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Supplementary Information

Brominated Flame Retardants in Children's Room: Concentration, Composition, and Health Risk Assessment

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Table S1. Important parameters collected on the questionnaire during sample collection.

Parameters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	2	16	1	4-6	AC	W	12h	D	N	Y	90%	10%	60%	20%	0%	20%	0%	0%	N	E
2	1	20	1	12	AC	W	15h	D	Y	Y	100%	0%	85%	5%	5%	5%	0%	0%	R, A	E
3	1	16	1	10	AC/W	S	12h	ID	Y	Y	90%	10%	70%	5%	5%	0%	10%	0%	N	E
4	5	16	2	7-11	AC	W	12h	D	Y	N	60%	40%	30%	30%	40%	0%	0%	0%	N	E
5	2	12	2	2-6	AC	W	10h	D	N	Y	80%	20%	60%	10%	10%	10%	10%	0%	N	E
6	2	20	2	8-6	AC	W	16h	D	N	Y	80%	20%	50%	20%	5%	10%	0%	15%	N	E
7	3	12	3	7-9-11	AC/W	W	14h	ID	N	Y	100%	0%	0%	0%	0%	0%	100%	0%	R	NE
8	4	16	2	3-6	AC	W	6h	ID	Y	N	90%	10%	50%	5%	10%	30%	0%	5%	N	E
9	2	15.8	2	5-7	AC	W	16h	ID	N	Y	100%	0%	80%	5%	0%	10%	2%	3%	A	E
10	2	24	4	6-10-11-13	AC	S	15h	D	N	Y	50%	50%	64%	4%	0%	30%	1%	1%	A, S	E
11	4	12	1	5	AC	S	10h	D	N	N	80%	20%	20%	50%	1%	28%	0%	1%	N	MTE
12	2	24	2	4-2	AC	S	24h	D	N	N	70%	30%	40%	30%	0%	30%	0%	0%	A	E
13	2	12	2	9-6	AC	W	5h	ID	Y	Y	50%	50%	80%	0%	0%	20%	0%	0%	N	E
14	2	16	1	5	AC	W	10h	D	N	N	90%	10%	10%	20%	5%	40%	5%	20%	N	E
15	3	12	4	4-5-7-9	AC	W	12h	D	Y	Y	50%	50%	60%	5%	10%	10%	5%	10%	N	E
16	3	16	2	8-12	AC	W	12h	ID	N	N	0%	0%	0%	0%	0%	0%	100%	0%	N	E
17	7	16	2	5-8	AC	W	15h	ID	N	N	100%	0%	80%	5%	0%	10%	2%	3%	N	E
18	3	15.8	3	5-7-9	AC	W	16h	D	N	Y	90%	10%	10%	20%	5%	40%	5%	20%	N	E
19	4	32	1	6	AC	S	14h	ID	Y	Y	5%	95%	60%	20%	5%	20%	1%	0%	N	E
20	2	16	2	4-6	AC	W	10h	D	N	N	30%	70%	80%	5%	0%	15%	0%	0%	N	E
21	3	12.3	4	4-6-8-10	AC	W	12	D	Y	N	30%	70%	40%	0%	0%	50%	0%	10%	N	E
22	3	13.4	2	2-4	AC	W	6h	D	Y	N	70%	30%	50%	0%	20%	30%	0%	0%	R	E
23	4	16	2	4-6	AC	W	10h	ID	N	Y	60%	40%	70%	5%	0%	25%	0%	0%	N	E
24	7	28	3	3-3-6	AC	S	8h	D	Y	Y	80%	20%	40%	35%	10%	5%	5%	5%	A	E
25	3	12	3	12-7-3	AC	W	16h	D	Y	Y	70%	30%	20%	15%	5%	40%	10%	10%	N	E
26	7	16	1	7	AC	C	14h	ID	Y	N	100%	0%	20%	0%	20%	60%	0%	0%	A	E
27	4	13	3	7	AC	C	10h	D	Y	N	95%	5%							R	E
28	3	16	2	8-10	AC/W	W	10h	D	N	N	70%	30%	40%	30%	0%	30%	0%	0%	A	E
29	3	13.4	2	5-9	AC	W	12h	ID	Y	Y	90%	10%	10%	20%	5%	40%	5%	20%	N	E
30	3	16	3	6-8-12	AC	W	15h	D	N	Y	70%	30%	50%	0%	20%	30%	0%	0%	N	E

A- Number of dusting per week; B- Size of room (m3); C- Number of kids sharing room; D- Age of kids sharing a room (years); E- Room ventilation (Air conditioning (AC), window (W)); F- AC type (window (W), split (S), centralized (C)); G- AC turned on the day (hours (h)); H- Cross ventilation with outside (Direct (D), indirect (ID)); I- Furniture with upholstery foam (no (N), yes (Y)); J- PC, TV, and other electronics (no (N), yes (Y)); K- Toys (older than one year) % of the total toys; L- Toys (new) % of the whole toys; M- Hard plastic toys; N- Soft plastic toys; O- Wooden toys; P- Stuff toys; Q- Electronic toys; R- Others; S- Any health issues such as respiratory (R), allergy (A), skin problems (S), and late learning (LL) etc., among children on consistent bases; T- Family resourcefulness (income) (not enough (NE), enough (E), more than enough (MTE)).

Table S2. Comparing median levels of BFRs data from different countries for indoor dust (ng/g) and indoor air (pg/m^3).

Country	Sampling site	BDE 28	BDE 47	BDE 99	BDE 100	BDE 153	BDE 183	BDE 209	TBB	TBPH	BTBPE
					Indoor Dust						
Romania[1]	Homes (n=47)	0.10	2	0.70	0.30	0.80	0	275	<dl	10	4
Sweden[2]	Homes (n=27)	0.99	21	17	2.6	1.9	0	310	2.6	61	6.3
Portugal[3]	Homes (n=28)	<0.2	5.7	6.3	1.2	0.75	2.4	270			1.2
Germany[4]	Homes (n=20)	0.1	5.7	9.2	1.6	2.1	9.3	950	<dl	343	<dl
Norway[5]	Homes (n=48)	0.688	126	171	33	26	3.22	325	2.54	79	3.76
Poland[6]	Homes (n=12)	3.8	5.4	1.4	<dl	<dl	3.9	219			
Turkey[7]	Homes (n=4)	0.12	62	34	2.4	26	21	574	184	0.13	108
Spain[8]	Homes (n=5)	<dl	7.3	5.9	<dl	7.9	33.4	3526			
USA[9]	Pre-school (n=39)	<dl	769	1031	212	125	17	1443			
[10]USA	Homes (n=30)	0.77	452	741	99	41	1.0	1720			
[11]USA	Homes (n=59)								337	186	22.3
Australia[12]	Schools (n=28)	1	40	91	0	12	4.7	217			
South Korea[13]	Schools (n=24)	2.8[a]	222[a]	216[a]	68[a]	30[a]	18[a]	4195[a]			
	Academies (15)	7.6[a]	46[a]	42[a]	6.9[a]	33[a]	237[a]	6267[a]			
	Homes (n=12)	0.8[a]	3.2[a]	14[a]	0.8[a]	219[a]	26[a]	4354[a]			
China[14]	Homes (n=23)	38	102	75	85	11	78	975			
Japan[15]	Schools (n=18)	2.54	8.9	7.89	1.63	2.82	13.2	995			
	Homes (n=10)	0.64	5.65	6.11	1.3	15	71	1429			
Taiwan[16]	Urban school (n=6)	0.14	2.87	5.66	0.99	2.59	8.25	263			
Pakistan[17]	Homes (n=15)	<0.1	1.3	1.7	0.3	0.6	1.5	140	0.4	5.8	15
Kuwait[17]	Home (n=15)	0.4	9.5	12	2.3	2.4	1.9	310	6.6	54	6.8
Egypt[18]	Homes (n=17)	0.34	1.69	2.7	0.37	6.26	1.05	40	0.81	0.12	0.24
Iraq[19]	Homes (n=18)	<dl	3.6	6.67	0.6	0.61	7.5	612	5.3	64	14
Saudi Arabia[20]	Homes (n=15)	<dl	27	35	5	4	4	275	16	25	5
Current study	Children rooms (n=30)	<dl	2	<dl	<dl	<dl	<dl	3150	3	7	2
					Indoor Air						
Kuwait[21]	Home (n=46)	0.4	3.6	2.4	0.5	0.2	0.2				
USA[22]	Home LR (n=20)	25	145	60	12	3.5	94				
Sweden [23]	Apartment (n=44)	2.2	11	2.7		0.74	1.3	24			
	Day care centers (n=10)	3.4	110	26		1.2	6.6	1100			
China[24]	Home (n=60)	3.21	35	14	9.66	10	4.5	97			
Norway[25]	Home (n=47)	7.53	128	21	6.78	0.927	<dl	3.76	<dl	<dl	<dl
South Korea[13]	Schools (n=54)	5[a]	399[a]	279[a]	135[a]	8[a]	15[a]	208[a]			
	Academies (31)	2[a]	17[a]	6[a]	2[a]	11[a]	3[a]	148[a]			
	Homes (n=12)	4[a]	33[a]	18[a]	6[a]	11[a]	4[a]	412[a]			
Taiwan[25]	Home (n=3)	7.8[a]	4.97[a]	0.74[a]	0.14[a]	0.66[a]	1.00[a]	57[a]			

a= Mean value; <dl = Detection limit.

Table S3. Different exposure scenarios of estimated daily exposure *via* indoor dust ingestion (ng/kg/bw/day) and PM10 (pg/kg/bw/day) to BFRs for Saudi young children from their rooms.

Analytes	RfD	Low dust intake						High dust intake						Air Inhalation					
		12 kg BW		25 kg BW		40 kg BW		12 kg BW		25 kg BW		40 kg BW		12 kg BW		25 kg BW		40 kg BW	
		90th %ile	Mean	90th %ile	Mean	90th %ile	Mean	90th %ile	Mean	90th %ile	Mean	90th %ile	Mean	90th %ile	Mean	90th %ile	Mean	90th %ile	Mean
BDE 28	100	0.21	0.07	0.10	0.03	0.06	0.02	0.83	0.29	0.40	0.14	0.25	0.09	0.03	0.00	0.02	0.01	0.02	0.01
BDE 47	100	0.33	0.28	0.16	0.13	0.10	0.08	1.31	1.10	0.63	0.53	0.39	0.33	0.00	0.00	0.04	0.03	0.03	0.03

BDE100	100	0.04	0.08	0.02	0.04	0.01	0.02	0.16	0.33	0.08	0.16	0.05	0.10	0.00	0.00	0.00	0.01	0.00	0.01
BDE 99	100	0.94	0.61	0.45	0.29	0.28	0.18	3.74	2.45	1.80	1.18	1.12	0.73	0.00	0.00	0.11	0.07	0.09	0.06
BDE153	200	0.63	0.40	0.30	0.19	0.19	0.12	2.51	1.61	1.20	0.77	0.75	0.48	0.00	0.00	0.07	0.05	0.06	0.04
BDE154	200	0.03	0.04	0.01	0.02	0.01	0.01	0.11	0.15	0.05	0.07	0.03	0.05	0.01	0.00	0.00	0.00	0.00	0.00
BDE183	300	0.01	0.11	0.00	0.05	0.00	0.03	0.04	0.43	0.02	0.21	0.01	0.13	0.02	0.01	0.00	0.01	0.00	0.01
BDE209	7000	72	30.3	34.5	14.5	21.7	9.1	287	121	138	58.4	86.3	36.3	0.19	0.09	8.25	3.48	6.54	2.76
TBB	20000	2.97	10.4	1.42	5.01	0.89	3.13	11.9	41.7	5.69	20.1	3.56	12.5	0.01	0.07	0.34	1.20	0.27	0.95
BTBPE	230000	0.06	0.07	0.03	0.03	0.02	0.02	0.24	0.28	0.12	0.14	0.07	0.08	0.04	0.02	0.01	0.01	0.01	0.01
TBPH	20000	5.83	2.41	2.80	1.15	1.75	0.72	23.3	9.62	11.2	4.62	6.99	2.89	0.01	0.00	0.67	0.28	0.53	0.22

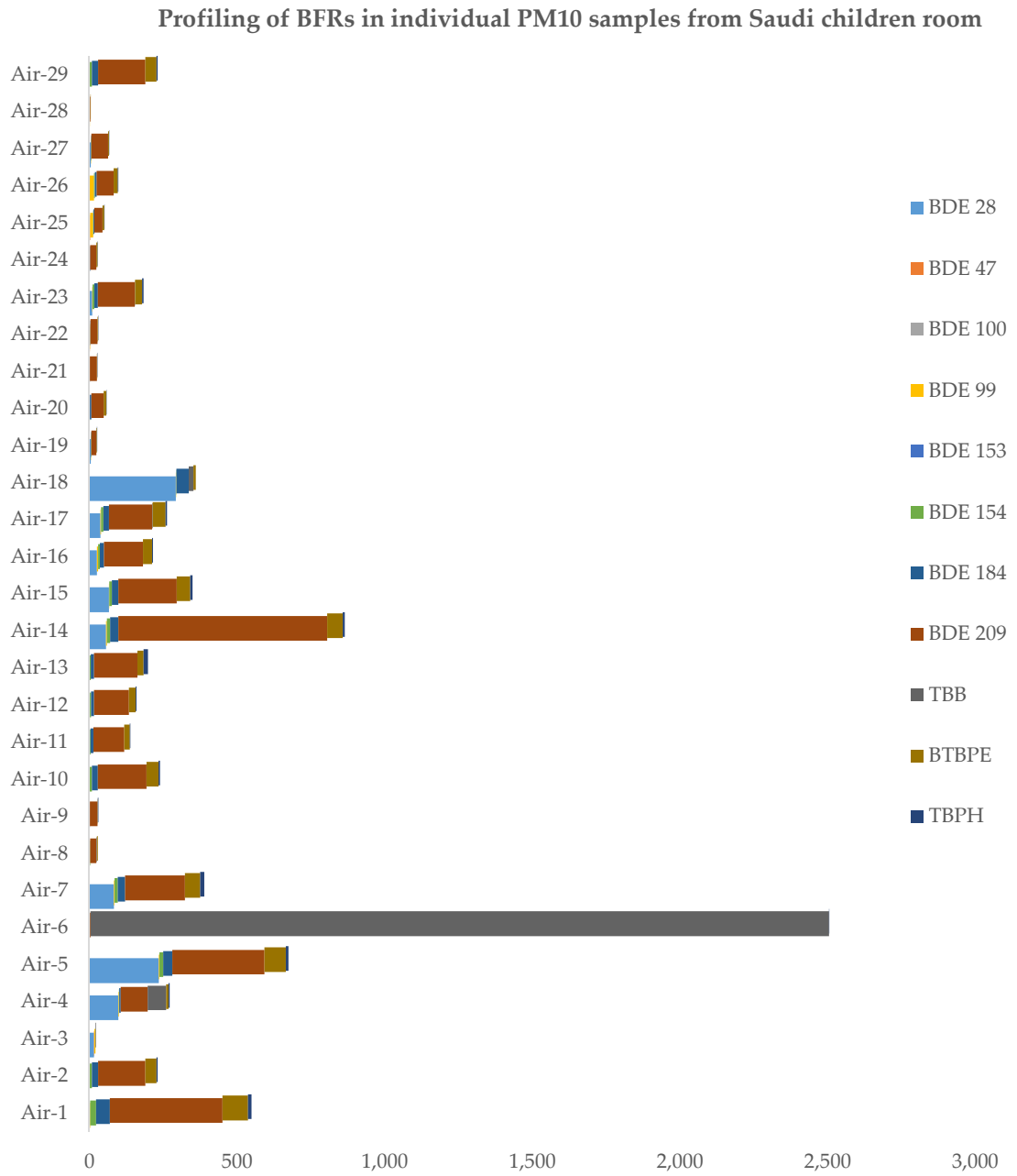

Figure S1. Profiling of analyzed BFRs in individual PM10 samples from Saudi children rooms. Values on the longitudinal axis are in pg/m^3.

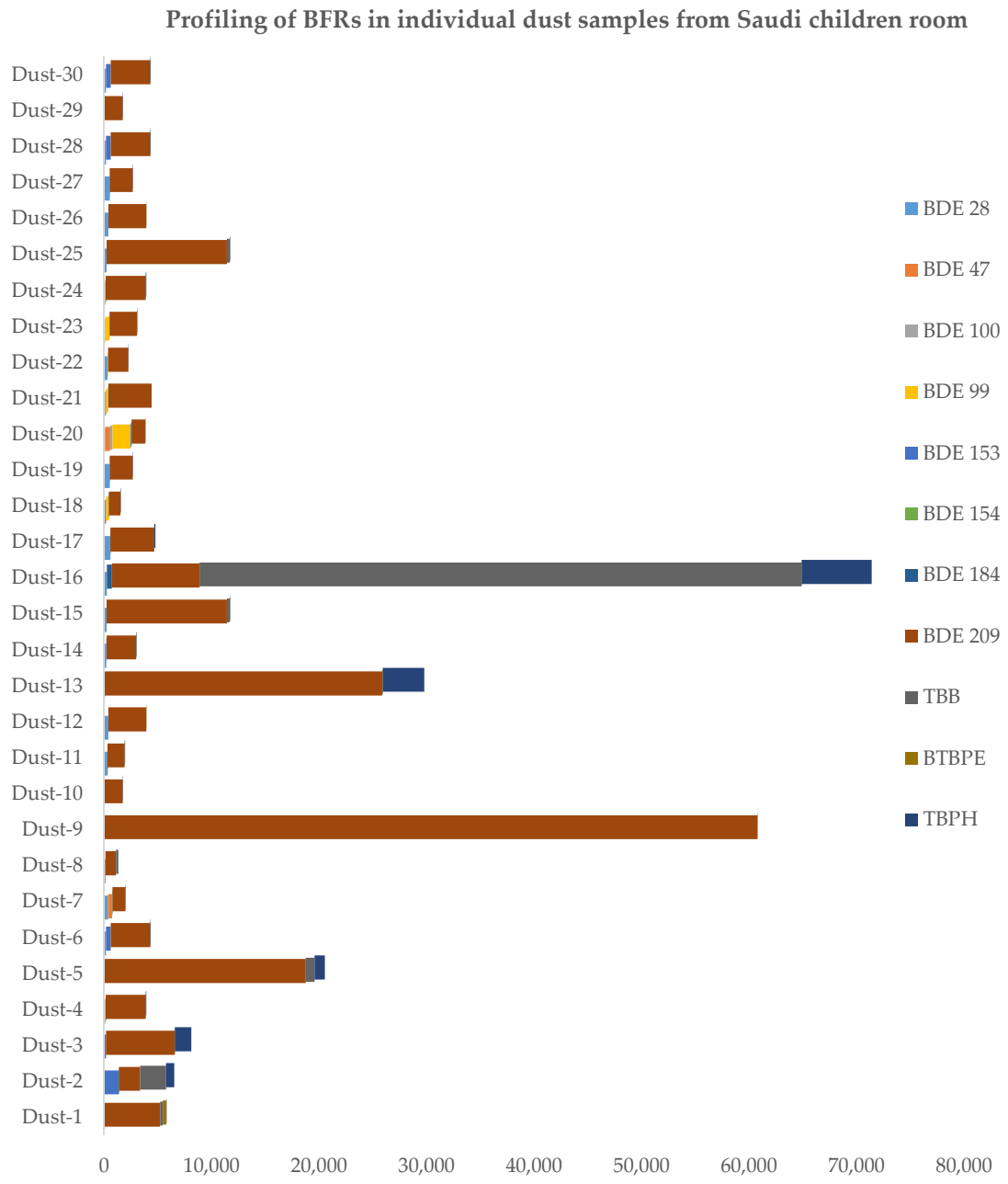

Figure S2. Profiling of analyzed BFRs in individual dust samples from Saudi children rooms. Values on the longitudinal axis are in ng/g of dust.

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