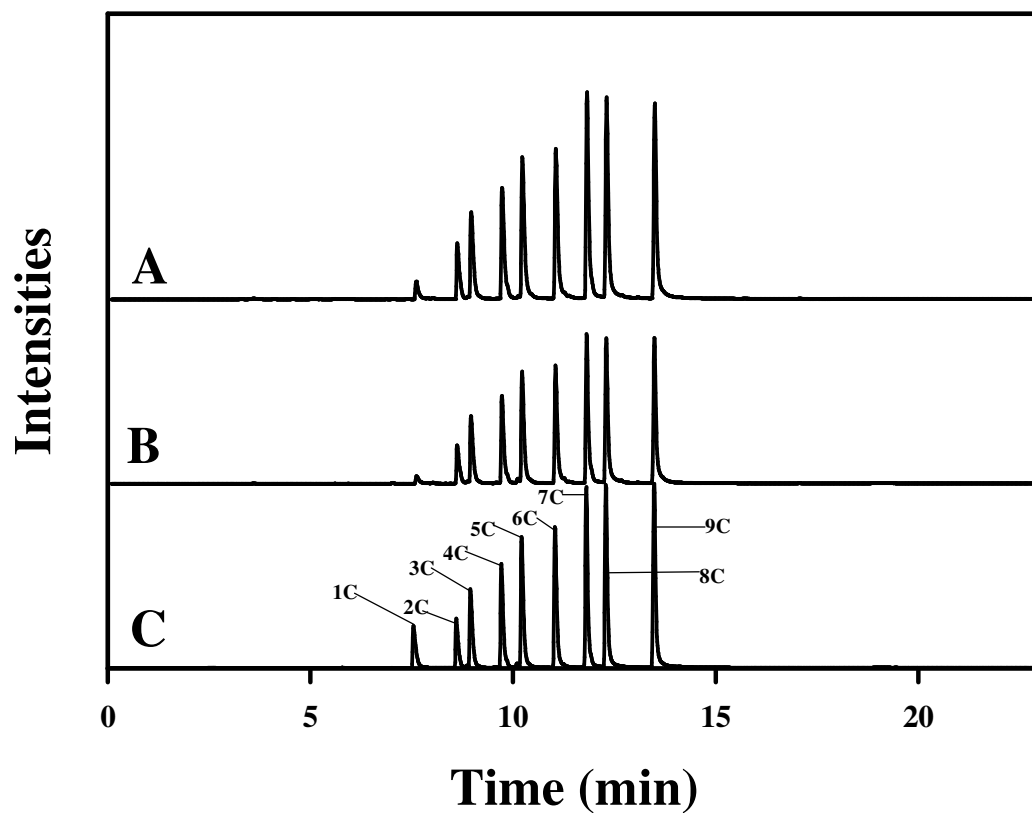


Figure S5. Chromatogram of Tenax TA sorbent tubes loaded with volatile fatty acid mixture and passage of 2 L of humidified air. (A) 80% Relative Humidity; (B) 50% Relative Humidity; and C) Dry standard spike (250 mL air). Compounds identified are as follows: 1) acetic acid; 2) propanoic acid; 3) 2-methylpropanoic acid; 4) butanoic acid; 5) 3-methylbutanoic acid; 6) pentanoic acid; 7) 4-methylpentanoic acid; 8) hexanoic acid; 9) heptanoic acid.

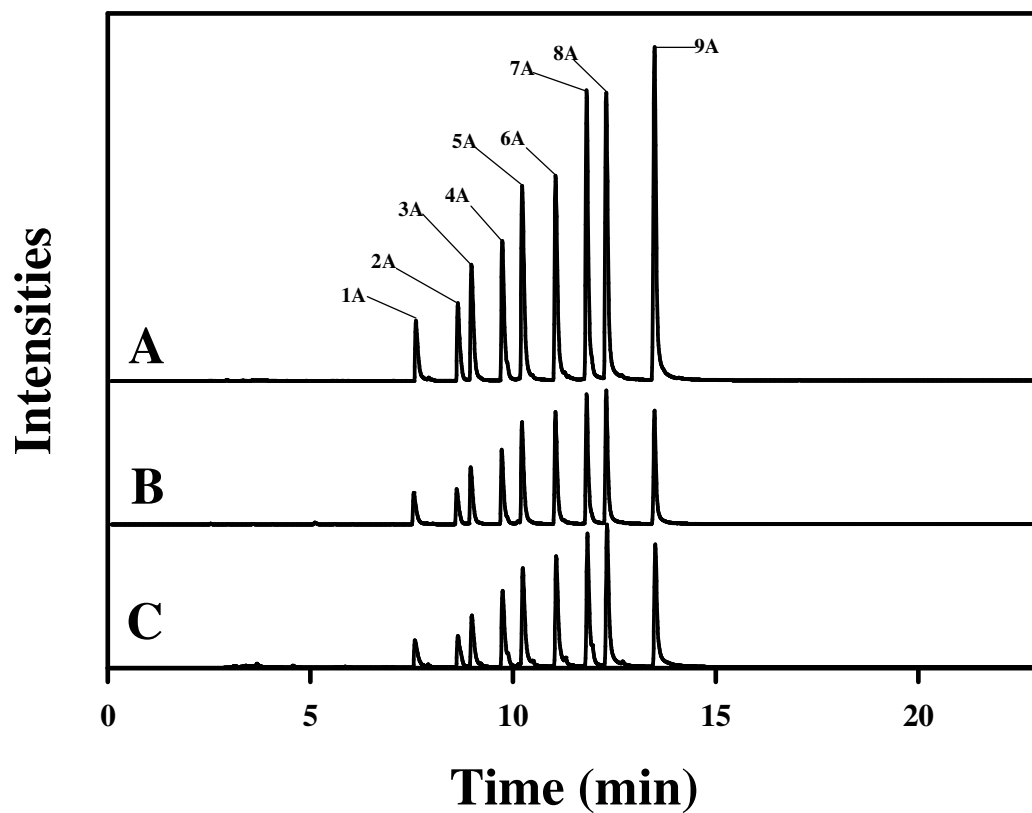


Figure S6. Chromatogram of CP-X sorbent tubes loaded with volatile fatty acid mixture and passage of 2 L of humidified air. (A) 80% Relative Humidity; (B) 50% Relative Humidity; and (C) Dry standard spike (250 mL air). Compounds identified are as follows: 1) acetic acid; 2) propanoic acid; 3) 2-methylpropanoic acid; 4) butanoic acid; 5) 3-methylbutanoic acid; 6) pentanoic acid; 7) 4-methylpentanoic acid; 8) hexanoic acid; 9) heptanoic acid.

Table S1. Recovery of compounds loaded on Carbotrap 300™ following 2 L of air at 50% relative humidity.

Compound	Recovery (%)	Standard Deviation
Acetic acid	87.4	30.6
Propanoic acid	79.8	19.8
2-Methylpropanoic acid	75.6	21.1
Butanoic Acid	78.7	37.9
3-Methylbutanoic acid	84.8	29.1
Pentanoic acid	89.9	26.8