

Is the FCTC tenable for non-standard tobacco products? The case of the waterpipe.

Alan Shihadeh
American University of Beirut

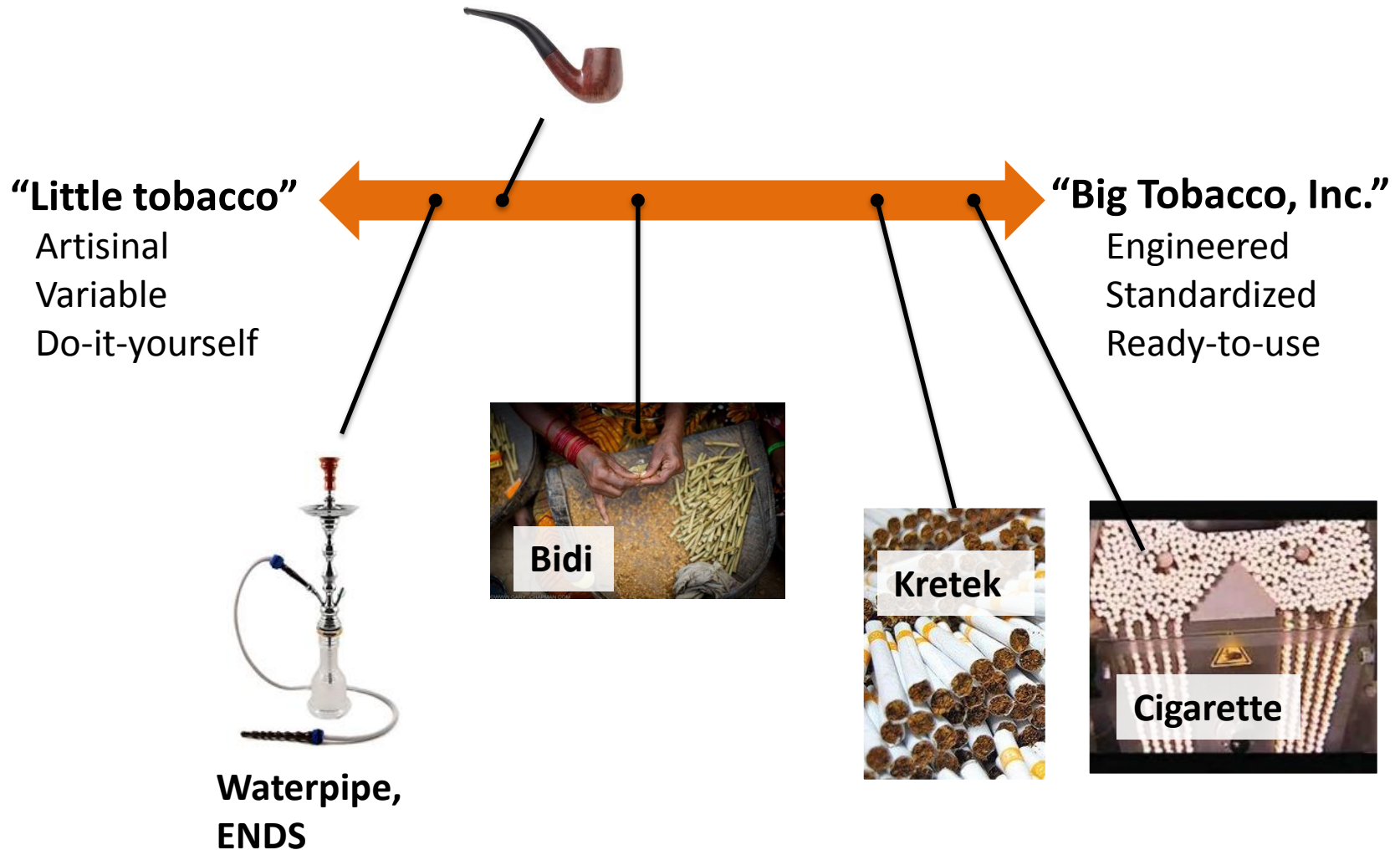
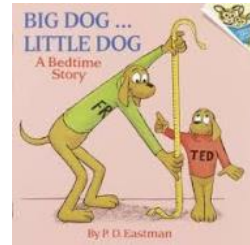
Waterpipe Tobacco Smoking Regulatory Challenges
AUB Nov 6-7, 2018



Rene Magritte (1898-1967)



Little Tobacco - Big Tobacco continuum



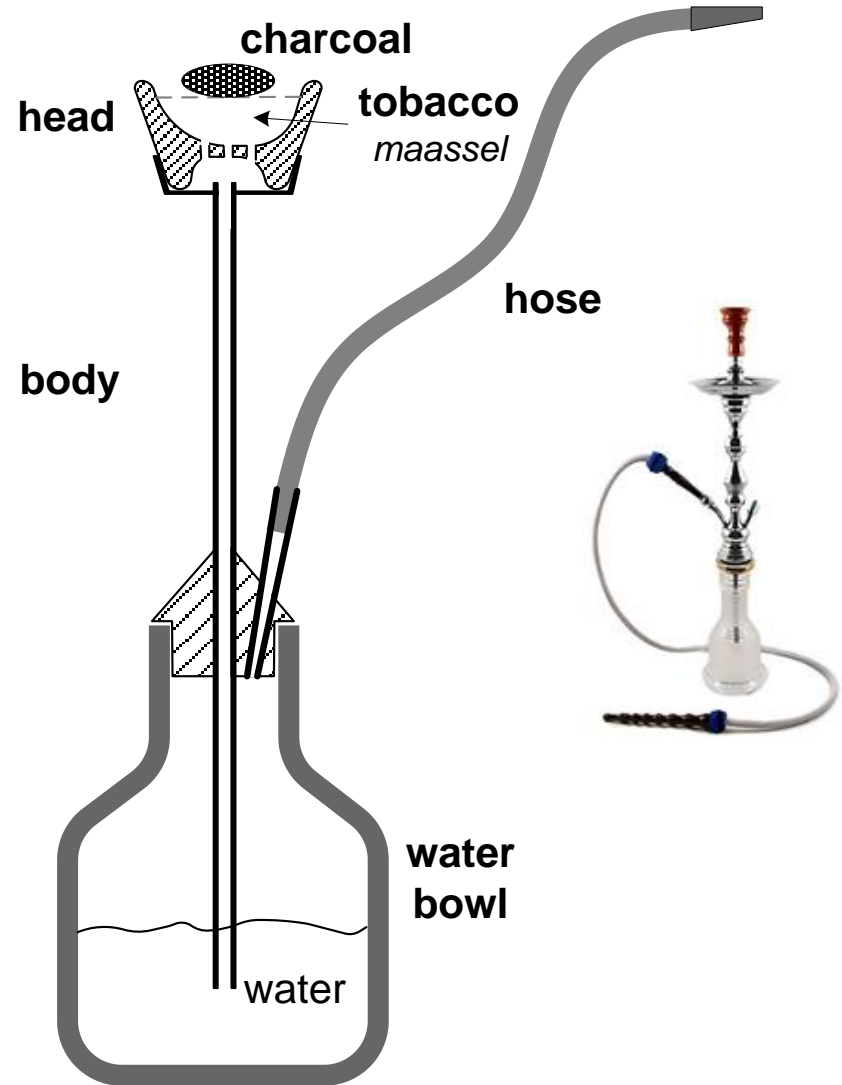
Waterpipe characteristics

Heavily flavored, high glycerol content
“maassel”

tobacco burn not self-sustaining →
charcoal needed

long flow path with bubbler/humidifier
makes a cool, humid aerosol

order of magnitude higher puff velocity &
volume (200 ml/s, 500 ml)



Preparing a waterpipe involves using these items



Metal foil sheet

Hose



Charcoal



Maassel



FCTC Articles 9 & 10

Article 9

Regulation of the contents of tobacco products

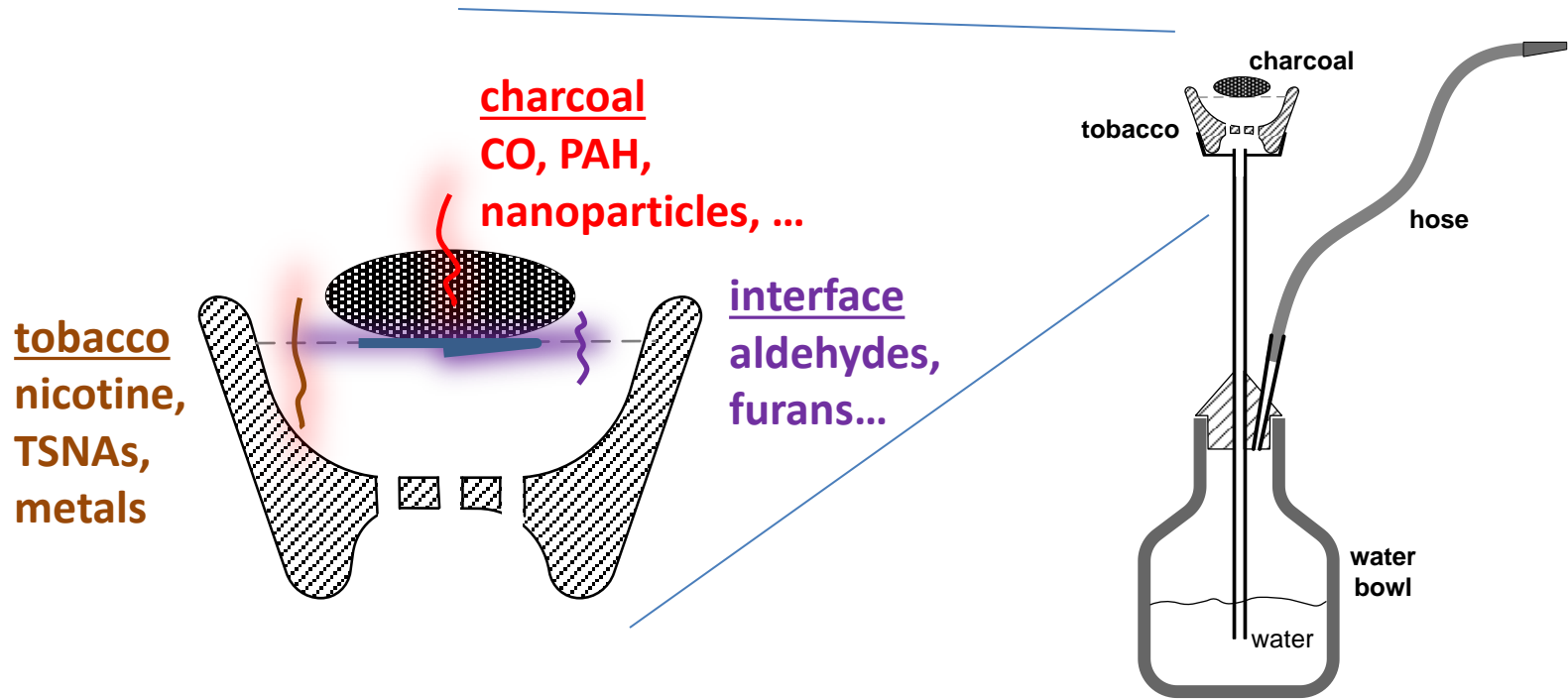
“The COP...shall propose guidelines for testing and measuring the contents and emissions of tobacco products, and for the regulation of these...”

Article 10

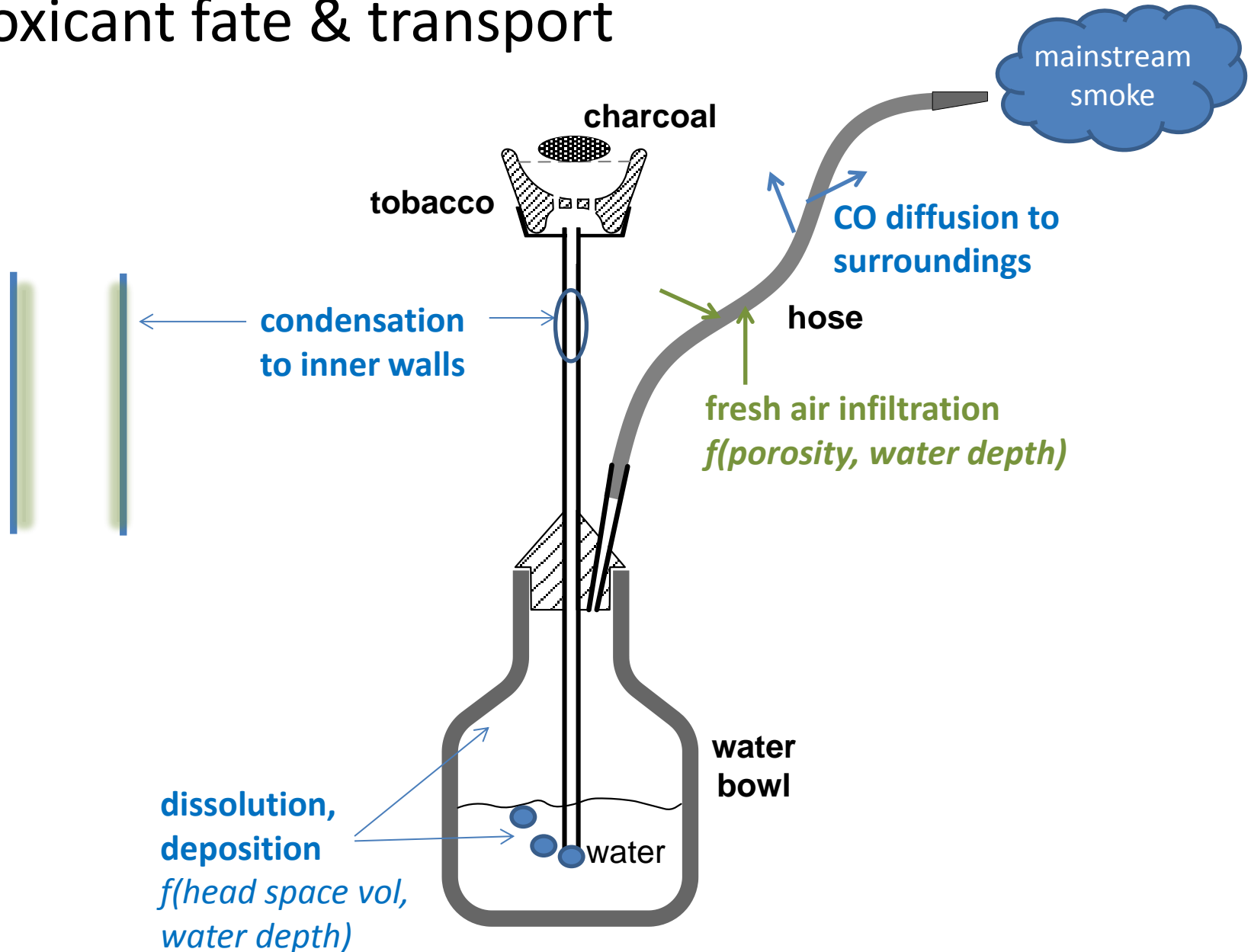
Regulation of tobacco product disclosures

“Each Party shall...require manufacturers of tobacco products to disclose...information about the contents and emissions of tobacco products...”

Toxicant emission sources



Toxicant fate & transport



Waterpipe smoke toxicants (MS yields/unit)



How important is the tobacco for toxicant emissions?

“Provides the same flavorful smoke found in other shisha but without the harmful effects of tobacco” www.texashooka.com



SoeX Lebanon
SoeX is the World's First Herbal Hookah
Molasses and the tastiest

Molasses
Free of:
Nicotine 0%
Tobacco 0%
Tar 0%

Home Page



About SoeX



Flavors



Clients



Companies

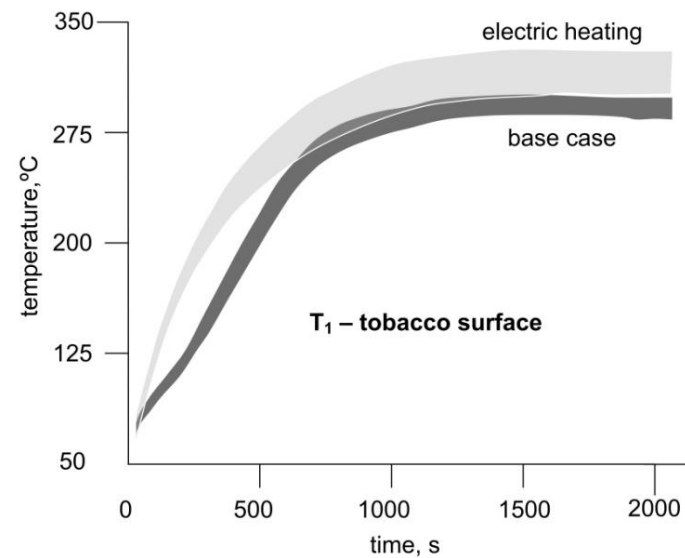
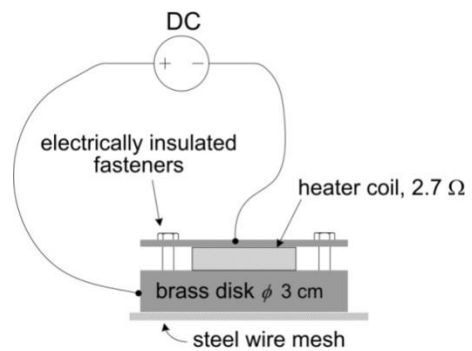
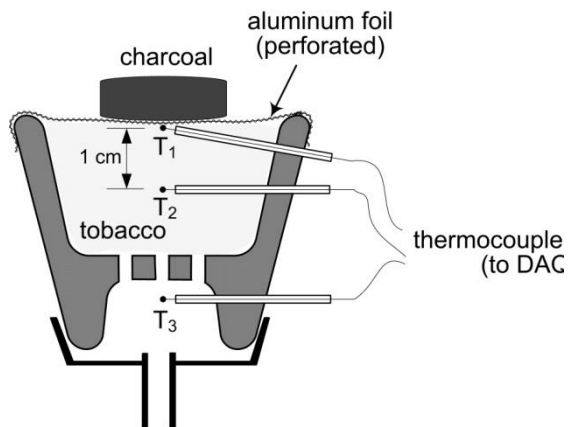


Except for nicotine, toxicant profiles of tobacco and tobacco-free toxicant yields are the same

Toxicant yield mean±95% CI	Product type (mean ± 95% CI)		<i>p</i>
	Tobacco	Non-tobacco	
Nicotine, mg	1.04 ± 0.30	< 0.01	< 0.001
Carbon monoxide, mg	155 ± 49	159 ± 42	n.s.
Nitric oxide, µg	437 ± 207	386 ± 116	n.s.
Tar, mg	464 ± 159	513 ± 115	n.s.
TPM, mg	770 ± 228	855 ± 192	n.s.
Carcinogenic PAH, ng			
Benz (a)anthracene	86.4 ± 15.2	113 ± 46	n.s.
Chrysene	106 ± 16	124 ± 36	n.s.
Benzo(b+k)fluoranthenes	64.7 ± 11.3	72.9 ± 12.6	n.s.
Benzo(a)pyrene	51.8 ± 12.9	66.1 ± 17.8	n.s.
Indeno(1,2,3-cd)pyrene	47.3 ± 10.7	44.3 ± 10.4	n.s.
Volatile aldehydes, µg			
Formaldehyde	58.7 ± 21.6	117.6 ± 78.7	n.s.
Acetaldehyde	383 ± 121	566 ± 370	n.s.
Acetone	118 ± 36	163 ± 68	n.s.
Propionaldehyde	51.7 ± 15.3	98.4 ± 65.0	n.s.
Methacrolein	12.2 ± 4.4	20.4 ± 9.7	n.s.



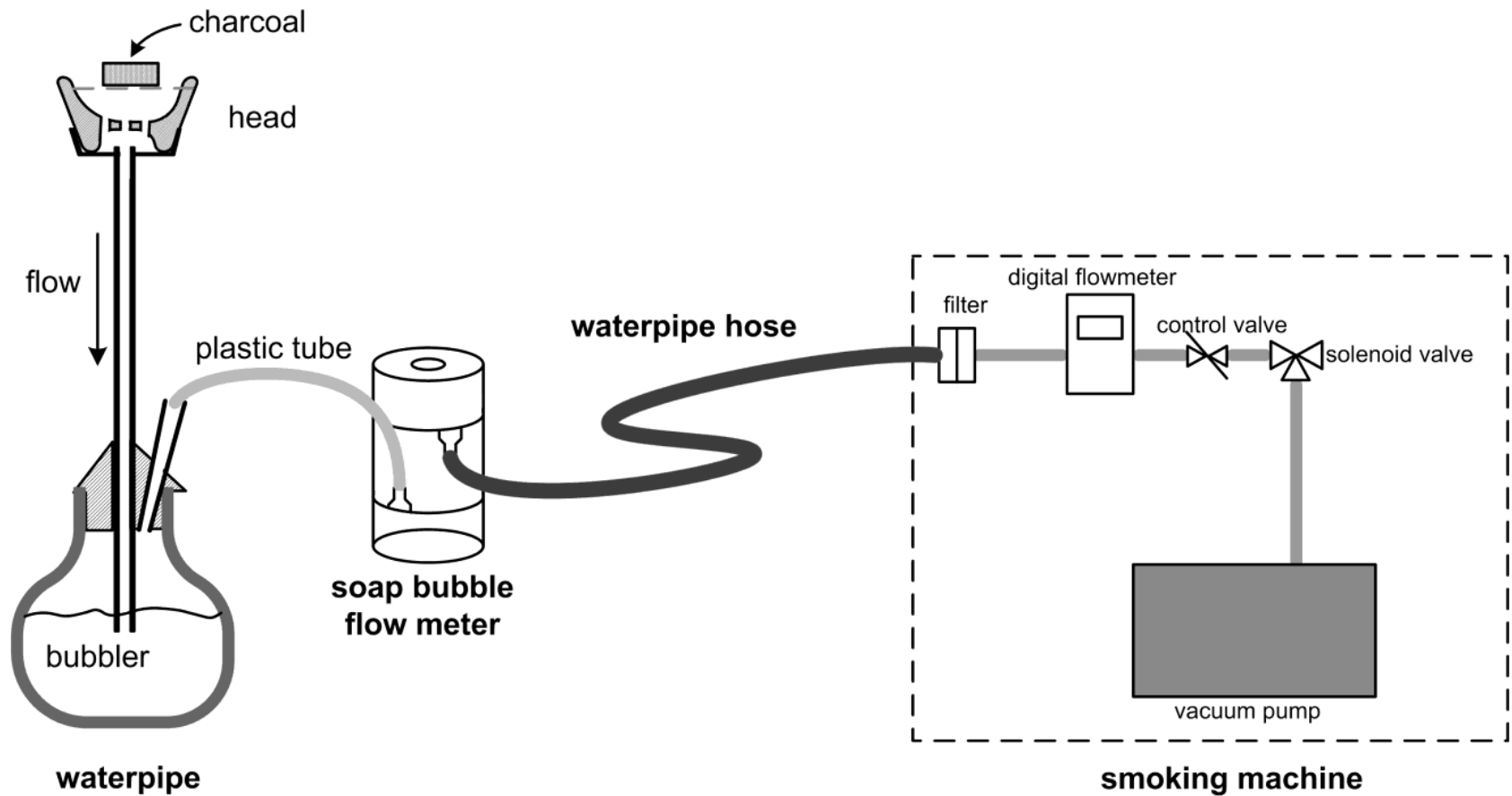
CHARCOAL



HOSE



Infiltration rate measurement setup



Infiltration rate varies widely across and within hose types

Test	Hose	Material	Length (cm)	Outer dia. (cm)	Infiltration rate (SLPM)
1	A1	Leather	158	1.5	3.3
2	A2	Leather	162	1.5	3.8
3	B1	Leather	142	1.5	1.5
4	B2	Leather	142	1.5	1.4
5	B3	Leather	144	1.5	2.1
6	B4	Leather	143	1.5	3.3
7	B5	Leather	145	1.5	1.2
8	C1	Leather	131	1.2	1.3
9	C2	Leather	134	1.2	2.5
10	D1	Leather	129	1.3	0.9
11	D2	Leather	130	1.3	1.2
12	E1	Leather	116	1.3	2.7
13	E2	Leather	113	1.3	2.4
14	F	Plastic	130	1.4	0
15	G	Plastic	190	1.2	0
16	H1	Plastic	134	1.1	0
17	H2	Plastic	134	1.1	0
18	I1	Plastic	175	1.2	0.8
19	I2	Plastic	177	1.2	1.1
20	J1	Plastic	182	1.3	0
21	J2	Plastic	181	1.2	0
22	K1	Plastic	191	1.5	0
23	K2	Plastic	191	1.5	0

Infiltration affects toxicant yield

	Current study		yield ratio
	leather	plastic	
Infiltration rate, SLPM	3.8	0	--
Tobacco consumed, g	3.6	5.1	1.2*
TPM, mg/session	1180	2860	2.4*
CO, mg/session	99	242	2.4*
nicotine, mg/session	6.06	5.23	0.9
CO:nicotine	16.3	46.3	2.8*

- More air infiltration means less smoke drawn through head
- CO is capable of diffusing out of the hose during puffing

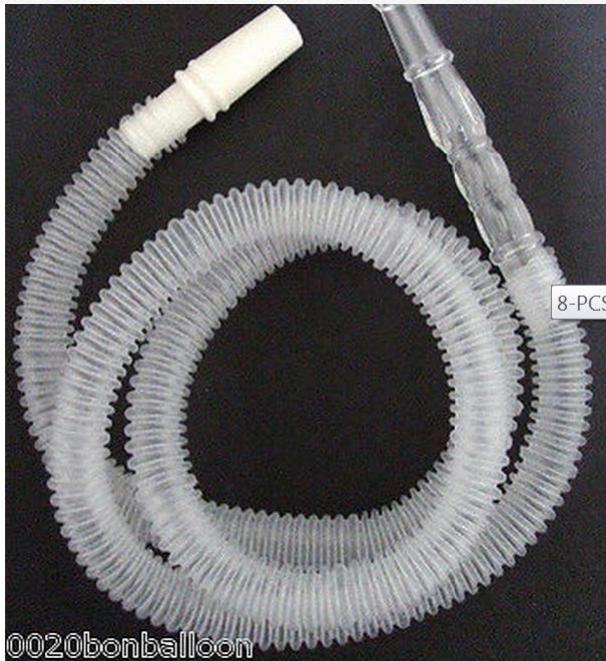
"Healthy Hose"

althy-medical-Washable-Hookah-Shisha-Nargila-Plastic-Hose-/181074765258

> [Hookahs](#)

about private listings.

8 PCS Disposable Healthy medical Washable Hookah Shisha Nargila Plastic Hose



8-PCS-Disp

0020bonballoon



**Healthy Hookah Hose
(New Al Fakher Accessory)**

\$2.95

Add To Cart

The "Al Fakher Healthy Hookah Hose" is one of Al Fakher's newest products. The Healthy Hookah hose is produced from high quality plastic and guarantees the natural flavors taste of Al Fakher.

Review

- Toxicant emissions are a function of product combinations.
- Who of these manufacturers is responsible for the emissions?



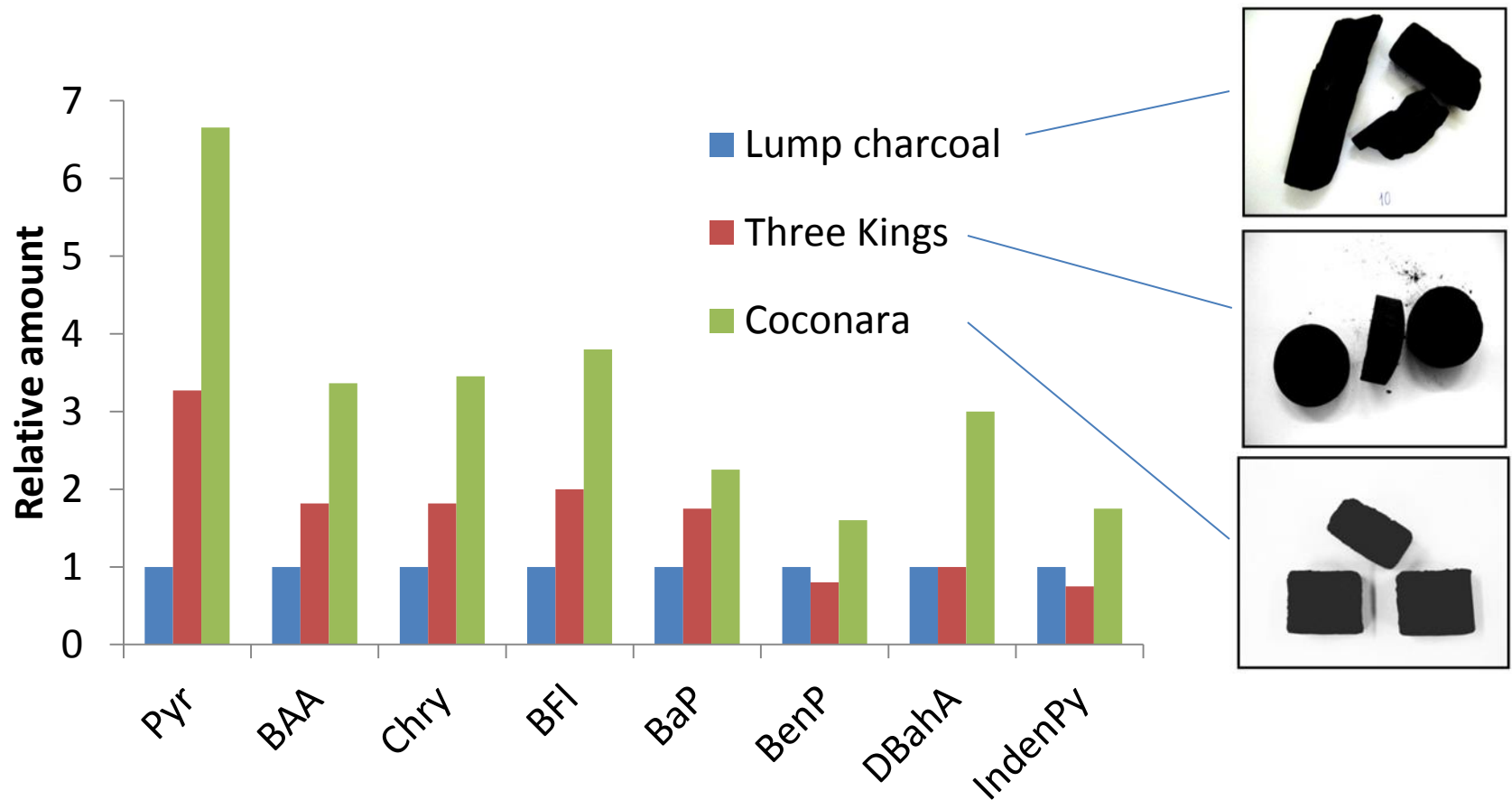
Ways forward (short term)

- Shift approach. For “little tobacco”, focus on the design and content of the principle components (and potential interactions) rather than emissions from the total smoked unit.



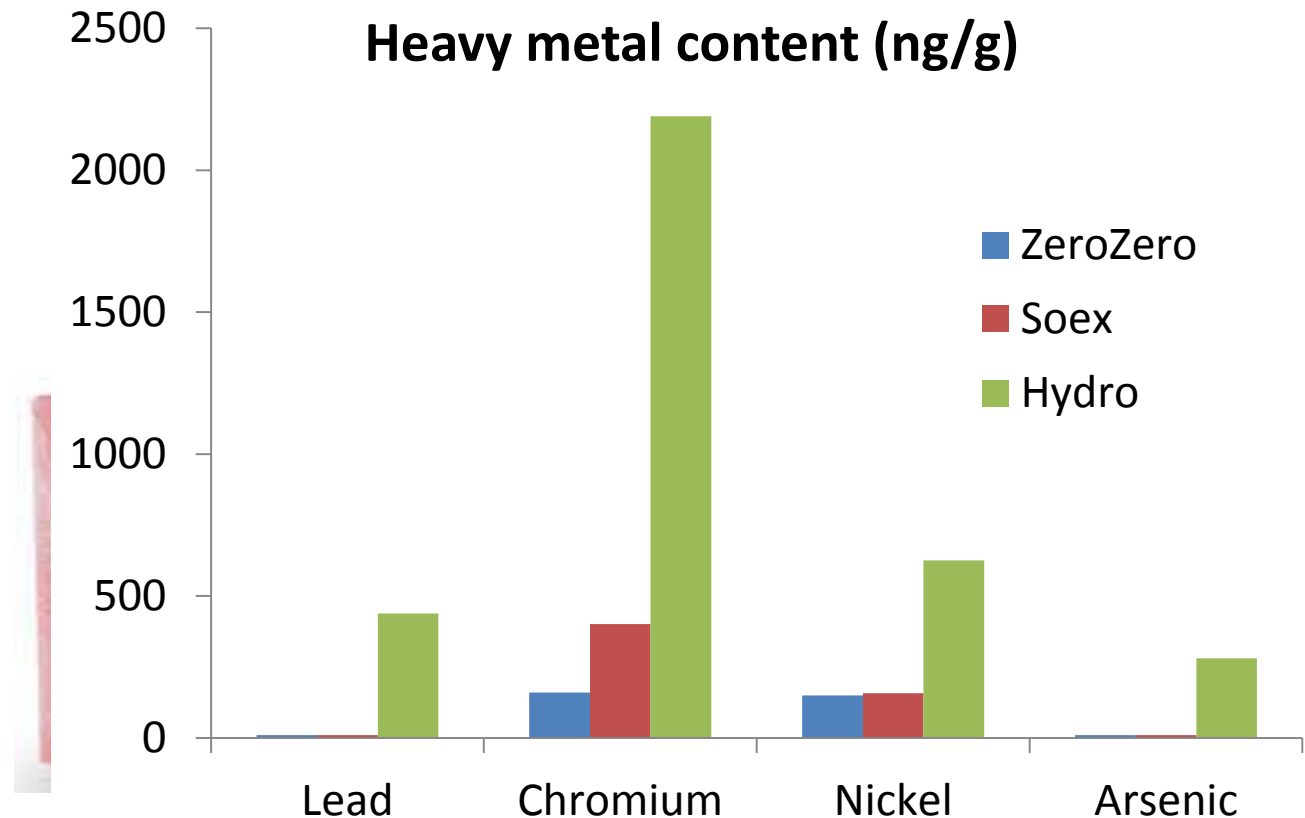
- Short term: limits on contaminants (e.g. metals in maassel, PAH in charcoal), ban unproven health claims.

PAH content of charcoal varies widely by product



Waterpipe *maassel* ingredients and contaminants vary systematically across products

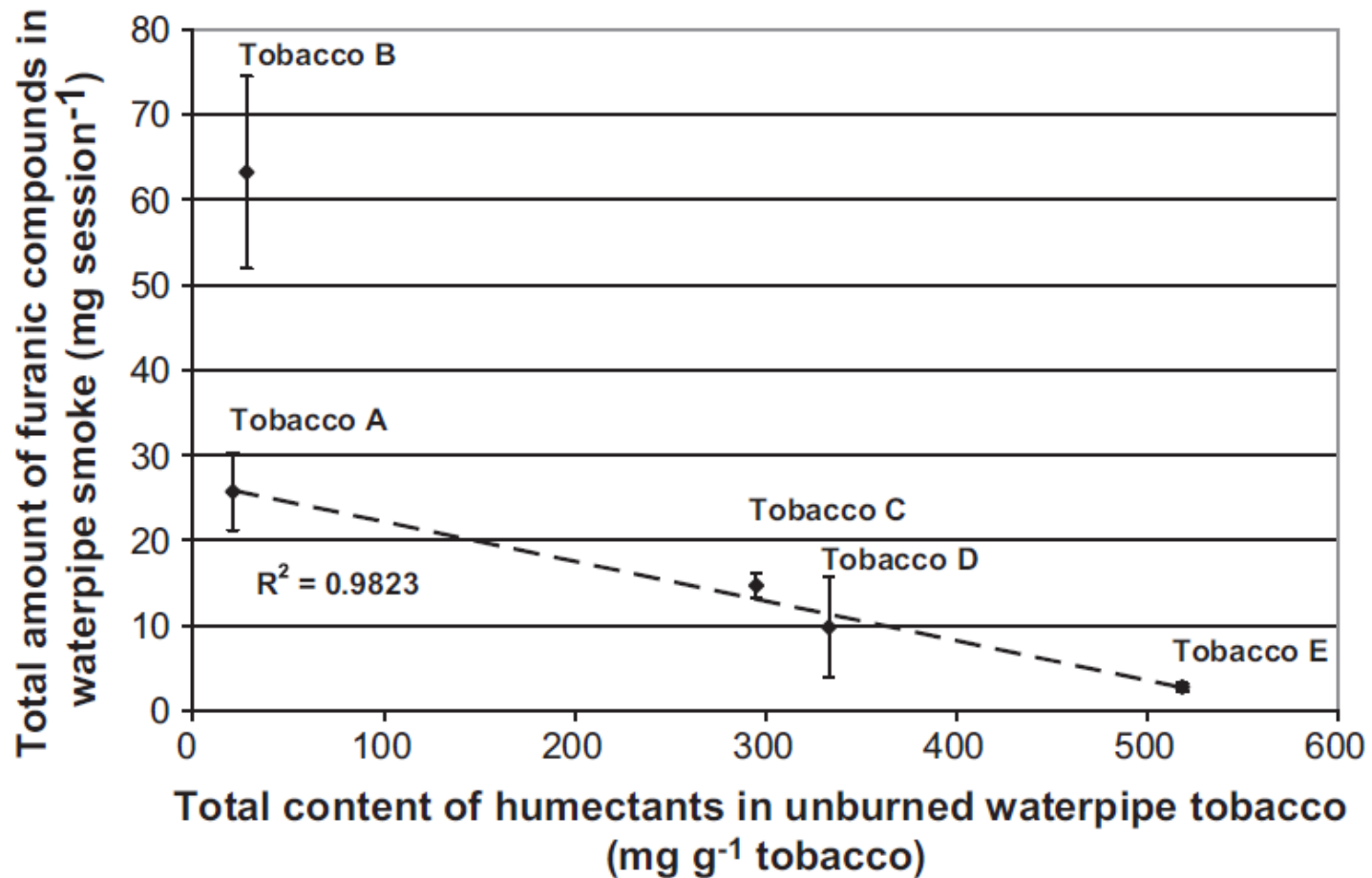
- Humectant fraction (5-60% wt)
- Tobacco fraction (0-90% wt)
- Flavor agents
- Heavy metals
- Nicotine



Ways forward (longer term)

- Ingredients/additives, hardware (e.g. hose infiltration)
- More research needed to establish relationships between toxicant exposure and ingredients & hardware.

E.g. humectant content and furan yield vary across products



Acknowledgments

- Dr. Thomas Eissenberg (VCU Department of Psychology)
- Dr. Najat Saliba (AUB Department of Chemistry)
- AUB and VCU students and staff
- US National Institutes of Health and US Food and Drug Administration, Research for International Tobacco Control (IDRC), AUB University Research Board
-

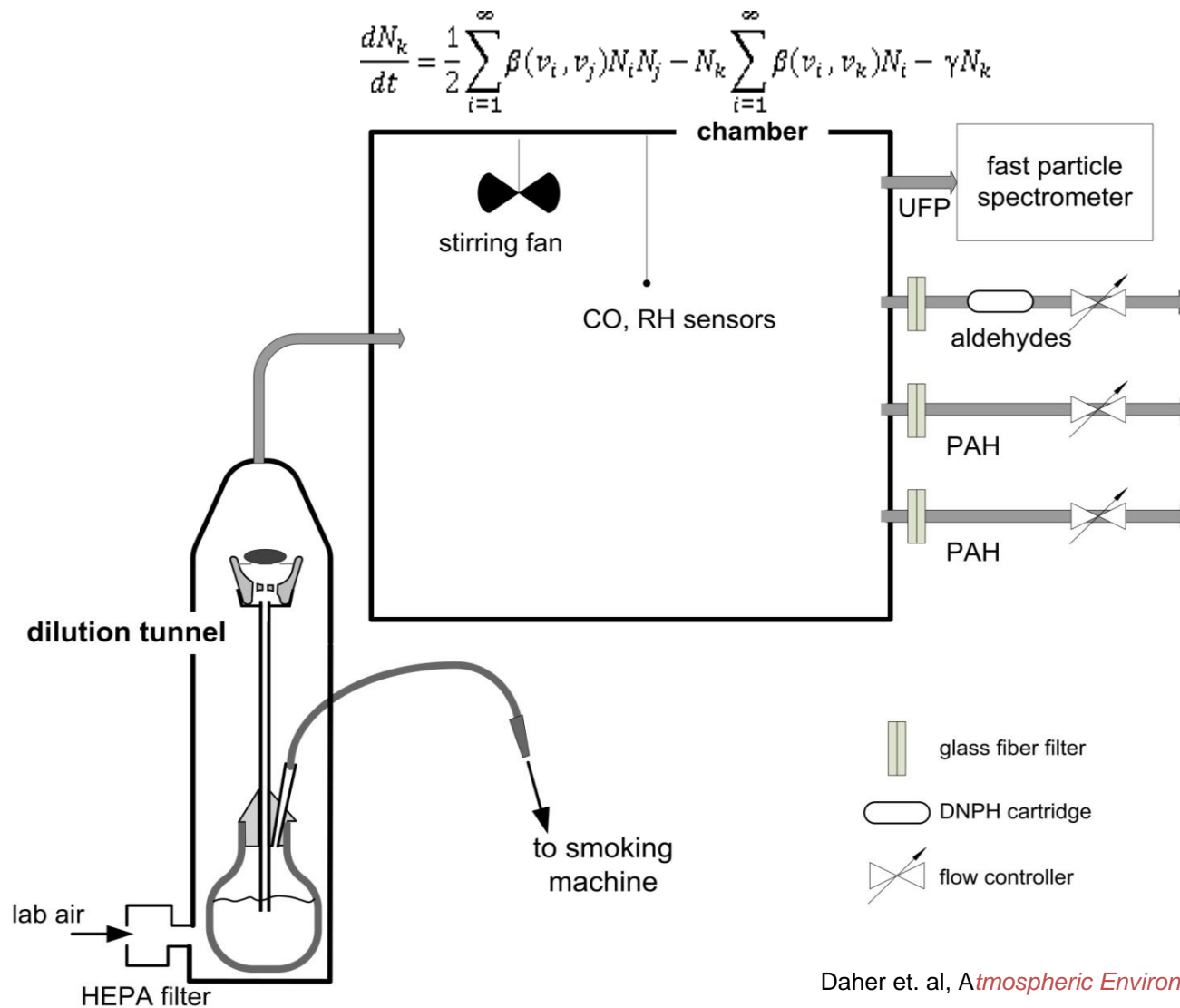
Thanks for your attention!



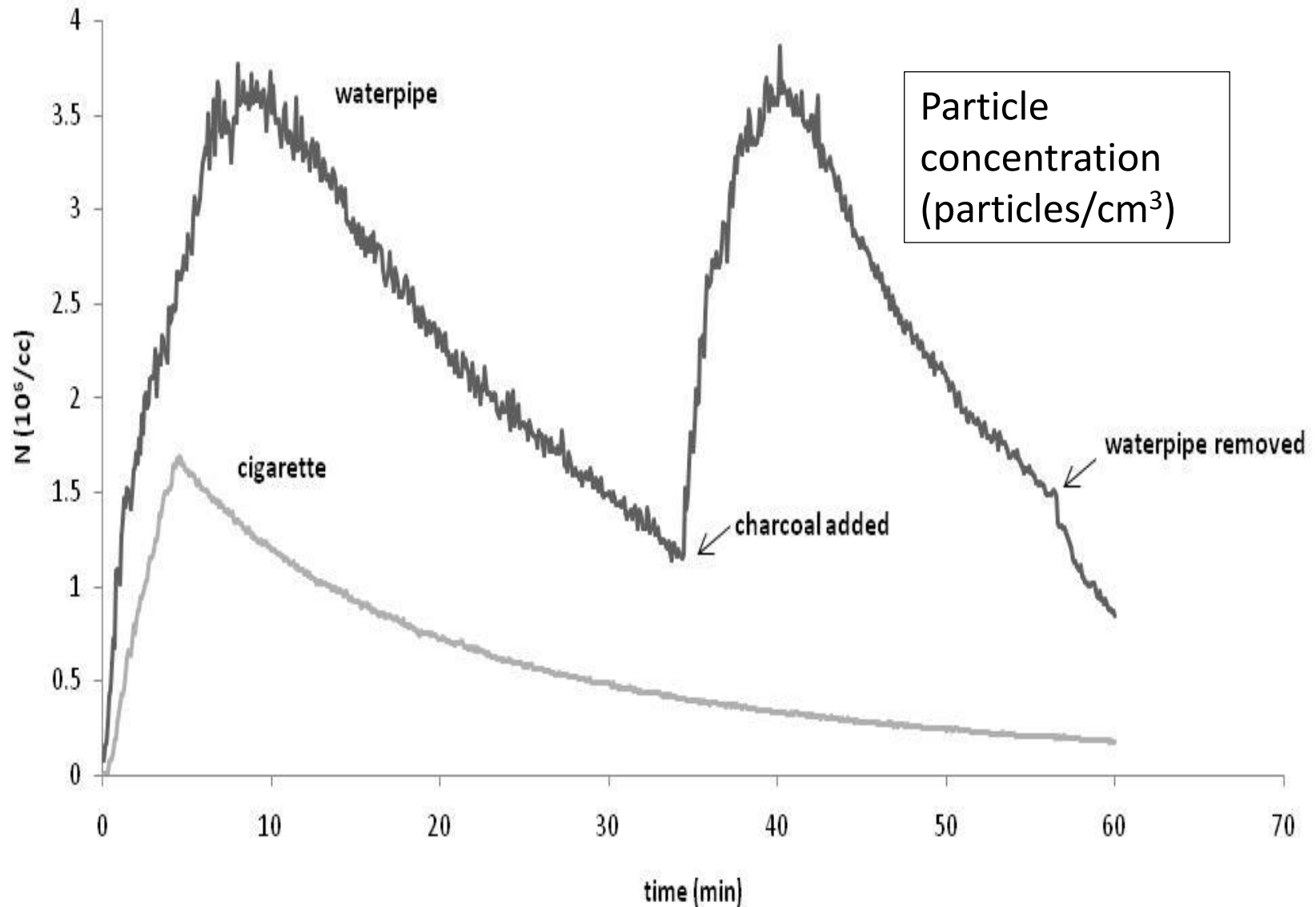
Do waterpipe *smoking* emit toxicants?

- chamber based studies
- observational studies of cafés

Chamber study



Waterpipe emits more nanoparticles



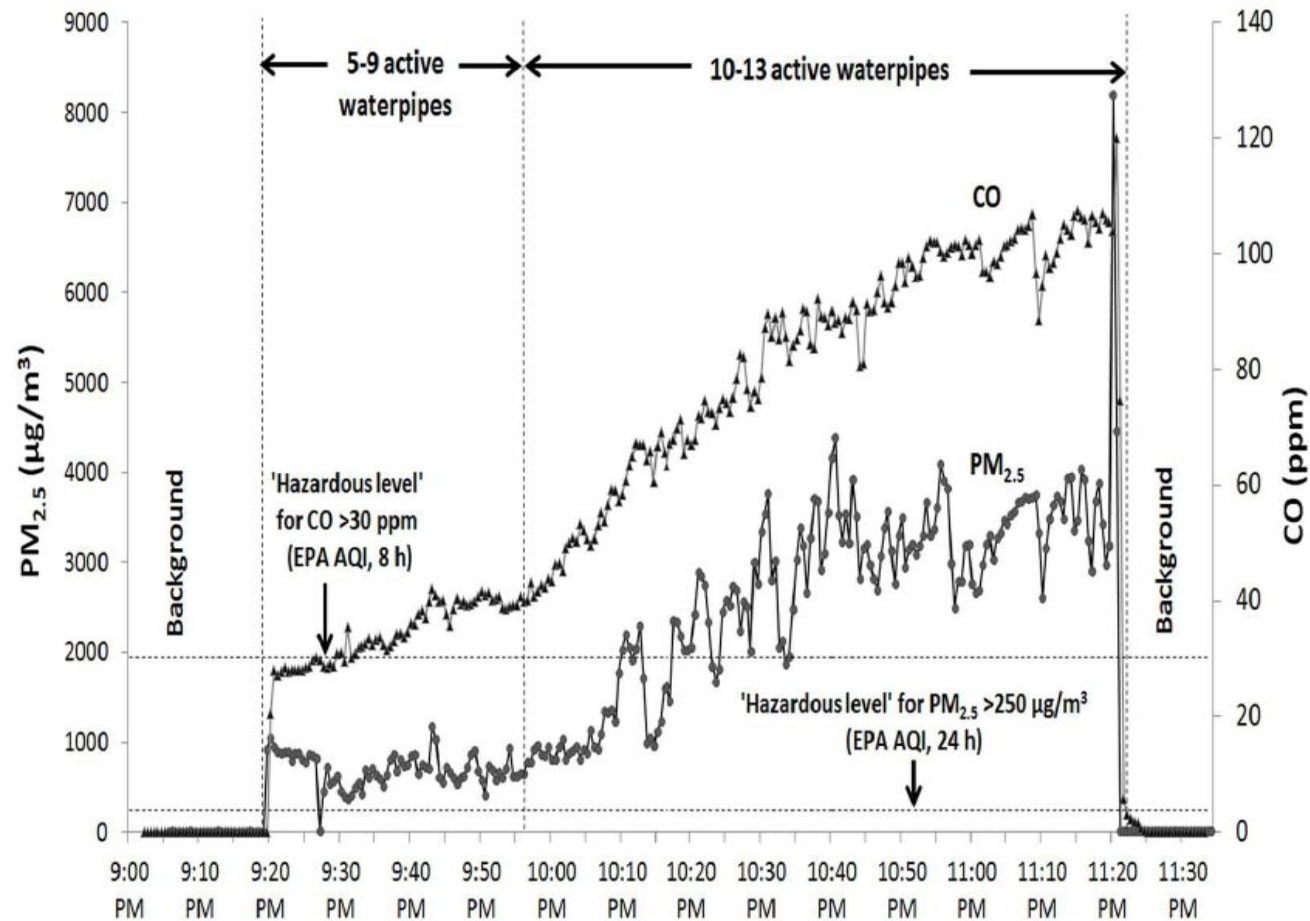
WP emits more of everything measured

mean±95% CI	<i>waterpipe SS</i>	<i>cigarette SS</i>
	<i>N = 12</i>	<i>N=9</i>
Carbon monoxide, mg	2269 ± 108	65.5 ± 5.5
PAH, ng	<i>N = 11</i>	<i>N = 3</i>
<i>Total PAH</i>	1193 ± 226	305 ± 49
Particle number emissions	<i>N = 4</i>	<i>N = 4</i>
ultrafine particles 5.6-99.5 nm, /10 ¹²	3.99 ± 0.60	0.639 ± 0.188
total particles 5.6-560 nm, /10 ¹²	4.38 ± 0.66	1.68 ± 0.27
count median diameter, nm	37.9 ± 4.1	130 ± 8
Volatile aldehydes, ug	<i>N = 6</i>	<i>N = 5</i>
<i>Total aldehydes</i>	12000 ± 1610	2954 ± 416

What about per smoker-hour?

Observational studies in WP cafés

Zhang et al., 2013



PAH “finger print” of unburned charcoal and of collected smoke particles are the same

