

SUPPORTING INFORMATION

Flavoring Compounds Dominate Toxic Aldehyde Production During E-cigarette Vaping

Andrey Khlystov* and Vera Samburova

Desert Research Institute, Department of Atmospheric Sciences,
Desert Research Institute, Reno, NV 89512

*Corresponding author's e-mail: andrey.khlystov@dri.edu
and phone: +1-775-6747084.

3 pages, 3 tables

Supplemental information

Tables

Table S1. Minimum detection limits for HPLC determination of free aldehydes.

<i>Aldehyde</i>	<i>MDL, $\mu\text{g/mL}$</i>
formaldehyde	0.009
acetaldehyde	0.007
acrolein	0.01
propionaldehyde	0.013
crotonaldehyde	0.008
methacrolein	0.008
n-butyraldehyde	0.009
benzaldehyde	0.009
valeraldehyde	0.011
glyoxal	0.003
m-tolualdehyde	0.008
hexaldehyde	0.007

Table S2. Average liquid consumption per puff for e-cigarette brands and e-liquids tested in this study. Liquid consumption within triplicate measurements did not vary by more than 20%.

<i>Brand</i>	<i>Flavor</i>	<i>Liquid consumption, mg/puff</i>
Brand I	Watermelon	7.85
	Gummy Bear	6.25
	Blueberry	7.627
	Irish Cream	7.027
	Dragon's Cafe	6.38
	No flavor	13.85
Brand II	Peppermint	6.19
	Menthol	4.6
	Congress	5.138
	Sahara	3.06
	Red Tobacco	2.456
Brand III	Bubble Gum	5.785
	Pina Colada	6.115
	Blueberry	5.988
	Tutti Frutti	6.117
	Caramel Mocha	3.319
	No flavor	4.04

Table S3. Concentration of aldehydes (units: $\mu\text{g puff}^{-1}$) in e-cigarette emissions from three e-cigarette devices, n/a – e-liquid was not available; ND – not detected (below detection limit); each sample was collected and analyzed in triplicates (N=3)

<i>Aldehyde</i>	<i>Flavors (concentration level in vapor emission)</i>					
<i>Brand I</i>	<i>No flavor</i>	<i>Watermelon</i>	<i>Gummy Bear</i>	<i>Blueberry Pomegranate</i>	<i>Kahlua & Irish Cream</i>	<i>Dragon Café</i>
formaldehyde	ND	49.5±3.2	34.8±2.1	43.8±6.6	41.57±4.5	46.0±2.6
acetaldehyde	ND	20.9±4.7	19.5±2.1	27.7±5.7	22.79±3.3	18.63±2.5
acrolein	ND	2.72±0.29	1.45±0.06	1.31±0.21	1.91±0.38	2.05±0.13
propionaldehyde	ND	3.44±0.72	2.38±0.59	3.28±0.83	3.64±0.62	2.04±0.08
crotonaldehyde	ND	ND	ND	ND	ND	ND
methacrolein	ND	ND	ND	ND	ND	ND
butyraldehyde	ND	ND	ND	ND	ND	ND
benzaldehyde	0.09±0.01	ND	1.10±0.05	0.15±0.05	0.06±0.02	0.13±0.10
glyoxal	0.04±0.02	0.50±0.11	0.40±0.06	0.60±0.16	0.54±0.10	0.93±0.79
valeraldehyde	ND	ND	ND	ND	ND	ND
m-tolualdehyde	ND	ND	0.15±0.10	ND	ND	ND
hexanaldehyde	ND	ND	ND	ND	ND	ND
<i>Brand II</i>	<i>No flavor</i>	<i>Sahara</i>	<i>Red Tobacco</i>	<i>Peppermint</i>	<i>Menthol</i>	<i>Congress</i>
formaldehyde	n/a	0.12±0.01	2.41±0.58	0.37±0.07	1.14±0.03	ND
acetaldehyde	n/a	ND	2.95±0.82	ND	0.60±0.06	ND
acrolein	n/a	ND	ND	ND	ND	ND
propionaldehyde	n/a	0.038±0.012	0.40±0.07	ND	0.080±0.003	ND
crotonaldehyde	n/a	ND	ND	ND	ND	ND
methacrolein	n/a	ND	ND	ND	ND	ND
butyraldehyde	n/a	ND	ND	ND	ND	ND
benzaldehyde	n/a	ND	ND	0.51±0.01	0.28±0.01	0.26±0.02
glyoxal	n/a	0.035±0.021	0.22±0.07	0.15±0.02	0.17±0.03	0.23±0.04
valeraldehyde	n/a	ND	ND	ND	ND	ND
m-tolualdehyde	n/a	ND	ND	0.030±0.001	0.012±0.005	ND
hexanaldehyde	n/a	ND	ND	ND	ND	ND
<i>Brand III</i>	<i>No flavor</i>	<i>Bubble Gum</i>	<i>Pina Colada</i>	<i>Blueberry</i>	<i>Tutti Fruity</i>	<i>Caramel Mocha</i>
formaldehyde	0.64±0.22	24.4±2.3	8.34±1.54	4.27±0.16	1.08±0.11	14.6±0.7
acetaldehyde	0.11±0.04	22.5±6.2	5.67±0.75	1.35±0.13	0.36±0.01	6.88±0.38
acrolein	ND	1.37±0.35	0.80±0.49	0.34±0.22	ND	0.76±0.03
propionaldehyde	ND	4.18±1.18	0.88±0.31	0.32±0.06	ND	0.59±0.04
crotonaldehyde	ND	ND	ND	ND	ND	ND
methacrolein	ND	ND	ND	ND	ND	ND
butyraldehyde	ND	ND	ND	ND	ND	ND
benzaldehyde	ND	ND	0.036±0.002	0.15±0.01	0.091±0.008	ND
glyoxal	0.19±0.06	0.85±0.16	0.92±0.07	0.54±0.05	0.14±0.02	1.51±0.25
valeraldehyde	ND	ND	ND	ND	ND	ND
m-tolualdehyde	ND	ND	ND	ND	ND	ND
hexanaldehyde	ND	ND	ND	ND	ND	ND