Legacy and alternative flame retardants in Norwegian and UK indoor environment: implications of human exposure via dust ingestion

Supplementary information

Legacy and alternative flame retardants in Norwegian and UK indoor environment: Implications of human exposure via dust ingestion

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Number of pages: 28

Number of figures: 1

Number of tables: 19

17 # Materials and methods

18 Table SI-1 – Sample codes with country of origin, source, collection year, mass used (g) and flooring material

Sample code	Country	Source	Collection year	Mass used (g)	Flooring material	General remarks
H1	UK	House	2013	0.034	wall-to-wall Carpet	
H2	UK	House	2013	0.032	wall-to-wall Carpet	
H3	UK	House	2013	0.031	wall-to-wall Carpet	
H4	UK	House	2013	0.032	wall-to-wall Carpet	
H5	UK	House	2013	0.033	wall-to-wall Carpet	
H6	UK	House	2013	0.032	wall-to-wall Carpet	
H7	UK	House	2011	0.030	wall-to-wall Carpet	
H8	UK	House	2011	0.031	wall-to-wall Carpet	
H9	UK	House	2012	0.032	wall-to-wall Carpet	
H10	UK	House	2011	0.032	wall-to-wall Carpet	
H11	Norway	House	2013	0.030	Laminated floor	
H12	Norway	House	2013	0.030	Wooden floor	
H13	Norway	House	2013	0.032	Laminated floor	
H14	Norway	House	2013	0.032	Other/not-defined	
H15	Norway	House	2013	0.033	Wooden floor	
H16	Norway	House	2013	0.030	No data	
H17	Norway	House	2013	0.032	No data	
H18	Norway	House	2013	0.033	parquet	
H19	Norway	House	2013	0.032	Wooden floor	
H20	Norway	House	2013	0.031	Flooring	
S1	UK	Office	2013	0.031	wall-to-wall Carpet	Library offices
S2	UK	Office	2013	0.030	Laminated floor and carpet flooring	University offices
S3	UK	Store	2013	0.030	Laminated wood flooring	Store with office supplies, printers, office furniture

S4	UK	Store	2013	0.031	wall-to-wall Carpet; PVC floor in repair room only	Computer store
S5	UK	Store	2013	0.032	Laminated wood flooring	Luggage store
S6	UK	Office	2013	0.032	wall-to-wall Carpet	Lettings office
S7	UK	Office	2013	0.031	wall-to-wall Carpet (two floors)	Bank offices
S8	UK	Store	2013	0.032	Laminated wood flooring (two floors)	Kitchenware store
S9	UK	Office	2013	0.032	Laminated flooring (1st floor) wall-to-wall Carpet (2nd floor)	Lettings office
S10	UK	Office	2013	0.032	wall-to-wall Carpet	Construction management office
S11	UK	Store	2013	0.032	wall-to-wall Carpet	Phone store
S12	UK	Store	2012	0.031	Laminated wood flooring	Toys store

19

20

Chemicals and Reagents

Standards of BDE 28, 47, 66, 85, 100, 153, 154, 183 and 209, EH-TBB, BTBPE, Dechlorane plus (*syn*- and *anti*-DP isomers), BEH-TEBP, TBECH (alpha and beta isomers) and labelled internal standards (IS) ^{13}C-BDE 209 were purchased from Wellington Laboratories (Guelph, ON, Canada). BDE 77 and 128 IS were obtained from AccuStandard Inc. (New Haven, CT, USA). Standards of tri-n-propyl phosphate (TnPP), tri-isobutyl phosphate (TiBP), tri-n-butyl phosphate (TnBP), triphenyl phosphate (TPHP), tris(2-chloroethyl) phosphate (TCEP) and tris(1,3-dichloropropyl) phosphate (TDCIPP, mixture of 2 isomers) were purchased from Chiron AS (Trondheim, Norway). Triamyl phosphate (TAP; IS) was purchased from TCI Europe (Zwijndrecht, Belgium). Labeled TPP-d15 IS and tris(2-butoxyethyl) phosphate (TBOEP) were purchased from Sigma Aldrich. Tris(1-chloro-2-propyl) phosphate (TCPP, mixture of 3 isomers) was purchased from Pfaltz & Bauer (Waterbury, CT, USA). Purity of analytical standards was >98%, except for TBOEP (>94%). Resorcinol bis(diphenyl phosphate) (PBDPP or RDP) and Bisphenol A bis(diphenyl phosphate) (BPA-BDPP or BDP) were purchased from TRC (Toronto, ON, Canada). The purities of the standards were 95.8% for RDP and 98% for BDP, respectively. Standards of isodecyl diphenyl phosphate (iDPP) were purchased from Accustandard (New Haven, CT, USA) and purity was 45% (in a mix with 55% TPHP, marketed as "Santicizer 148"), while Trixylenyl phosphate (TXP) standard was purchased from Chemos (Regenstauf, Germany) with purity . Standard stock solutions were prepared in iso-octane for PBDEs, EHFRs and m-PFRs, whereas standard stock solutions for o-PFRs were prepared in MeOH.

Commented [a1]: add

Indoor dust reference material SRM 2585 was purchased from the US National Institute of Standards and Technology (NIST, Gaithersburg, MD, USA). Empty, pre-fritted polypropylene filtration tubes (6 mL) for silica SPE cartridge preparation and Amino Propyl (NH_2)/silica-based cartridges (500 mg, 3 mL) were purchased from Agilent. For 5% acidified silica gel preparation, concentrated sulphuric acid (H_2SO_4, >96%) was used and was purchased from Merck. Briefly, 1.9 mL of pure sulphuric acid was added drop-wise to 50 g of hexane-washed, oven-dried silica gel under continuous and vigorous stirring. Glass test tubes were cleaned by soaking for at least 12 h in an alkali solution. After washing, the tubes were rinsed with water and dried at 100 ºC for at least 12 h and burned at 400°C to remove all traces of contamination.

Analytical methods

Approximately 30 mg indoor dust sample were carefully placed into clean, transparent glass test tubes. 50 µL of an IS mix (prepared in iso-octane) were added ranging from 5 to 200 ng (^{13}C-EH-TBB-d17, ^{13}C-BTBPE, ^{13}C-BEH-TEBP-d17, ^{13}C-syn-DP, ^{13}C-anti-DP, ^{13}C-BDE-209, BDE-77, BDE-128, TCEP-d12, TPHP-d15, TDCPP-d15, TBEP-d6, and TAP). Indoor dust samples were extracted 3 times (1 min vortex and 10 min sonication) using 2.5 mL of hexane/acetone (3:1; v/v). The supernatant was collected after each extraction cycle and evaporated to near dryness under a gentle stream of N_2. All samples

were analysed in batches of 20 samples in two consecutive days, along with one SRM 2585 (NIST, USA) as quality control and two field blanks. Oligomeric PFRs were detected in all procedural blanks. The average blank value was calculated in ng/g and then subtracted from the sample o-PFR values. For the not detected FRs in blanks, mLOD was established using the last point of the calibration curve divided by two. Our results of PBDEs and PFRs were in compliance with SRM 2585 indicative levels and PFR levels from (Cequier et al., 2014). PBDEs levels ranged from 90 to 118% (median: 95%) with the exception of BDE-28 (33%) and BDE-183 (122%). As for some PFRs, no indicated values were available while drafting of the current manuscript, therefore no comparison could be performed.

Method optimisation

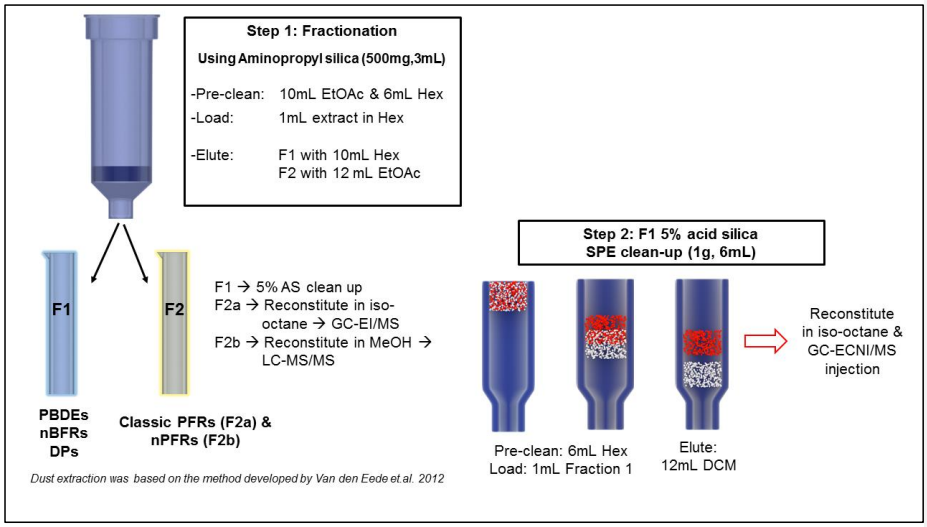

Figure SI-1 - Schematic representation of aminopropyl silica fractionation (step 1) and 5% acidified silica (AS) clean up (step: 2) based on (Van den Eede et al., 2012b)

Target analytes and analytical characteristics

Table SI-2 – Nomenclature and analytical characteristics of the internal standards

Abbreviation	Full name	Used as	Quantifier ion (m/z)	Qualifier ion (m/z)	Category	Instrumental analysis
BDE 77	3,3 ,4,4 -Tetrabromodiphenyl ether	IS	79	81	PBDE	GC-ECNI-MS
BDE 128	2,2 ,3,3 ,4,4 -Hexabromodiphenyl ether	IS	79	81	PBDE	GC-ECNI-MS
^{13}C-BDE 209	^{13}C-labeled decabromodiphenyl ether	IS	495	497	PBDE	GC-ECNI-MS
^{13}C-anti-DP	^{13}C-syn-dechlorane plus	IS	664	662	EHFR	GC-ECNI-MS
^{13}C-syn-DP	^{13}C-anti-dechlorane plus	IS	664	662	EHFR	GC-ECNI-MS
^{13}C-EH-TBB	2-ethylhexyl-D17-2,3,4,5-tetrabromo[$^{13}C_6$]benzoate	IS	363	365	EHFR	GC-ECNI-MS
^{13}C-BEH-TEBP	Bis(2-ethylhexyl-D17)-tetrabromo[$^{13}C_6$]phthalate	IS	470	390	EHFR	GC-ECNI-MS
^{13}C-BTBPE	1,2-Bis(2,4,6-tribromo[$^{13}C_6$]phenoxy)ethane	IS	257	259	EHFR	GC-ECNI-MS
TAP	Triamyl phosphate	IS	239	169	m-PFR[1]	GC-EI-MS
TPHP-d15	Triphenyl phosphate-D15	IS	341	339	m-PFR	GC-EI-MS/LC-MS-MS
TDCPP-d15	Tris(1,3-dichloropropyl) phosphate-D15	IS	394	396	m-PFR	GC-EI-MS/LC-MS-MS
TBOEP-d6	tris-(butoxyethyl)-phosphate-D6	IS	303	202	m-PFR	GC-EI-MS
TCEP-d12	Tris(2-chloroethyl) phosphate-D12	IS	341	339	-m-PFR	GC-EI-MS

1: monomeric PFRs

Table SI-3 – Nomenclature and analytical characteristics of PBDEs and EHFRs

Abbreviation	Full name	Used as	Quantifier ion (m/z)	Qualifier ion (m/z)	Quantify against IS	Category	Instrumental analysis
BDE28	2,4,4'-Tribromodiphenyl ether	Target	79	81	BDE 77	PBDE	GC-ECNI-MS
BDE47	2,2',4,4'-Tetrabromodiphenyl ether	Target	79	81	BDE 77	PBDE	GC-ECNI-MS
BDE66	2,3',4,4'-Tetrabromodiphenyl ether	Target	79	81	BDE 77	PBDE	GC-ECNI-MS
BDE85	2,2′,3,4,4′-penta- bromodiphenyl ether	Target	79	81	BDE 77	PBDE	GC-ECNI-MS
BDE100	2,2',4,4',6-Pentabromodiphenyl ether	Target	79	81	BDE 77	PBDE	GC-ECNI-MS
BDE153	2,2',4,4',5,5'-Hexabromodiphenyl ether	Target	79	81	BDE 128	PBDE	GC-ECNI-MS
BDE154	2,2',4,4',5,6'-Hexabromodiphenyl ether	Target	79	81	BDE 128	PBDE	GC-ECNI-MS
BDE183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	Target	79	81	BDE 128	PBDE	GC-ECNI-MS
BDE209	Decabromodiphenyl ether	Target	487	485	^{13}C-BDE 209		GC-ECNI-MS
EH-TBB	2-ethylhexyl-2,3,4,5-tetrabromobenzoate	Target	357	359	^{13}C-EH-TBB	EHFR	GC-ECNI-MS
BTBPE	1,2-bis(2,4,6-tribromophenoxy)ethane	Target	251	249	^{13}C-BTBPE	EHFR	GC-ECNI-MS
BEH-TEBP	Bis(2-ethylhexyl)-3,4,5,6-tetrabromo-phthalate	Target	464	384	^{13}C- BEH-TEBP	EHFR	GC-ECNI-MS
syn-DP	*syn*-dechlorane plus isomer	Target	654	652	^{13}C-syn-DP	EHFR	GC-ECNI-MS
anti-DP	*anti*-dechlorane plus isomer	Target	654	652	^{13}C-anti-DP	EHFR	GC-ECNI-MS
α-TBECH	alpha isomer tetrabromoethylcyclohexane	Target	79	81	BDE 77	EHFR	GC-ECNI-MS
β-TBECH	beta isomer tetrabromoethylcyclohexane	Target	79	81	BDE 77	EHFR	GC-ECNI-MS
DBDPE	Decabromodiphenyl ethane	Target	79	81	^{13}C-BDE 209	EHFR	GC-ECNI-MS

Table SI-4 – Nomenclature and analytical characteristics of monomeric PFRs

Abbreviation	Full name	Used as	Quantifier ion (m/z)	Qualifier ion (m/z)	Quantify against ISTD	Category	Instrumental analysis
TEHP	Tris(2-ethylhexyl)phosphate	Target	211	99	TAP	m-PFR	GC-EI-MS
TnPP	Tri-n-propyl phosphate	Target	99	183	TAP	m-PFR	GC-EI-MS
TnBP	tri(n-butyl)phosphate	Target	211	155	TAP	m-PFR	GC-EI-MS
EHDPHP	2-ethylhexyl-di-phenylphosphate	Target	251	250	TAP	m-PFR	GC-EI-MS
TCEP	Tris(2-chloroethyl)phosphate	Target	249	251	TCEP-d12	m-PFR	GC-EI-MS
TBOEP	tris-(butoxyethyl)-phosphate	Target	299	199	TBOEP-d6	m-PFR	GC-EI-MS
TPHP	triphenyl phosphate	Target	326	325	TPHP-d15	m-PFR	GC-EI-MS
TMPP*	tri-4-methoxythphenyl phosphate	Target	368	367	TPHP-d15	m-PFR	GC-EI-MS
TDCIPP	tris(1,3-dichloro-2-propyl) phosphate	Target	381	379	TDCPP-d15	m-PFR	GC-EI-MS
TCPP**	tris(chloropropyl)phosphate	Target	277	279	TDCPP-d15	m-PFR	GC-EI-MS

*in four isomers, ** in two isomers;

Table SI-5 - Nomenclature and analytical characteristics of monomeric PFRs and oligomeric PFRs

Abbreviation	Full name	Used as	Quantifier ion (m/z)	Qualifier ion 1 (m/z)	Qualifier ion 2 (m/z)	Quantify against ISTD	Category	Instrumental analysis
V6	tetrakis(2-chlorethyl) dichloroisopentyldiphosphate	Target	580.9->358.9	582.9 -> 234.9	584.9 -> 360.9	TDCPP-d15	o-PFR*	LC-MS-MS
TDBPP	Tris (2,3-dibromopropyl) phosphate	Target	698.6->99	696.6 -> 99.0	700.6 -> 99.0	TDCPP-d15	m-PFR	LC-MS-MS
iDPP	isodecyldiphenyl phosphate	Target	251.0->77.1	391.2 -> 251.0	391.2 -> 77.1	TPHP-d15	o-PFR	LC-MS-MS
RDP	resorcinol bis(diphenyl phosphate)	Target	575.1->77	575.1 -> 152.0	575.1 -> 419.1	TPHP-d15	o-PFR	LC-MS-MS
TXP	trixylenyl phosphate	Target	411.1 -> 105.0	411.1 -> 77.1	411.1 -> 179.0	TPHP-d15	m-PFR	LC-MS-MS
BDP	bisphenol A bis(diphenyl phosphate)	Target	693.2->367.1	694.1 -> 367.1	694.1 -> 368.1	TPHP-d15	o-PFR	LC-MS-MS
TPHP-d15	Triphenyl phosphate-D15	IS	446.0->101.9	444.0->101.9				LC-MS-MS
TDCPP-d15	Tris(1,3-dichloropropyl) phosphate-D15	IS	342.2->82.1	342.2->223.0	342.2->159.5			LC-MS-MS

*: o-PFR: oligomeric PFR

Instrumental methods

GC/ECNI-MS: Two µL of cleaned extract were injected on a DB-5 column (15 m×0.25 mm×0.10 µm) using solvent vent injection. The injection temperature was set at 92 °C, hold 0.04 min, ramp 700 °C/min to 295 °C. Injection was performed under a pressure of 0.19 bar until 1.25 min and purge flow to split vent of 50 mL/min after 1.25 min. The GC temperature program was 90 °C, hold 1.50 min, ramp 10 °C/min to 300 °C, hold 3 min, ramp 40 °C/min to 310 °C, hold 5 min. Helium was used as a carrier gas with a flow rate of 1.0 mL/min. The mass spectrometer was employed in selected ion monitoring (SIM) mode. Dwell times were set on 35 ms. The ion source, quadrupole and interface temperatures were set at 250, 150 and 300 °C, respectively and the electron multiplier voltage was at 2200 V. Methane was used as moderating gas.

GC/EI-MS: One µL of purified extract was injected on a HT-8 column (25 m×0.22 mm×0.25 µm) using cold splitless injection. The injection temperature was set at 90 °C, hold 0.03 min, ramp 700 °C/min to 290 °C. Injection was performed using a pressure of 1 bar until 1.25 min and purge flow to split vent of 50 mL/min after 1.25 min. The GC temperature program was 90 °C, hold 1.25 min, ramp 10 °C/min to 240 °C, ramp 20 °C/min to 310 °C, hold 16 min. Helium was used as a carrier gas with a flow rate of 1.0 mL/min. The mass spectrometer was run in selected ion monitoring (SIM) mode. Dwell times ranged between 20 and 30 ms in different acquisition windows. The ion source, quadrupole and interface temperatures were set at 230, 150 and 300 °C, respectively and the electron multiplier voltage was at 2200 V.

LC-MS/MS: For the instrumental analysis, an Agilent 1290 Infinity liquid chromatography (LC) system (Agilent Technologies, Santa Clara, CA, USA) coupled to an Agilent 6460 Triple Quadrupole mass spectrometer (MS) was employed, equipped with a Jetstream® electrospray ionization (ESI) ion source. The LC parameters were optimised to provide both good chromatographic separation and minimal run tine, in order to maximise sample throughput. A volume of 3 µL of extract was injected on a Phenomenex (Torrance, CA, USA) Kinetex Biphenyl reversed phase column (2.1 x 50 mm, 1.7 µm), at a column oven temperature of 55 °C. The mobile phases were A: ultrapure H_2O and B: MeOH, both containing 5 mM ammonium formate. Separation was achieved using a flow rate of 0.5 mL/min and a gradient from 55 B to 94% B in 3.4 min, followed by 1 min hold before returning to the initial conditions, making the total run time of 4.5 minutes. The column is re-equilibrated for the next run during a 2.5 min post time. The source parameters were initially optimised for all main analytes individually and subsequently a set of values for these parameters were selected to provide the best response for all considered analytes. As such, the drying gas temperature was set at 350 °C, the gas flow at 3 L/min, the nebulizer at 25 psi, sheath gas temperature 400 °C, sheath gas flow 12 L/min, capillary voltage 2700 V and nozzle voltage 0 V. The MS was operated in dynamic multiple-reaction monitoring (dMRM) mode, with 2-10 ion transitions for each analyte in their specific retention time

(RT) window (RT ± 0.5 min).The Agilent MassHunter Workstation Software version B.06.00 was used for all aspects of data analysis.

Table SI-6 - Accuracy of PBDEs and PFRs in SRM 2585 (N=2)

PBDEs	**Mean (ng/g)**	**STDEV**	***RSD%**	**Ref value**	**Accuracy %**
BDE28	15.3	6.8	44.1	46.9	33
BDE47	446.5	26.9	6	497	90
BDE66	22.8	1.7	7.4	29.5	77
BDE85	117.5	10.6	9.1	145	81
BDE100	35.8	3.8	10.5	43.8	82
BDE153	137.5	42.9	31.2	119	116
BDE154	99	33.8	34.2	83.5	119
BDE183	52.5	27.1	51.6	43	122
BDE209	2420.4	362.9	15	2510	96
PFRs	**Mean (ng/g)**	**STDEV**	***RSD%**	**†Ref value**	**Accuracy %**
TEHP	252.7	11.4	4.5	NM**	NM
TnPP	17	6.3	36.8	NM	NM
TnBP	266.3	21.6	8.1	197	135
EHDPHP	1049.2	57.3	5.5	NM	NM
TCEP	962.6	48.6	5	899	107
TBOEP	50460.2	2444.3	4.8	45795	110
TPHP	963	52.9	5.5	1052	92
TMPP	53435.1	652	1.2	NM	NM
TDCIPP	2221.8	69.8	3.1	1933	115
TCPP	1156	98.5	8.5	1063	109
V6	47	24	51.1	NM	NM
TDBPP	18	7	38.9	NM	NM
iDPP	122	15	12.3	NM	NM
RDP	nd	nd	nd	NM	NM
TXP	73	2	2.7	NM	NM
BDP	nd	nd	nd	NM	NM

*RSD= (Stdev/mean)*100, **NM=not measured, †taken from (Cequier et al., 2014)

Table SI 7 - Values of target analytes in field blanks (ng/g) and method limit of detection (mLOD)

PBDEs	**BL1**	**BL2**	**BL3**	**BL4**	**AVG**	**STEDV**	**mLOD* (ng/g)**
BDE28	1.3	1.0	1.3	N.D.	1.2	0.2	0.5
BDE47	1.0	1.0	1.3	N.D.	1.1	0.2	0.5
BDE66	N.D.**	N.D.	N.D.	N.D.	N.D.	N.D.	0.6†
BDE85	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.6
BDE100	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.6
BDE153	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.7
BDE154	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.6
BDE183	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	0.6
BDE209	N.D.	N.D.	5.7	4.3	5.0	1.0	3.0
EHFRs	**BL1**	**BL2**	**BL3**	**BL4**	**AVG**	**STEDV**	**mLOD**
EH-TBB	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	1.3
BTBPE	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	1.3
BEH-TEBP	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	1.3
syn-DP	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	1.6
anti-DP	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	1.6
αTBECH	0.3	0.7	0.3	0.7	0.5	0.2	0.7
βTBECH	0.3	0.3	0.3	0.3	0.3	0.0	0.6
DBDPE	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	13.3
PFRs	**BL1**	**BL2**	**BL3**	**BL4**	**AVG**	**STEDV**	**mLOD**
TEHP	16.7	13.0	10.3	9.7	12.4	3.2	9.5
TnPP	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	26.7
TnBP	12.3	10.0	11.0	12.0	11.3	1.1	3.2
EHDPHP	4.7	N.D.	N.D.	N.D.	4.7	N.D.	2.3
TCEP	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	44.1
TBOEP	159.3	158.0	121.7	153.0	148.0	17.7	53.3
TPHP	4.3	N.D.	N.D.	N.D.	4.3	N.D.	2.7
ΣTMPP	3.3	N.D.	N.D.	N.D.	3.3	N.D.	5.4
TDCIPP	61.3	N.D.	71.7	N.D.	66.5	7.4	21.9
ΣTCPP	17.3	*N.D.*	15.0	N.D.	16.2	1.6	4.9
V6	1.0	0.7	0.7	0.6	0.8	0.2	0.5
TDBPP	0.9	0.7	0.6	0.6	0.7	0.2	0.5
iDPP	4.9	4.2	4.7	3.9	4.4	0.4	1.3
RDP	3.9	2.6	3.0	2.6	3.0	0.6	1.8
TXP	2.8	1.9	2.1	2.1	2.2	0.4	1.1
BDP	6.1	3.9	4.7	3.5	4.6	1.1	3.4

* mLOD= 3 x STDEV of field blank;

** N.D. = not detected

† For non-detected analytes, mLOD was calculated as signal-to-noise ratio 3:1

Table SI-8 Descriptive statistics of PBDEs and EHFRs measured in the UK house dust samples (N=10). Concentrations and mLOD in ng/g.

PBDEs - UK Houses N=10 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
BDE28	0.9	1.1	2.1	7.7	10.6	2.5	3.9	3.9	1.2	100	0.5
BDE47	2.6	4.9	10.9	38.7	684	15.7	83.8	212.0	67.0	100	0.5
BDE66	<0.6	<0.6	<0.6	9.6	9.6	9.6	9.6	0.0	0.0	10	0.6
BDE85	<0.6	1.0	3.7	66.3	126	4.7	27.6	55.2	24.7	50	0.6
BDE100	<0.6	1.8	3.2	14.3	272	5.4	35.0	89.2	29.7	90	0.6
BDE153	1.6	3.3	8.2	15.6	448	9.3	52.0	139	44.0	100	0.7
BDE154	0.9	1.9	4.1	9.1	273	5.5	34.3	89.6	29.9	90	0.6
BDE183	3.8	4.6	5.8	14.3	133	10.3	25.7	47.6	18.0	70	0.6
Σ_8PBDEs	19.4	25.3	49.9	175.6	1958.4	63	272	637	215		
BDE209	265	1636	3351	13843	50601	3810	11081	17437	5514	100	3.0
Σ_9PBDEs	304	1689	3451	14194	54518	3936	11625	18710	5943		
EHFRs - UK Houses N=10 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
EH-TBB	2.5	3	5.0	20.5	32.0	6.7	10.7	11.2	3.7	90	1.3
BTBPE	<1.3	<1.3	<1.3	100	100	36.3	48.7	45.2	26.1	30	1.3
BEH-TEBP	18.0	62.3	106	179	234	95	116	67.9	21.5	100	1.3
syn-DP	2.1	2.85	4.5	14.3	31.5	5.7	9.1	11.2	4.6	60	1.6
anti-DP	1.6	4.48	6.8	10.6	31.6	7.0	9.5	8.9	2.8	100	1.6
α-TBECH	<0.7	0.7	1.2	5.4	5.6	2.2	3.1	2.3	0.9	60	0.7
β-TBECH	<0.6	<0.6	0.6	1.7	1.7	1.4	1.4	0.4	0.2	30	0.6
DBDPE	531	849	1091	4594	39221	1902	5576	11924	3771	100	13.3
Σ_8EHFRs	572	923	1245	4925	39659	2055	5774	12071	3831		

Table SI-9 Descriptive statistics of PFRs measured in the UK house dust samples (N=10). Concentrations and mLOD in ng/g.

PFRs - UK Houses N=10 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
TEHP	96.2	105	157	348	465	188	223	144	48	90	9.5
TnPP	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	0	26.7
TnBP	210	239	262	403	479	294	306	99	31	100	3.2
EHDPHP	292	1703	2375	3385	9172	2228	3010	2481	785	100	2.3
TCEP	138	590	873	1830	6265	991	1566	1793	567	100	44.1
TBOEP	225	2806	8070	24347	58745	6711	16080	19724	6237	100	53.3
TPHP	190	1129	1509	3724	9549	1716	2737	2915	922	100	2.7
TMPP	83	198	293	740	1052	340	459	359	114	100	5.4
TDCIPP	346	523	752	1229	3792	836	1081	1019	322	100	21.9
TCPP	18331	27054	64546	98080	1010000	64605	152691	303883	96096	100	4.9
Σ_{10}m-PFRs	19911	34347	78837	134086	1099519	77909	178165	332419	105123		
V6	1.3	11.8	16.6	50.8	756	23.5	96.8	232.0	73.4	100	0.5
TDBPP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	n.d.	n.d.	n.d.	0	0.5
iDPP	114	233.0	401	1053.0	1687	452	617	506	160	100	1.3
RDP	<1.8	<1.8	1.9	3.1	3.1	1.5	1.9	1.2	0.5	50	1.8
TXP	<1.1	6.6	26.5	73.6	537		84.0	162.0	51.3	100	1.1
BDP	<3.4	25.8	66.8	167.0	485	47.7	116.0	144.0	45.6	100	3.4

Table SI-10 Descriptive statistics of PBDEs and EHFRs measured in the Norwegian house dust samples (N=10). Concentrations and mLOD in ng/g.

PBDEs – Norway Houses N=10 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
BDE28	<0.5	1.8	2.6	3.7	3.8	2.5	2.7	1.0	0.5	50	0.5
BDE47	<0.5	1.7		49.0	94.4	4.6	20.7	41.2	18.4	50	0.5
BDE66	<0.6	<0.6	1.3	1.3	1.3	1.3	1.3	0.0	0.0	10	0.6
BDE85	<0.6	<0.6	5.8	5.8	5.8	5.8	5.8	0.0	0.0	10	0.6
BDE100	<0.6	<0.6	23.3	23.3	23.3	23.3	23.3	0.0	0.0	10	0.6
BDE153	<0.7	<0.7	8.9	14.7	14.7	3.4	6.2	7.4	4.3	30	0.7
BDE154	<0.6	<0.6	9.6	9.6	9.6	2.6	5.2	6.3	4.5	20	0.6
BDE183	<0.6	<0.6	3.6	98.2	130	7.5	34.7	63.3	31.6	40	0.6
Σ_8PBDEs	35.6	39.0	48.3	196	285.2	50.6	94.0	111.2	52.4		
BDE209	26.7	97.3	161	536	3084	203	518	929	294	100	3.0
Σ_9PBDEs	98	185	258	938	3654	304	706	1151	399		
EHFRs – Norway Houses N=10 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
EH-TBB	<1.3	3.8	5.4	8.7	9.2	3.7	5.1	3.4	1.5	50	1.3
BTBPE	299	299	299	299	299	299	299	0	0	10	1.3
BEH-TEBP	7.9	12.1	27.1	156	426.0	38.3	89.6	132.0	41.7	100	1.3
syn-DP	<1.6	<1.6	2.6	3.4	3.4	2.2	2.4	1.1	0.6	30	1.6
anti-DP	1.6	1.8	3.1	4.7	5.1	2.9	3.2	1.5	0.7	40	1.6
α-TBECH	<0.7	1.2	1.2	2.3	3.1	1.1	1.4	1.0	0.3	40	0.7
β-TBECH	<0.6	<0.6	<0.6	<0.6	<mLOD	0.6	0.6	0.6	0.6	0	0.6
DBDPE	81.8	219	686	834	1802	484	689	536	190	80	13.3
Σ_8EHFRs	389	538	1025	1308	2549	831	1090	675	235		

Table SI-11 Descriptive statistics of PFRs measured in the Norwegian house dust samples (N=10). Concentrations and mLOD in ng/g.

PFRs - Norway Houses N=10 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
TEHP	107	144	178	302	618	206	240	161	53.7	90	9.5
TnPP	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	0	26.7
TnBP	229	281	485	649	3123	512	713	859	272	100	3.2
EHDPHP	37.1	108	195	818	4011	285	743	1229	389	100	2.3
TCEP	56.7	81	120	370	498	158	210	162	51.1	100	44.1
TBOEP	1343	2912	18364	30999	48006	10232	19145	17269	5461	100	53.3
TPHP	202	240	830	1273	2922	656	931	826	261	100	2.7
TMPP	110	131	194	321	3176	252	503	943	298	100	5.4
TDCIPP	81	159	344	554	2306	319	511	654	207	100	21.9
TCPP	997	1323	1959	5431	33891	2800	5832	10122	3201	100	4.9
Σ_{10}m-PFRs	3163	5379	22669	40717	98551	15420	28828	32230	10195		
V6	1.2	2.2	4.1	5.3	8.8	3.5	4.1	2.4	0.9	80	0.5
TDBPP	<0.5	<0.5	<0.5	0.7	0.7	0.6	0.6	0.1	0.1	20	0.5
iDPP	6.3	28.7	51.3	119	262	51.4	80.5	76.7	24.3	100	1.3
RDP	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	n.d.	n.d.	n.d.	0	1.8
TXP	2.7	5.7	9.1	81.8	105.0	13.7	32.3	41.6	13.2	100	1.1
BDP	<3.4	56.5	35.4	1240	697	27.4	118	236	83.5	80	3.4

Table SI-12 - Descriptive statistics of PBDEs and EHFRs measured in the UK stores and offices (N=12). Concentrations and mLOD in ng/g.

PBDEs - UK Stores N=12 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
BDE28	0.7	4.9	8.5	15.0	7352	13.6	677	2213	667	92	0.5
BDE47	<0.5	8.3	9.1	17.2	119	13.5	22	33.9	10.7	83	0.5
BDE66	1.0	1.0	3.4	5.8	5.8	2.4	3.4	3.4	2.4	17	0.6
BDE85	1.0	1.1	2.1	7.3	8.8	2.4	3.5	3.6	1.8	33	0.6
BDE100	1.9	2.1	4.0	5.5	27.9	4.2	6.6	8.7	3.1	67	0.6
BDE153	3.0	5.0	5.2	8.1	29.2	6.8	8.3	7.3	2.2	92	0.7
BDE154	1.9	2.5	3.4	4.6	14.9	3.7	4.5	3.8	1.2	83	0.6
BDE183	2.2	7.9	11.4	27.0	44.4	11.8	16.3	12.8	3.7	100	0.6
Σ_8PBDEs	13.3	32.7	48.4	90.5	7602.0	54.2	684.1	2190.5	635.6		
BDE209	92.2	2068.0	4654	4654	10874	2937	4529	3098	894	100	3.0
Σ_9PBDEs	118.8	2133.5	4751	4835.0	26078	3045	5897	7479	2165		
EHFRs - UK Stores N=12 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
EH-TBB	1.6	5.3	18.1	45.2	143	13.9	29.4	41.1	12.4	92	1.3
BTBPE	13.3	18.9	27.1	40.8	79.9	28.2	32.9	21.4	7.6	67	1.3
BEH-TEBP	25.3	111.0	248	1367.0	2541	310.0	678.0	798.0	230.0	100	1.3
syn-DP	3.6	12.1	15.2	80.4	1237	27.9	152	383	121	83	1.6
anti-DP	<1.6	17.4	43.1	311.0	5547	49.3	555	1579	456	100	1.6
α-TBECH	2.3	2.9	4.5	11.4	4201	9.3	426	1326	456	100	0.7
β-TBECH	<0.6	0.9	1.3	4.25	1462	3.1	164	486	162	100	0.6
DBDPE	110	3049	5387	14259	23977	4759	8322	7646	2207	100	13.3
Σ_8EHFRs	154	3218	5744	16115	39188	5197	10248	12101	3506		

Table SI-13 - Descriptive statistics of PFRs measured in the UK stores and offices (N=12). Concentrations and mLOD in ng/g.

PFRs - UK Stores N=12 (ng/g)	Minimum	25% Percentile	Median	75% Percentile	Maximum	Geometric mean	Mean	Std. Deviation	Std. Error of Mean	DF%	mLOD
TEHP	97.7	389	529	1008	2259	548	743	640	213	75	9.5
TnPP	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	<26.7	0	26.7
TnBP	223	235	281	329	488	288	297	80.1	23.1	100	3.2
EHDPHP	457	7374	19648	29767	127686	13554	26020	33613	9703	100	2.3
TCEP	237	456	897	2489	7185	1103	1895	2220	641	100	44.1
TBOEP	3371	8531	32700	82439	1.8E+06	40294	305634	647120	186808	100	53.3
TPHP	1331	3581	5752	11251	38094	5885	8834	9917	2863	100	2.7
TMPP	118	439	850	1068	1163	638	758	359	104	100	5.4
TDCIPP	195	877	1274	9827	12774	1790	3974	5243	1514	100	21.9
TCPP	5012	10174	25751	51148	155955	25867	44714	53044	15312	100	4.9
Σ_{10}m-PFRs	11042	32068	87682	189341	2165604	89967	392883	752240	217182		
V6	2.1	6.3	40.4	158	511	36.5	132	192	57.8	100	0.5
TDBPP	2.6	2.6	3.0	15.1	15.1	4.9	6.9	7.1	4.1	100	0.5
iDPP	644	1990	5898	7653	145455	5083	18018	42467	12804	100	1.3
RDP	2.0	2	6.1	53.5	53.5	8.7	20.5	28.6	16.5	100	1.8
TXP	20.8	69.2	244	1406	5820	240	935	1733	523	100	1.1
BDP	16.5	56.5	483	1240	5932	322	1083	1785	564	100	3.4

Human exposure assessment

All the exposure scenario equations and parameters used for adults and toddlers daily estimated intake to FRs were based on SI Eq.1 (USEPA, 1997) and table SI 14 (Brandsma et al., 2013). In our study, both average (20 mg/24 h for adult and 50 mg/24 h for toddler) and high (50 mg/24 h for adult and 200 mg/24 h toddler) dust intake situations were calculated. The exposure of home-based adults and toddlers were assessed with 24 h exposure duration, while intakes for adult workers in offices and stores were estimated with 8 h exposure duration. Body weight of 70 kg and 12.3 kg were used for adults and toddlers, respectively.

Equation used for calculating daily exposure to FRs via dust ingestion (SI Eq. 1)

$$Daily\ Exposure\ \left(\frac{\text{ng/kg bw}}{\text{day}}\right) = \frac{Concentration\ x\ Dust\ ingestion\ rate\ x\ Exposure\ duration}{Body\ weight}$$

Table SI-14 – Parameters used for calculating daily exposure to FRs via dust ingestion

	Dust ingestion rate (g/day)		**Body Weight (kg)**
	Average	High	
Adults	0.02	0.05	70
Toddlers	0.05	0.2	12.3

Table SI-15 - Daily exposure of FRs for adults (workers) in UK stores and offices (n=12) with average and high dust ingestion rate

	Adults ng/kg bw/day - Average ingestion rate -UK Workers t=8h		**Adults ng/kg bw/day - High ingestion rate – UK Workers t=8h - Worst case scenario**		
	UK Stores		UK Stores		
FR	Median	Maximum	Median	Maximum	RfD (ng/kg bw day)*
BDE28	0.001	0.700	0.002	1.750	
BDE47	0.001	0.011	0.002	0.028	1×10^2
BDE66	0.000	0.001	0.001	0.001	
BDE85	0.000	0.001	0.001	0.002	
BDE100	0.000	0.003	0.001	0.007	
BDE153	0.000	0.003	0.001	0.007	2×10^2
BDE154	0.000	0.001	0.001	0.004	
BDE183	0.001	0.004	0.003	0.011	
Σ8PBDEs	0.005	0.724	0.012	1.810	
BDE209	0.443	1.036	1.108	2.589	7×10^3
Σ_9PBDEs	0.452	2.484	1.131	6.209	
EH-TBB	0.002	0.014	0.004	0.034	
BTBPE	0.003	0.008	0.006	0.019	

BEH-TEBP	0.024	0.242	0.059	0.605	
syn-DP	0.001	0.118	0.004	0.295	
anti-DP	0.004	0.528	0.010	1.321	
α-TBECH	0.000	0.400	0.001	1.000	
β-TBECH	0.000	0.139	0.000	0.348	
DBDPE	0.513	2.284	1.283	5.709	
ΣEHFRs	0.547	3.732	1.368	9.330	
TEHP	0.050	0.215	0.126	0.538	
TNBP	0.027	0.046	0.067	0.116	2.4×10^4
EHDPHP	1.871	12.161	4.678	30.401	6×10^{6}**
TCEP	0.085	0.684	0.214	1.711	2.2×10^4
TBOEP	3.114	173.333	7.786	433.333	1.5×10^4
TPHP	0.548	3.628	1.370	9.070	7×10^4
TMPP	0.081	0.111	0.202	0.277	
TDCIPP	0.121	1.217	0.303	3.041	1.5×10^4
TCPP	2.452	14.853	6.131	37.132	8×10^4
Σ_{10}m-PFRs	8.351	206.248	20.877	515.620	
V6	0.004	0.049	0.010	0.122	
TDBPP	0.000	0.001	0.001	0.004	
iDPP	0.562	13.853	1.404	34.632	3×10^{7}***
RDP	0.001	0.005	0.001	0.013	
TXP	0.023	0.554	0.058	1.386	
BDP	0.046	0.565	0.115	1.412	

132 *taken from (Cequier et al., 2014), **taken from (UK Environment Agency, 2009c),*** taken from
133 (UK Environment Agency, 2009b)

134

Table SI-16 – Daily exposure of FRs from dust for adults (non-workers) from UK and Norway houses with average and high dust ingestion rates

	Adults ng/kg bw/day - Average ingestion rate - Non-workers t=24h				**Adults ng/kg bw/day - High ingestion rate -Non-workers - t=24h - Worst case scenario**				
	UK houses		Norwegian houses		UK houses		Norwegian houses		
FR	Median	Maximum	Median	Maximum	Median	Maximum	Median	Maximum	**RfD (ng/kg bw day)**
BDE28	0.001	0.003	0.001	0.001	0.002	0.008	0.002	0.004	
BDE47	0.003	0.196	0.001	0.027	0.009	0.489	0.002	0.068	1×10^{2}
BDE66	0.003	0.003	0.000	0.000	0.007	0.007	0.001	0.001	
BDE85	0.001	0.036	0.002	0.002	0.003	0.090	0.004	0.004	
BDE100	0.001	0.078	0.007	0.007	0.002	0.194	0.017	0.017	
BDE153	0.002	0.128	0.001	0.004	0.006	0.320	0.002	0.011	2×10^{2}
BDE154	0.001	0.078	0.001	0.003	0.003	0.195	0.004	0.007	
BDE183	0.002	0.038	0.001	0.037	0.004	0.095	0.003	0.093	
Σ_8PBDEs	0.014	0.560	0.014	0.081	0.036	1.399	0.035	0.204	
BDE209	0.957	14.457	0.046	0.881	2.394	36.144	0.115	2.203	7×10^{3}
Σ_9PBDEs	0.986	15.577	0.074	1.044	2.465	38.941	0.184	2.610	
EH-TBB	0.001	0.009	0.002	0.003	0.004	0.023	0.004	0.007	
BTBPE	0.008	0.029	0.085	0.085	0.021	0.071	0.214	0.214	
BEH-TEBP	0.030	0.067	0.008	0.122	0.076	0.167	0.019	0.304	
syn-DP	0.001	0.009	0.001	0.001	0.003	0.023	0.002	0.002	
anti-DP	0.002	0.009	0.001	0.001	0.005	0.023	0.002	0.004	
α-TBECH	0.000	0.002	0.000	0.001	0.001	0.004	0.001	0.002	
β-TBECH	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.001	
DBDPE	0.312	11.206	0.196	0.515	0.779	28.015	0.490	1.287	
ΣEHFRs	0.356	11.331	0.293	0.728	0.889	28.328	0.732	1.821	
TEHP	0.045	0.133	0.051	0.177	0.112	0.332	0.127	0.441	

TnBP	0.075	0.137	0.139	0.892	0.187	0.342	0.346	2.231	2.4 x10^4
EHDPHP	0.679	2.621	0.056	1.146	1.696	6.551	0.139	2.865	6 x10^6**
TCEP	0.249	1.790	0.034	0.142	0.624	4.475	0.086	0.356	2.2 x10^4
TBOEP	2.306	16.784	5.247	13.716	5.764	41.961	13.117	34.290	1.5 x10^4
TPHP	0.431	2.728	0.237	0.835	1.078	6.821	0.593	2.087	7 x10^4
TMPP	0.084	0.301	0.055	0.907	0.209	0.751	0.139	2.269	
TDCIPP	0.215	1.083	0.098	0.659	0.537	2.709	0.246	1.647	1.5 x10^4
TCPP	18.442	288.571	0.560	9.683	46.104	721.429	1.399	24.208	8 x10^4
Σ_{10}PFRs	22.525	314.148	6.477	28.157	56.312	785.371	16.192	70.394	
V6	0.005	0.216	0.001	0.003	0.012	0.540	0.003	0.006	
TDBPP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
iDPP	0.115	0.482	0.015	0.075	0.286	1.205	0.037	0.187	3 x10^7***
RDP	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	
TXP	0.008	0.153	0.003	0.030	0.019	0.384	0.007	0.075	
BDP	0.019	0.139	0.010	0.199	0.048	0.346	0.025	0.498	

*taken from (Cequier et al., 2014), **taken from (UK Environment Agency, 2009c),*** taken from (UK Environment Agency, 2009b)

Table SI-17 - Daily exposure of FRs from dust for toddlers from UK and Norway houses with average and high dust ingestion rate

	Toddlers ng/kg bw/day - Average ingestion rate t=24h				**Toddlers ng/kg bw/day - High ingestion rate - t=24h - Worst case scenario**				
	UK houses		Norwegian houses		UK houses		Norwegian houses		
FR	Median	Maximum	Median	Maximum	Median	Maximum	Median	Maximum	**RfD (ng/kg bw day)***
BDE28	0.013	0.048	0.014	0.020	0.053	0.192	0.055	0.081	
BDE47	0.049	2.785	0.011	0.388	0.195	11.138	0.045	1.553	1×10^2
BDE66	0.039	0.039	0.005	0.005	0.156	0.156	0.021	0.021	
BDE85	0.015	0.512	0.024	0.024	0.060	2.049	0.094	0.094	
BDE100	0.013	1.106	0.095	0.095	0.052	4.423	0.379	0.379	
BDE153	0.033	1.821	0.012	0.060	0.133	7.285	0.049	0.239	2×10^2
BDE154	0.017	1.110	0.021	0.039	0.067	4.439	0.084	0.156	
BDE183	0.024	0.541	0.015	0.528	0.094	2.163	0.059	2.114	
Σ_8PBDEs	0.203	7.961	0.196	1.159	0.811	31.844	0.785	4.637	
BDE209	13.622	205.695	0.654	12.537	54.488	822.780	2.618	50.146	7×10^3
Σ_9PBDEs	14.027	221.617	1.047	14.855	56.109	886.468	4.189	59.421	
EH-TBB	0.020	0.130	0.022	0.037	0.081	0.520	0.088	0.150	
BTBPE	0.121	0.407	1.215	1.215	0.483	1.626	4.862	4.862	
BEH-TEBP	0.431	0.951	0.110	1.732	1.724	3.805	0.441	6.927	
syn-DP	0.018	0.128	0.011	0.014	0.073	0.512	0.042	0.055	
anti-DP	0.027	0.128	0.012	0.021	0.110	0.514	0.050	0.083	
α-TBECH	0.005	0.025	0.005	0.013	0.021	0.101	0.020	0.050	
β-TBECH	0.002	0.009	0.002	0.004	0.010	0.037	0.010	0.015	
DBDPE	4.435	159.435	2.789	7.325	17.740	637.740	11.154	29.301	
ΣEHFRs	5.060	161.214	4.166	10.361	20.241	644.855	16.666	41.442	
TEHP	0.638	1.890	0.724	2.512	2.553	7.561	2.894	10.049	

TNBP	1.065	1.947	1.972	12.695	4.260	7.789	7.886	50.780	2.4×10^4
EHDPHP	9.654	37.285	0.793	16.305	38.618	149.138	3.171	65.220	6×10^6**
TCEP	3.549	25.467	0.488	2.024	14.195	101.870	1.951	8.098	2.2×10^4
TBOEP	32.805	238.801	74.650	195.146	131.220	955.203	298.602	780.585	1.5×10^4
TPHP	6.134	38.817	3.374	11.878	24.537	155.268	13.496	47.512	7×10^4
TMPP	1.191	4.276	0.789	12.911	4.764	17.106	3.154	51.642	
TDCIPP	3.057	15.415	1.398	9.374	12.228	61.659	5.593	37.496	1.5×10^4
TCPP	262.382	4105.691	7.963	137.768	1049.528	16422.764	31.854	551.073	8×10^4
Σ_{10}m-PFRs	320.476	4469.589	92.150	400.614	1281.902	17878.358	368.602	1602.455	
V6	0.067	3.073	0.016	0.036	0.270	12.293	0.066	0.143	
TDBPP	0.002	0.002	0.002	0.003	0.008	0.008	0.010	0.011	
iDPP	1.630	6.858	0.209	1.065	6.520	27.431	0.834	4.260	3×10^7***
RDP	0.008	0.013	0.007	0.007	0.031	0.050	0.029	0.029	
TXP	0.108	2.183	0.037	0.427	0.431	8.732	0.148	1.707	
BDP	0.272	1.972	0.144	2.833	1.086	7.886	0.576	11.333	

*taken from (Cequier et al., 2014), **taken from (UK Environment Agency, 2009c),*** taken from (UK Environment Agency, 2009b)

Table SI 18 – Daily exposure of FRs for adult workers (t=8h) in UK offices (n=6) with average and high dust ingestion rate

	S1		S2		S6		S7		S9		S10		
FR	Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	**RfD (ng/kg bw day)***
BDE28	0.000	0.001	0.000	0.000	0.003	0.008	0.001	0.002	0.700	1.750	0.000	0.000	
BDE47	0.002	0.004	0.000	0.000	0.001	0.002	0.001	0.002	0.001	0.002	0.000	0.000	1×10^{2}
BDE66	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
BDE85	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
BDE100	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
BDE153	0.001	0.002	0.000	0.001	0.001	0.003	0.000	0.001	0.001	0.002	0.000	0.000	2×10^{2}
BDE154	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.000	0.000	
BDE183	0.000	0.001	0.001	0.002	0.004	0.011	0.001	0.003	0.003	0.007	0.000	0.001	
Σ_8PBDEs	0.004	0.010	0.001	0.003	0.010	0.025	0.004	0.010	0.705	1.763	0.000	0.001	
BDE209	0.482	1.206	0.076	0.190	0.186	0.465	0.608	1.519	0.545	1.363	0.009	0.022	7×10^{3}
Σ_9PBDEs	0.487	1.217	0.077	0.193	0.196	0.490	0.612	1.529	1.250	3.125	0.009	0.023	
EH-TBB	0.002	0.004	0.000	0.000	0.000	0.001	0.002	0.004	0.004	0.011	0.000	0.000	
BTBPE	0.000	0.000	0.000	0.000	0.001	0.003	0.003	0.008	0.004	0.010	0.000	0.000	
BEH-TEBP	0.059	0.147	0.002	0.006	0.008	0.020	0.083	0.208	0.242	0.605	0.005	0.012	
syn-DP	0.000	0.001	0.000	0.000	0.118	0.295	0.006	0.015	0.013	0.031	0.000	0.000	
anti-DP	0.001	0.003	0.000	0.000	0.528	1.321	0.042	0.105	0.037	0.093	0.000	0.000	
aTBECH	0.000	0.001	0.000	0.000	0.002	0.005	0.000	0.001	0.400	1.000	0.000	0.000	
bTBECH	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.139	0.348	0.000	0.000	
DBDPE	0.297	0.741	0.700	1.749	0.439	1.098	0.587	1.467	1.922	4.805	0.010	0.026	
ΣEHFRs	0.359	0.898	0.703	1.756	1.098	2.744	0.724	1.809	2.762	6.904	0.016	0.040	
TEHP	0.043	0.107	0.009	0.023	0.000	0.001	0.050	0.126	0.051	0.128	0.000	0.001	

TnBP	0.039	0.097	0.033	0.081	0.021	0.053	0.027	0.067	0.027	0.067	0.028	0.069	2.4×10^4
EHDPHP	3.023	7.557	0.580	1.449	0.306	0.766	2.272	5.680	1.070	2.676	0.043	0.109	6×10^6**
TCEP	0.040	0.101	0.023	0.056	0.039	0.097	0.052	0.131	0.199	0.497	0.521	1.304	2.2×10^4
TBOEP	3.312	8.279	0.468	1.171	0.321	0.803	3.421	8.552	2.078	5.194	0.537	1.341	1.5×10^4
TPHP	0.857	2.143	0.127	0.317	0.145	0.364	1.143	2.858	0.310	0.775	0.444	1.109	7×10^4
TMPP	0.042	0.104	0.011	0.028	0.024	0.059	0.086	0.216	0.076	0.190	0.042	0.106	
TDCPP	0.099	0.246	0.019	0.046	0.066	0.166	0.115	0.287	1.214	3.034	0.204	0.511	1.5×10^4
TCPP	14.853	37.132	0.958	2.396	14.511	36.278	5.343	13.357	2.830	7.076	0.477	1.193	8×10^4
Σ_{10}PFRs	22.307	55.769	2.228	5.571	15.436	38.589	12.510	31.275	7.856	19.641	2.299	5.747	
V6	0.003	0.009	0.000	0.001	0.001	0.002	0.004	0.010	0.000	0.000	0.000	0.001	
TDBPP	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	
iDPP	0.729	1.822	0.190	0.474	0.086	0.214	0.681	1.703	0.000	0.000	0.061	0.153	3×10^7***
RDP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TXP	0.007	0.016	0.002	0.005	0.004	0.009	0.035	0.087	0.000	0.000	0.007	0.018	
BDP	0.002	0.004	0.000	0.000	0.003	0.008	0.087	0.218	0.000	0.000	0.068	0.169	

*taken from (Cequier et al., 2014), **taken from (UK Environment Agency, 2009c),*** taken from (UK Environment Agency, 2009b)

Table SI 29 - Daily exposure of FRs for adult workers (t=8h) in UK stores (n=6) with average and high dust ingestion rate

	S3		S4		S5		S8		S11		S12		
FR	Average	High	Average	High	Average	High	Average	High	Average	High	Average	High	**RfD (ng/kg bw day)***
BDE28	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.004	
BDE47	0.001	0.003	0.011	0.028	0.002	0.004	0.001	0.002	0.001	0.002	0.002	0.005	1×10^2
BDE66	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
BDE85	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
BDE100	0.000	0.001	0.003	0.007	0.001	0.001	0.000	0.001	0.000	0.000	0.001	0.001	
BDE153	0.000	0.001	0.003	0.007	0.001	0.002	0.000	0.001	0.000	0.001	0.000	0.001	2×10^2
BDE154	0.000	0.001	0.001	0.004	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	
BDE183	0.001	0.002	0.002	0.004	0.002	0.005	0.003	0.007	0.001	0.002	0.001	0.002	
Σ_8PBDEs	0.003	0.008	0.022	0.055	0.006	0.014	0.006	0.014	0.003	0.007	0.006	0.014	
BDE209	0.404	1.010	0.230	0.574	0.739	1.848	1.036	2.589	0.281	0.702	0.580	1.450	7×10^3
Σ_9PBDEs	0.407	1.018	0.252	0.629	0.745	1.862	1.041	2.603	0.284	0.710	0.586	1.464	
EH-TBB	0.001	0.001	0.005	0.012	0.014	0.034	0.001	0.002	0.001	0.001	0.003	0.006	
BTBPE	0.002	0.005	0.008	0.019	0.002	0.005	0.002	0.004	0.000	0.000	0.003	0.008	
BEH-TEBP	0.018	0.046	0.146	0.364	0.147	0.366	0.018	0.044	0.021	0.053	0.026	0.065	
syn-DP	0.001	0.002	0.001	0.003	0.002	0.005	0.001	0.004	0.001	0.004	0.001	0.003	
anti-DP	0.003	0.007	0.004	0.011	0.006	0.016	0.004	0.010	0.004	0.011	0.003	0.009	
aTBECH	0.000	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.001	0.002	
bTBECH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
DBDPE	0.288	0.721	0.893	2.232	2.284	5.709	0.217	0.543	1.513	3.783	0.362	0.904	
ΣEHFRs	0.313	0.783	1.057	2.642	2.455	6.136	0.243	0.608	1.541	3.853	0.399	0.998	
TEHP	0.100	0.250	0.032	0.079	0.215	0.538	0.045	0.113	0.000	0.001	0.092	0.230	

TnBP	0.021	0.053	0.025	0.061	0.023	0.058	0.022	0.055	0.028	0.070	0.046	0.116	2.4×10^4
EHDPHP	1.380	3.451	1.751	4.377	2.123	5.309	3.036	7.589	1.992	4.979	12.161	30.401	6×10^6**
TCEP	0.099	0.249	0.250	0.624	0.124	0.310	0.071	0.178	0.063	0.157	0.684	1.711	2.2×10^4
TBOEP	147.190	367.976	1.640	4.101	2.917	7.292	8.804	22.011	4.993	12.482	173.616	434.040	1.5×10^4
TPHP	0.446	1.115	0.650	1.624	0.435	1.087	1.215	3.038	0.697	1.743	3.628	9.070	7×10^4
TMPP	0.086	0.214	0.109	0.273	0.102	0.254	0.075	0.188	0.102	0.254	0.111	0.277	
TDCPP	1.180	2.949	0.132	0.329	0.088	0.220	0.128	0.319	0.082	0.205	1.217	3.041	1.5×10^4
TCPP	2.277	5.694	2.627	6.569	1.001	2.502	1.926	4.814	0.841	2.102	3.457	8.642	8×10^4
Σ_{10}PFRs	152.781	381.953	7.216	18.041	7.029	17.573	15.324	38.311	8.798	21.994	195.013	487.532	
V6	0.006	0.016	0.049	0.122	0.048	0.120	0.015	0.038	0.001	0.003	0.011	0.027	
TDBPP	0.000	0.000	0.001	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
iDPP	0.650	1.625	0.279	0.698	0.562	1.404	1.448	3.620	0.338	0.845	13.853	34.632	3×10^7***
RDP	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.013	
TXP	0.023	0.058	0.554	1.386	0.026	0.064	0.009	0.023	0.179	0.447	0.134	0.335	
BDP	0.150	0.376	0.107	0.268	0.019	0.047	0.024	0.061	0.006	0.015	0.565	1.412	

*taken from (Cequier et al., 2014), **taken from (UK Environment Agency, 2009c),*** taken from (UK Environment Agency, 2009b)

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