

**Note to readers with disabilities:** *EHP* strives to ensure that all journal content is accessible to all readers. However, some figures and Supplemental Material published in *EHP* articles may not conform to [508 standards](#) due to the complexity of the information being presented. If you need assistance accessing journal content, please contact [ehp508@niehs.nih.gov](mailto:ehp508@niehs.nih.gov). Our staff will work with you to assess and meet your accessibility needs within 3 working days.

### **Supplemental Material**

#### **Endotoxin and (1→3)- $\beta$ -D-Glucan Contamination in Electronic Cigarette Products Sold in the United States**

Mi-Sun Lee, Joseph G. Allen, and David C. Christiani

#### **Table of Contents**

**Table S1.** Coefficient of variation (CV) for endotoxin and glucan (n = 8).

**Table S2.** Endotoxin and glucan levels in EC products by brand, type, and flavor.

**Figure S1.** EC products selection.

**Table S1.** Coefficient of variation (CV) for endotoxin and glucan (n = 8)

Brand	Flavor	Type	Endotoxin <sup>a</sup>				Glucan <sup>a</sup>			
			Sample (EU/mL)	Replicate sample (EU/mL)	SD	CV, %	Sample (ng/mL)	Replicate sample (ng/mL)	SD	CV, %
A	Others	Cartridge	<LOD	<LOD	-	-	5.40	5.30	0.07	1.32
G	Menthol	Cartridge	<LOD	<LOD	-	-	9.73	7.40	1.65	19.24
H	Tobacco	Cartridge	<LOD	<LOD	-	-	2.20	2.54	0.24	10.14
J	Tobacco	Cartridge	<LOD	<LOD	-	-	25.30	28.00	1.91	7.16
C	Menthol	E-liquid	<LOD	<LOD	-	-	9.73	7.40	2.47	22.40
C	Fruit	E-liquid	<LOD	<LOD	-	-	2.20	2.54	0.02	19.55
F	Fruit	E-liquid	<LOD	<LOD	-	-	25.30	28.00	-	-
J	Fruit	E-liquid	<LOD	<LOD	-	-	0.88	0.90	0.02	2.31

Each pair of samples was from the same package (or bottle for e-liquid); Endotoxin was measured using an endotoxin-specific kinetic turbidimetric in a *Limulus* amoebocyte lysate (LAL) assay and Glucan was measured using a GlucateLL® Kinetic Assay.

<sup>a</sup> Concentrations < LOD were replaced by LOD/2 when calculating distributions. LODs ranged from 0.1–0.6 EU/mL for endotoxin and from 0.0125–0.2 ng/mL for glucan.

**Table S2.** Endotoxin and glucan levels in EC products by brand, type, and flavor

Brand	Type	Flavor	Nicotine content	Distribution source	Endotoxin (EU/mL)	Glucan (ng/mL)
A	Cartridge	Tobacco	2.4%	company website	0.326	146.5
A	Cartridge	Menthol	13-16 mg	company website	<0.400 <sup>a</sup>	38.2
A	Cartridge	Others	16 mg	company website	1.64	1450
A	Cartridge	Fruit	13-16 mg	company website	<0.200 <sup>a</sup>	3.3
A	Cartridge	Others	13-16 mg	company website	0.448	3.4
A	Cartridge	Others	13-16 mg	company website	<0.800 <sup>a</sup>	5.4
A	Cartridge	Fruit	2.4%	company website	0.486	3.3
B	Cartridge	Tobacco	2.4%	company website	<0.200 <sup>a</sup>	0.812
B	Cartridge	Menthol	2.4%	company website	<0.200 <sup>a</sup>	1.24
B	E-liquid	Tobacco	2.4%	company website	<0.100 <sup>a</sup>	0.453
B	E-liquid	Menthol	2.4%	company website	<0.100 <sup>a</sup>	0.118
C	Cartridge	Tobacco	4.5%	company website	<0.800 <sup>a</sup>	30.8
C	Cartridge	Tobacco	2.4%	company website	0.114	36.2
C	Cartridge	Menthol	3.0%	company website	0.118	15.5
C	Cartridge	Fruit	18 mg	company website	<0.100 <sup>a</sup>	1.06
C	E-liquid	Tobacco	15 mg/mL	company website	<0.100 <sup>a</sup>	25.6
C	E-liquid	Menthol	15 mg/mL	company website	<0.100 <sup>a</sup>	9.3
C	E-liquid	Fruit	15 mg/mL	company website	<1.60 <sup>a</sup>	0.116
C	E-liquid	Fruit	15 mg/mL	company website	<1.60 <sup>a</sup>	0.0802
C	E-liquid	Fruit	15 mg/mL	company website	<1.60 <sup>a</sup>	0.115
C	E-liquid	Others	15 mg/mL	company website	0.58	0.143
C	E-liquid	Fruit	15 mg/mL	company website	<0.200 <sup>a</sup>	0.106
C	E-liquid	Fruit	15 mg/mL	company website	<0.200 <sup>a</sup>	0.0919
C	E-liquid	Fruit	15 mg/mL	company website	0.893	0.0877
C	E-liquid	Others	15 mg/mL	company website	<0.400 <sup>a</sup>	0.125
C	E-liquid	Tobacco	15 mg/mL	company website	<0.100 <sup>a</sup>	32.3
C	E-liquid	Menthol	15 mg/mL	company website	<0.100 <sup>a</sup>	14.1
C	E-liquid	Fruit	15 mg/mL	company website	<0.100 <sup>a</sup>	0.396
C	E-liquid	Others	15 mg/mL	company website	<0.100 <sup>a</sup>	0.452
C	E-liquid	Fruit	15 mg/mL	company website	<0.100 <sup>a</sup>	0.654
D	Cartridge	Tobacco	2.0%	company website	<0.100 <sup>a</sup>	1.36
D	Cartridge	Menthol	2.0%	company website	<0.100 <sup>a</sup>	1.24
E	Cartridge	Tobacco	1.8%	company website	0.737	16.4
E	Cartridge	Menthol	1.8%	company website	<1.60 <sup>a</sup>	19.9
F	Cartridge	Tobacco	2.4%	company website	<0.100 <sup>a</sup>	0.516
F	Cartridge	Menthol	2.4%	company website	<1.60 <sup>a</sup>	0.367
F	E-liquid	Tobacco	1.8%	company website	0.663	202.8
F	E-liquid	Menthol	1.8%	company website	<0.400 <sup>a</sup>	<0.0125 <sup>a</sup>
F	E-liquid	Others	1.8%	company website	<0.100 <sup>a</sup>	<0.0313 <sup>a</sup>

**Table S2, continued:**

Brand	Type	Flavor	Nicotine content	Distribution source	Endotoxin (EU/mL)	Glucan (ng/mL)
F	E-liquid	Fruit	1.8%	company website	0.363	<0.0313 <sup>a</sup>
F	E-liquid	Fruit	1.8%	company website	<0.100 <sup>a</sup>	<0.0313 <sup>a</sup>
G	Cartridge	Tobacco	4.8%	convenience store	<0.100 <sup>a</sup>	1.6
G	Cartridge	Menthol	4.8%	convenience store	<0.100 <sup>a</sup>	9.73
G	Cartridge	Fruit	4.8%	convenience store	<0.400 <sup>a</sup>	7.6
G	Cartridge	Others	4.8%	convenience store	<0.100 <sup>a</sup>	7.15
G	Cartridge	Others	4.8%	convenience store	<0.100 <sup>a</sup>	6.12
G	Cartridge	Others	4.8%	convenience store	0.33	6.9
H	Cartridge	Tobacco	24 mg	company website	<0.400 <sup>a</sup>	2.2
H	Cartridge	Others	24 mg	company website	0.801	12.3
H	Cartridge	Fruit	24 mg	company website	0.828	12.4
H	Cartridge	Menthol	24 mg	company website	<1.60 <sup>a</sup>	5.73
H	Cartridge	Fruit	18 mg	company website	0.666	13.7
H	Cartridge	Fruit	18 mg	company website	0.646	13.6
I	Cartridge	Tobacco	2.4%	company website	<0.100 <sup>a</sup>	0.676
I	Cartridge	Menthol	2.4%	company website	<0.100 <sup>a</sup>	0.712
I	E-liquid	Tobacco	2.4%	company website	<0.100 <sup>a</sup>	0.033
I	E-liquid	Menthol	2.4%	company website	<0.100 <sup>a</sup>	<0.05 <sup>a</sup>
I	E-liquid	Others	2.4%	company website	<0.100 <sup>a</sup>	0.128
I	E-liquid	Fruit	2.4%	company website	<1.60 <sup>a</sup>	0.029
I	E-liquid	Fruit	2.4%	company website	<0.100 <sup>a</sup>	<0.05 <sup>a</sup>
I	E-liquid	Others	1.8%	company website	<0.100 <sup>a</sup>	<0.200 <sup>a</sup>
I	E-liquid	Fruit	2.4%	company website	<0.400 <sup>a</sup>	<0.025 <sup>a</sup>
I	E-liquid	Fruit	2.4%	company website	<0.100 <sup>a</sup>	55
I	E-liquid	Fruit	1.8%	company website	<0.100 <sup>a</sup>	<0.025 <sup>a</sup>
I	E-liquid	Fruit	2.4%	company website	0.522	113.4
I	E-liquid	Fruit	1.8%	company website	<0.100 <sup>a</sup>	0.875
I	E-liquid	Fruit	1.8%	company website	<0.100 <sup>a</sup>	<0.100 <sup>a</sup>
I	E-liquid	Fruit	2.4%	company website	<0.100 <sup>a</sup>	<0.025 <sup>a</sup>
I	E-liquid	Fruit	2.4%	company website	<0.100 <sup>a</sup>	<0.025 <sup>a</sup>
I	E-liquid	Fruit	2.4%	company website	<0.100 <sup>a</sup>	<0.025 <sup>a</sup>
I	E-liquid	Fruit	2.4%	company website	<0.100 <sup>a</sup>	<0.025 <sup>a</sup>
J	Cartridge	Tobacco	2.4%	company website	<0.400 <sup>a</sup>	25.3
J	Cartridge	Menthol	2.4%	company website	<0.100 <sup>a</sup>	19.6
J	Cartridge	Others	2.4%	company website	<0.100 <sup>a</sup>	16.7
J	Cartridge	Others	2.4%	company website	<0.100 <sup>a</sup>	23.9

<sup>a</sup> Sample levels below LOD; LODs ranged from 0.1 to 1.6 EU/mL for endotoxin and from 0.0125 to 0.2 ng/mL for glucan.

**Figure S1.** EC products selection

