Supplementary information (SI)

Persistent Organic Pollutants in Austrian Human Breast Milk collected between 2013 and 2016

Table S1: Investigated substances, limits of detection (LOD) and limits of quantification (LOQ).

Substance	Abbreviation	CAS#	LOD	LOQ	Measured in		
					(1)	*(2)*	*(3)*
PBDE congeners			***[ng/g milk] (1)***	***[ng/g milk] (1) [ng/g fat] (3)***			
4,4'-Dibromodiphenyl ether	BDE-15	2050-47-7		0.00017 (3)			x
2,2',4-Tribromodiphenyl ether	BDE-17	147217-75-2		0.00092 (3)			x
2,4,4'-Tribromodiphenyl ether	BDE-28	41318-75-6	0.0000068-0.00035 (1)	0.0026-0.0088 (1); 0.00093 (3)	x		x
2,2',4,4'-Tetrabromodiphenyl ether[*,1]	BDE-47	5436-43-1	0.000018-0.0005 (1)	0.028-0.095 (1); 0.00056 (3)	x		x
2,2',4,5'-Tetrabromodiphenyl ether[*,1]	BDE-49	243982-82-3	0.000019-0.00044 (1)	0.00014-0.00088 (1); 0.00091 (3)	x		x
2,3',4,4'-Tetrabromodiphenyl ether[*,1]	BDE-66	189084-61-5	0.000028-0.0012 (1)	0.00029-0.0024 (1); 0.00084 (3)	x		x
2,4,4',6-Tetrabromodiphenyl ether	BDE-75	189084-63-7		0.00059 (3)			x
3,3',4,4'-Tetrabromodiphenyl ether[*,1]	BDE-77	93703-48-1	0.000014-0.0005 (1)	0.00011-0.001 (1); 0.00048 (3)	x		x
2,2',3,4,4'-Pentabromodiphenyl ether[*,1]	BDE-85	182346-21-0	0.00016-0.0061 (1)	0.0033-0.012 (1)	x		
2,2',4,4',5-Pentabromodiphenyl ether[*,1]	BDE-99	60348-60-9	0.000028-0.00097 (1)	0.012-0.042 (1); 0.00170 (3)	x		x
2,2',4,4',6-Pentrabromodiphenyl ether[*,1]	BDE-100	189084-64-8	0.000022-0.001 (1)	0.0034-0.011 (1); 0.00195 (3)	x		x
2,3',4,4',5-Pentabromodiphenyl ether[*,1]	BDE-118	446254-80-4	0.000049-0.0014 (1)	0.00075-0.0028 (1)	x		
2,3',4,4',6-Pentabromodiphenyl ether	BDE-119	189084-66-0		0.00145 (3)			x
3,3',4,4',5-Pentabromodiphenyl ether[*,1]	BDE-126	366791-32-4	0.00011-0.0041 (1)	0.0022-0.0082 (1)	x		
2,2',3,4,4',5',6-Heptabromodiphenyl ether	BDE-138	207122-16-5		0.00089 (3)			x
2,2',3,4,4',6-Hexabromodiphenyl ether[*,1]	BDE-139	446254-96-2	0.000066-0.0018 (1)	0.00058-0.0036 (1)	x		
2,2',4,4',5,5'-Hexabromodiphenyl ether[*,1]	BDE-153	68631-49-2	0.000044-0.0012 (1)	0.00042-0.0024 (1); 0.00062 (3)	x		x
2,2'4,4'5,6'-Hexabromodiphenyl ether[*,1]	BDE-154	207122-15-4	0.000028-0.0016 (1)	0.00032-0.0032 (1); 0.00060 (3)	x		x
2,2',3,4,4',5,6-Heptabromodiphenyl ether[*,1]	BDE-181	189084-67-1	0.000061-0.00053 (1)	0.00012-0.0011 (1)	x		
2,2',3,4,4',5',6-Heptabromodiphenyl ether[*,1]	BDE-183	207122-16-5	0.000052-0.00046 (1)	0.0038-0.013 (1); 0.00249 (3)	x		x
2,3,3',4,4',5,6-Heptabromodiphenyl ether	BDE-190	189084-68-2		0.00479			x
2,2',3,3',4,4',5,6'-Octabromodiphenyl ether	BDE-196	446255-39-6	0.000085-0.0012 (1)	0.0054-0.018 (1)	x		
2,2',3,3',4,4',6,6'-Octabromodiphenyl ether	BDE-197	117964-21-3	0.000094-0.0013 (1)	0.0042-0.014 (1)	x		
2,2',3,4,4',5,5',6-Octabromodiphenyl ether	BDE-203	337513-72-1	0.001-0.002 (1)	0.006-0.02 (1); 0.00187 (3)	x		x

Substance	Abbreviation	CAS#	LOD	LOQ	Measured in		
					(1)	*(2)*	*(3)*
2,2',3,3',4,4',5,5',6-Nonabromodiphenyl ether	BDE-206	63387-28-0		0.0126 (3)			x
2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl ether	BDE-207	437701-79-6	0.00027-0.004 (1)	0.059-0.2 (1); 0.0072 (3)	x		x
2,2',3,3',4,4',5,5',6,6'-decabromodiphenyl ether[*,1]	BDE-209	1163-19-5	0.0019-0.021 (1)	0.87-4.0 (1)	x		
PFAS			***[ng/l]***	***[ng/l]***			
perfluoro-1-butanesulfonate	PFBS	375-73-5	7.7 (1); 1.6 (2)	28 (1); 7.7 (2)	x	x	
perfluoro-n-butanoic acid	PFBA	375-22-4	1.4	7.1-7.2		x	
perfluoro-n-pentanoic acid	PFPeA	2706-90-3	1.1 (2); 0.01[11] (3)	5.7 (2)		x	x
perfluoro-n-pentane sulfonate	PFPeS	630402-22-1	1.7	7.9		x	
perfluoro-n-hexanoic acid	PFHxA	307-24-4	2.3 (1); 1.4 (2); 0.01[11] (3)	8.4 (1); 7.1 (2)	x	x	x
perfluoro-1-hexanesulfonate[4]	PFHxS	355-46-4	6.2 (1); 9.0 (2); 0.01[11] (3)	23 (1); 4.1 (2)	x	x	x
perfluoro-n-heptanoic acid	PFHpA	375-85-9	2.7 (1); 1.4 (2); 0.01[11] (3)	10 (1); 6.1 (2)	x	x	x
perfluoro-heptanesulfonate	PFHpS	375-92-8	13 (1); 1.9 (2)	47 (1); 9.0 (2)	x	x	
perfluorooctanoic acid[*,1]	PFOA	335-67-1	6.2 (1); 1.4-2.8 (2); 0.015[11] (3)	22 (1); 6.1-12 (2)	x	x	x
perfluorooctanesulphonate[*,2]	PFOS	1763-23-1	13 (1); 2.4-8.4 (2); 0.01[11] (3)	47 (1); 11-38	x	x	x
perfluoro-n-nonanoic acid	PFNA	375-95-1	3.9 (1); 1.1-3.6 (2); 0.01[11] (3)	15 (1); 4.6-16 (2)	x	x	x
perfluoro-n-nonane sulfonate	PFNS	98789-57-2	1.5	6.9		x	
perfluoro-n-decanoic acid	PFDA	335-76-2	2.4 (1); 1.1-6.6 (2); 0.01[11] (3)	9.0 (1); 4.3-26 (2)	x	x	x
perfluoro decanesulfonate	PFDS	67906-42-7	10 (1); 1.4 (2)	36 (1); 6.6 (2)	x	x	
perfluoro-n-undecanoic acid	PFUnDA	2058-94-8	7.2 (1); 1.3-2.9 (2); 0.01[11] (3)	27 (1); 6.3-15 (2)	x	x	x
perfluoro-n-dodecanoic acid	PFDoA	307-55-1	3.4 (1); 1.3-2.6 (2)	26 (1); 6.5-13 (2)	x	x	
perfluoro-n-tridecanoic acid	PFTrDA	72629-94-8	10 (1); 2.4 (2)	37 (1); 12 (2)	x	x	
perfluoro-n-tetradecanoic acid	PFTeDA	376-06-7	13 (1); 2.0-4.9 (2)	47 (1); 9.5-23 (2)	x	x	
N-ethyl-perfluoro-n-octane sulfonamido acetic acid	EtFOSAA	2991-50-6	1.2-4.0	6.1-20		x	
4:2 fluorotelomer sulfonate	4:2 FTSA	757124-72-4	1.3	6.0		x	
6:2 fluorotelomer sulfonate	6:2 FTSA	27619-97-2	2.4	11		x	
8:2 fluorotelomer sulfonate	8:2 FTSA	39108-34-4	8.1	37		x	
dodecalfluoro-3H-4,8-dioxanonanoate	DONA	919005-14-4	1.2	5.8		x	
6:2 chlorinated polyfluorinated ether sulfonate	6:2 Cl-PFESA (F-53B)	73606-19-6	1.1	5.1		x	
hexafluoropropylene oxide-dimer acid	HFPO-DA (GenX)	13252-13-6	6.0	28-30		x	
Persistent organic pollutants (POPs)			***[ng/g] lipid***	***[ng/g] lipid***			
Aldrin[*,1]		309-00-2	0.5				x
Chlordane[*,1,5]		see footnote	0.5				x
Dieldrin[*,1]		60-57-1	0.5				x
DDT[*,2,6]		see footnote	0.5				x

Substance	Abbreviation	CAS#	LOD	LOQ	Measured in		
					(1)	*(2)*	*(3)*
Endrin[*,1,7]		see footnote	0.5				x
Heptachlor[*,1,8]		see footnote	0.5				x
Hexachlorobenzene[*,1,3]	HCB	118-74-1	0.5				x
alpha-Hexachlorocyclohexane[*,1]	α-HCH	319-84-6	0.5				x
beta-Hexachlorocyclohexane[*,1]	β-HCH	319-85-7	0.5				x
gamma-Hexachlorocyclohexane[*,1]	γ-HCH	58-89-9	0.5				x
Endosulfan[*,1,9]		see footnote	0.5				x
Toxaphene (Parlar) [*,1,10]		see footnote	0.5				x
Mirex[*,1]		2385-85-5	0.5				x
Hexabromobiphenyl[*,1]		36255-01-8	0.5				x
Pentachlorobenzene[*,1,3]		608-93-5	0.5				x
Chlordecone[*,1]		143-50-0	0.5				x
alpha-hexabromocyclododecane[*,1]	α-HBCD	134237-50-6	0.1				x
beta- hexabromocyclododecane[*,1]	β-HBCD	134237-51-7	0.1				x
gamma-hexabromocyclododecane[*,1]	γ-HBCD	134237-52-8	0.1				x
Persistent organic pollutants (POPs)				***[pg/g]***			
2,3,7,8-Tetrachlorodibenzofuran[*,3]	2,3,7,8-TCDF	51207-31-9		0.006			x
1,2,3,7,8-Pentachlorodibenzofuran[*,3]	1,2,3,7,8-PeCDF	57117-41-6		0.009			x
2,3,4,7,8-Pentachlorodibenzofuran[*,3]	2,3,4,7,8-PeCDF	57117-31-4		0.01			x
1,2,3,4,7,8-Hexachlorodibenzofuran[*,3]	1,2,3,4,7,8-HxCDF	70648-26-9		0.02			x
1,2,3,6,7,8-Hexachlorodibenzofuran[*,3]	1,2,3,6,7,8-HxCDF	57117-44-9		0.02			x
2,3,4,6,7,8-Hexachlorodibenzofuran[*,3]	2,3,4,6,7,8-HxCDF	60851-34-5		0.02			x
1,2,3,7,8,9-Hexachlorodibenzofuran[*,3]	1,2,3,7,8,9-HxCDF	72918-21-9		0.03			x
1,2,3,4,6,7,8-Heptachlorodibenzofuran[*,3]	1,2,3,4,6,7,8-HpCDF	67562-39-4		0.007			x
1,2,3,4,7,8,9-Heptachlorodibenzofuran[*,3]	1,2,3,4,7,8,9-HpCDF	55673-89-7		0.009			x
Octachlorodibenzofuran[*,3]	OCDF	39001-02-0		0.003			x
2,3,7,8-Tetrachlorodibenzo-p-dioxin[*,3]	2,3,7,8-TCDD	1746-01-6		0.005			x
1,2,3,7,8-Pentachlorodibenzo-p-dioxin[*,3]	1,2,3,7,8-PeCDD	40321-76-4		0.03			x
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[*,3]	1,2,3,4,7,8-HxCDD	39227-28-6		0.03			x
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[*,3]	1,2,3,6,7,8-HxCDD	57653-85-7		0.03			x
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[*,3]	1,2,3,7,8,9-HxCDD	19408-74-3		0.03			x
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[*,3]	1,2,3,4,6,7,8-HpCDD	35822-46-9		0.007			x
Octachlorodibenzo-p-dioxin[*,3]	OCDD	3268-87-9		0.02			x
Persistent organic pollutants (POPs)				***[ng/g]***			
2,4,4'-Trichlorobiphenyl[*,1]	PCB 28	7012-37-5		0.002			x
2,2',5,5'-Tetrachlorobiphenyl[*,1]	PCB 52	35693-99-3		0.006			x
3,3',4,4'-Tetrachlorobiphenyl[*,1]	PCB 77	32598-13-3		0.0000001			x
3,4,4',5-Tetrachlorobiphenyl[*,1]	PCB 81	70362-50-4		0.0000001			x
2,2',4,5,5'-Pentachlorobiphenyl[*,1]	PCB 101	37680-73-2		0.01			x

Substance	Abbreviation	CAS#	LOD	LOQ	Measured in		
					(1)	*(2)*	*(3)*
2,3,3',4,4'-Pentachlorobiphenyl[*,1]	PCB 105	32598-14-4		0.00002			x
2,3,4,4',5-Pentachlorobiphenyl[*,1]	PCB 114	74472-37-0		0.00001			x
2,3',4,4',5-Pentachlorobiphenyl[*,1]	PCB 118	31508-00-6		0.00001			x
2,3',4,4',5'-Pentachlorobiphenyl[*,1]	PCB 123	65510-44-3		0.00001			x
3,3',4,4',5-Pentachlorobiphenyl[*,1]	PCB 126	57465-28-8		0.0000003			x
2,2',3,4,4',5'-Hexachlorobiphenyl[*,1]	PCB 138	35065-28-2		0.02			x
2,2',4,4',5,5'-Hexachlorobiphenyl[*,1]	PCB 153	35065-27-1		0.02			x
2,3,3',4,4',5-Hexachlorobiphenyl[*,1]	PCB 156	38380-08-4		0.00002			x
2,3,3',4,4',5'-Hexachlorobiphenyl[*,1]	PCB 157	69782-90-7		0.00002			x
2,3',4,4',5,5'-Hexachlorobiphenyl[*,1]	PCB 167	52663-72-6		0.00002			x
3,3',4,4',5,5'-Hexachlorobiphenyl[*,1]	PCB 169	1336-36-3		0.00000003			x
2,2',3,4,4',5,5'-Heptachlorobiphenyl[*,1]	PCB 180	35065-29-3		0.03			x
2,3,3',4,4',5,5'-Heptachlorobiphenyl[*,1]	PCB 189	39635-31-9		0.00002			x
Short-chained chlorinated paraffins[*,1]	SCCPs	-	2.2	6.2			x
Medium-chained chlorinated paraffins	MCCPs	-	3.0	8.8			x
Pentachlorophenol[*,1]	PCP	87-86-5	0.5				x
Pentachloroanisole		1825-21-4	0.5				x
Hexachlorobutadiene[*,1,3]	HCBD	87-68-3	1.0				x

(1) pilot study (2013); (2) follow-up study (2014-2016); (3) WHO/UNEP breast milk monitoring programme
* listed in Stockholm Convention
[1] listed in Annex A of the Stockholm Convention (Elimination)
[2] listed in Annex B of the Stockholm Convention (Restriction)
[3] listed in Annex C of the Stockholm Convention (Unintentional production)
[4] recommended for listing in the Stockholm Convention
[5] sum of alpha-chlordane (CAS# 5103-71-9), gamma-chlordane (CAS# 5566-34-7) and oxy-chlordane (CAS# 27304-13-8); calculated as chlordane
[6] sum of o,p'-DDT (CAS# 789-02-6), p,p'-DDT (CAS# 50-29-3), p,p'-DDE (CAS# 68679-99-2) and p,p'-DDD (CAS# 72-45-8); calculated as DDT
[7] sum of endrin (CAS# 72-20-8) and endrin ketone (CAS# 53494-70-5); calculated as endrin
[8] sum of heptachlor (CAS# 76-44-8) and heptachlor epoxide (cis/trans) (CAS# 1024-57-3); calculated as heptachlor
[9] sum of alpha-endosulfan (CAS# 959-98-8), beta-endosulfan (CAS# 33213-65-9) and endosulfan sulfate (CAS# 1031-07-8)
[10] sum of parlar 26 (CAS# 142534-71-2), parlar 50 (CAS# 66860-80-8) and parlar 62 (CAS# 154159-06-5)
[11] given in ng/g milk; comprising the method detection limit (MDL)

Table S2: Correlations (Spearman) between levels of PBDE congeners in breast milk (n=18) of the pilot study (2013).

	triBDE	**tetraBDEs**				**pentaBDEs**				**hexaBDEs**			**heptaBDE**	**octaBDEs**			**nonaBDE**
	BDE-28	BDE-47	BDE-49	BDE-66	BDE-77	BDE-99	BDE-100	BDE-118	BDE-126	BDE-139	BDE153	BDE-154	BDE-183	BDE-196	BDE-197	BDE-203	BDE-207
BDE-47	0.705**																
BDE-49	0.656**	0.421															
BDE-66	0.654**	0.428	0.997**														
BDE-77	0.684**	0.443	0.955**	0.952**													
BDE-99	0.767**	0.934**	0.501*	0.504*	0.515*												
BDE-100	0.882**	0.866**	0.539*	0.544*	0.573*	0.920**											
BDE-118	0.681*	0.450	0.952**	0.955**	0.997**	0.518*	0.578*										
BDE-126	0.213	-0.024	0.346	0.292	0.362	0.072	0.070	0.306									
BDE-139	0.644**	0.442	0.828**	0.828**	0.867**	0.488*	0.545*	0.867**	0.385								
BDE- 153	0.609**	0.243	0.538*	0.528*	0.431	0.304	0.507*	0.421	0.047	0.370							
BDE-154	0.688**	0.449	0.944**	0.940**	0.989**	0.519*	0.570*	0.985**	0.306	0.800**	0.450						
BDE-183	0.108	0.096	0.029	0.034	-0.037	0.033	0.153	-0.032	-0.352	0.038	0.507*	-0.005					
BDE-196	0.069	-0.013	-0.343	-0.343	-0.420	-0.004	0.112	-0.420	-0.148	-0.323	0.411	-0.420	0.487*				
BDE-197	0.262	0.230	0.029	0.046	-0.086	0.134	0.305	-0.069	-0.398	0.058	0.601**	-0.092	0.570*	0.555*			
BDE-203	0.189	0.294	-0.322	-0.322	-0.278	0.322	0.369	-0.278	-0.148	-0.323	0.115	-0.268	-0.039	0.564*	0.372		
BDE-207	0.166	0.290	-0.358	-0.358	-0.382	0.225	0.216	-0.382	-0.225	-0.221	0.138	-0.382	0.122	0.520*	0.558*	0.669**	
BDE-209	0.138	0.219	-0.369	-0.369	-0.458	0.153	0.198	-0.458	-0.245	-0.285	0.286	-0.458	0.272	0.674**	0.682**	0.599**	0.921**

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Table S3: Results on PBDE congeners and total PBDEs concentration (ranges, means, medians in ng/g lipid; detection rates in %) from selected studies in European populations.

Country	**Sampling period**	**n**	**BDE-28**	**BDE-47**	**BDE-66**	**BDE-85**	**BDE-99**	**BDE-100**	**BDE-153**	**BDE-154**	**BDE-209**	**Total PBDEs**	**Reference**
							range (mean; median) [ng/g lipid]						
							detection rate						
Sweden (Uppsala)	1996-2006	276		<0.40-16 (1.9; 1.5)			<0.12-5.2 (0.45; 0.32)	<0.10-5.1 (0.36; 0.29)	0.20-4.6 (0.64; 0.57)			0.91-28 (3.5; 2.9)[1]	[1]
Finland (Turku), Denmark (Copenhagen)	1997-2001	68	(-; 0.1)	(-; 1.12)	(-; 0.03)		(-; 0.42)	(-; 0.27)	(-; 0.81)	(-; 0.04)		(-; 104.2)[2]	[2]
Italy (Rome)	2000-2001	1[3]	0.082	1.9	0.019	0.074	0.97	0.48	0.47	0.07		4.1[4]	[3]
Norway (Tromsø)	2000-2002	10	n.d.-0.4 (0.12; 0.10) *90%*	0.42-6.12 (1.74; 1.26) *100%*			0.16-1.42 (0.49; 0.41) *100%*	0.15-0.79 (0.38; 0.40) *100%*	0.43-1.85 (0.77; 0.68) *100%*	n.d.-0.25 (0.07; 0.06) *60%*	0.05-0.72 (0.22; 0.13) *100%*	1.68-9.67 (3.80; 3.19)[5]	[4]
Czech Republic (Olomouc region)	2003	103	<0.02-0.07 (0.06; 0.07)	0.16-2.02 (0.65; 0.58)	<0.02-0.11 (0.08; 0.08)		<0.02-0.70 (0.24; 0.22)	<0.02-0.35 (0.13; 0.12)	<0.03-0.54 (0.17; 0.15)	<0.02-0.12 (0.08; 0.07)			[5]
Spain (Madrid, Vallecas District)	2003-2004	22	<0.01-0.1 (-; 0.01)	0.03-3.6 (-; 0.37)	<0.01	<0.01-3.1 (-; 0.17)	0.30-3.3 (-; 0.51)	0.18-1.9 (-; 0.58)	<0.03-3.2 (-; 0.13)	<0.005-2.0 (-; 0.02)	<0.16-52 (-; 2.9)		[6]

Country	Sampling period	n	BDE-28	BDE-47	BDE-66	BDE-85	BDE-99	BDE-100	BDE-153	BDE-154	BDE-209	Total PBDEs	Reference
			range (mean; median) [ng/g lipid] *detection rate*										
Spain (Madrid, Getafe District)	2003-2004	30	<0.01	<0.003-1.2 (-; 0.22)	<0.01	<0.01-0.43 (-; 0.12)	0.15-0.72 (-; 0.38)	0.15-1.0 (-; 0.46)	<0.02-1.2 (-; 0.1)	<0.01	<0.16-33 (-; 2.8)		[6]
Norway	2003+	393 (46)[6]	<LOQ-6.8 (0.18; 0.093) *95.4%*	0.15-56 (1.7; 0.99) *100%*		<LOQ-0.89 (0.077; 0.040) *40.7%*	0.02-9.5 (0.49; 0.27) *100%*	<LOQ-6.4 (0.40; 0.25) *99.7%*	<LOQ-5.0 (0.56; 0.45) *99.5%*	<LOQ-1.2 (0.062; 0.036) *63.4%*	<LOQ-5.8 (0.61; 0.32) *76%*	0.48-82 (3.4; 2.1)[7]	[7]
Spain (Madrid)	2004	11										0.04-1.38 (0.33; -)[8]	[8]
Poland (Wielkopolska)	2004	22	<LOQ-0.33 (0.07; <LOQ)	0.31-5.62 (1.07; 1.03)			<LOQ-1.43 (0.47; 0.33)	<LOQ-0.55 (0.15; 0.05)	0.015-1.12 (0.53; 0.45)			0.08-8.4 (2.5; 2.0)[9]	[9]
France (Toulouse)	2004-2006	62-77	0.037-1.62 (0.179; 0.089)	0.343-12.0 (0.162; 1.15)		0.009-0.216 (0.046; 0.028)	0.133-5.3 (1.10; 0.527)	0.046-3.91 (0.412; 0.226)	0.288-10.5 (0.019; 0.781)	0.009-0.691 (0.097; 0.04)	0.39-6.80 (1.88; 1.62)		[10]
Spain (Madrid)	2005	9	<LOQ-0.097	0.15-0.97 (0.53; 0.54)	<LOQ-0.017	<LOQ-0.26 (0.14; 0.15)	0.32-0.69 (0.52; 0.51)	0.19-0.81 (0.55; 0.58)	0.040-0.63 (0.24; 0.16)	<LOQ-0.26 (0.061; 0.017)	0.20-5.7 (2.5; 2.7)	2.1-11 (5.5; 5.3)[10]	[11]

Country	Sampling period	n	BDE-28	BDE-47	BDE-66	BDE-85	BDE-99	BDE-100	BDE-153	BDE-154	BDE-209	Total PBDEs	Reference
			range (mean; median) [ng/g lipid] *detection rate*										
			(0.032; 0.01)		(<LOQ; <LOQ)								
Germany (Munich)	2005	42	0.19-2.24 (0.66; 0.51) *95% (>LOQ)*				0.03-1.34 (0.28; 0.18) *83% (>LOQ)*	0.03-0.70 (0.18; 0.15) *100% (>LOQ)*	0.19-2.02 (0.73; 0.61) *95% (>LOQ)*			0.65-5.76 (2.03; 1.64)[11]	[12]
Slovakia[12]	2006-2007	14	(0.022; 0.017)	(0.20; 0.12)			(0.051; 0.032)	(0.056; 0.043)	(0.14; 0.12)	(0.009; 0.008)		(0.52; 0.40)[13]	[13]
Belgium (Flanders)	2009-2010	84	(-; <LOQ)	(-; 0.16)			(-; 0.06)	(-; 0.06)	(-; 0.29)	(-; 0.07)	(-; 0.65)		[14]
United Kingdom (Birmingham)	2010	35		0.17-14.65 (3.3; 2.8) *100%*		<0.05-0.83 (0.08; <0.05) *46%*	<0.06-3.43 (0.71; 0.69) *94%*	<0.05-1.86 (0.45; 0.38) *89%*	<0.06-4.57 (1.1; 0.91) *97%*	<0.06-11.1 (0.30; 0.21) *77%*	<0.06-0.92 (0.31; 0.25) *69%*		[15]
United Kingdom	2011-2012	6	0.02-0.31 (-; 0.09) *100%*	0.32-13.1 (-; 1.92) *100%*	<0.03-0.13 (-; 0.03) *67%*	<0.01-0.35 (-; 0.04) *83%*	0.12-3.7 (-; 0.88) *100%*	0.07-2.19 (-; 0.64) *100%*	0.70-1.68 (-; 1.01) *100%*	0.01-0.18 (-; 0.07) *100%*	<0.20-1.04 (-; 0.54) *83%*	1.28-22.02 (-; 5.67)[14]	[16]

Country	Sampling period	n	BDE-28	BDE-47	BDE-66	BDE-85	BDE-99	BDE-100	BDE-153	BDE-154	BDE-209	Total PBDEs	Reference
			range (mean; median) [ng/g lipid] *detection rate*										
Germany	2016	100	<LOQ-0.12 (0.031; 0.029) *96%*	x-2.4 (0.31;0.20) *100%*	<LOQ-0.022 (;) *39%*	<LOQ-0.028 (;) *19%*	<LOQ-0.42 (0.086;0.063) *99%*	<LOQ-0.45 (0.076;0.054) *98%*	x-1.98 (0.46;0.38) 100%	<LOQ-0.029 (0.009;0.007) *83%*	<LOQ-104 (4.22;0.42) *96%*	x-113 (5.73;1.74)[1] [6]	[17]
Austria (Vienna)	2013	18	n.d.-0.38 (0.11; <LOQ) *72.2%*	n.d.-6.0 (1.04; <LOQ) *66.7%*	n.d.-0.48 (0.051; n.d.) *38.9%*	n.d. *0%*	n.d.-2.4 (0.52;<LOQ) *66.7%*	n.d.-1.1 (0.22; 0.16) *77.8%*	n.d.-0.86 (0.28; 0.23) *88.9%*	n.d.-1.3 (0.12; n.d.) *33.3%*	n.d.-43 (11.8; <LOQ) *55.6%*	0.055-52 (15; 11)[15]	this study

Abbreviations: LOQ: limit of quantification; n.d.: not detected.

[1] Σ BDE-47, -99, -100, -153 and -154. [2] Σ BDE-28, -47, -66, -71, -75, -77, -85, -99, -100, -119, -138, -153, -154 and -183. [3] Pooled sample consisting of 10 donors. [4] Σ BDE-17, -28, -47, -66, -85, -99, -100, -138, -153, -154 and -183. [5] Σ BDE-28, -47, -99, -100, -153, -154 and -209. [6] BDE-209 was investigated in a subsample (n=46). [7] Σ BDE-28, -47, -99, -100, -153, -154 and -183. [8] Σ BDE-17, -28, -47, -66, -85, -99, -100, -153 and -154. [9] Σ BDE-28, -47, -99, -100, -153 and -183. [10] Σ BDE-17, -28, -47, -66, -85, -99, -100, -153, -154, -183, -184, -191, -196, -197 and -209. [11] Σ BDE-47, -99, -100, -153 and -183. [12] Breast milk samples of women from four Slovakian areas were investigated in this study. Only the results from the area with the highest sample size are included in the table. [13] Σ BDE-28, -47, -99, -100, -153, -154 and -183. [14] Σ BDE-28, -47, -49, -66, -85, -99, -100, -138, -153, -154, -183 and -209. [15] Σ BDE-28, -47, -49, -66, -77, -85, -99, -100, -118, -126, -139, -153, -154, -181, -183, -196, -197, -203, -207 and -209. [16] ∑BDE-17,-18, -47, -66, -85, -99, -100, -153, -154, -183, -196, -197, -203, -206, -207, -208, -209.

Table S4: Results on PFOA and PFOS concentrations (ranges, means, medians; detection rates in %) from selected studies in European populations.

Country (City)	Sampling period	n	PFOS [µg/l]	PFOA [µg/l]	Reference
			range (mean; median) ***detection rate %***		
Hungary (Gyor)	1996-1997	13	0.096-0.639 (0.317; 0.330)		[18]
Germany (Leipzig)	1996-2006	38	0.033-0.309 (0.126; 0.123)		[18]
Sweden (Uppsala)	2004	12	0.060-0.470 (0.201; 0.166) *100%*	<0.209-0.492 (0.017; -) 92%	[19]
Germany (Munich)	2006	19	0.028-0.239 (0.116; 0.113)		[18]
Belgium	2006	22	<0.40-28.2 (-; 2.9)	<0.30-3.5 (-; 0.3)	[20]
France	2007	48	<0.050-0.33 (0.092; 0.079) *90%*	<0.070-0.224 (0.082; 0.075) *98%*	[21]
Spain (Catalonia)	2007-2008	10	0.07-0.22 (0.12; 0.11) *100%*	<LOD *0%*	[22]
Germany (Bavaria)	2007-2008	302	<0.02-0.26 (0.06; 0.05) *100%*	<0.08-0.29 (0.08; -) *2%*	[23]
Spain (Barcelona)	before 2010	20	<0.012-0.865 (0.116; 0.084) *95% (>LOQ)*	<0.015-0.907 (0.15; -) *45%*	[24]
Belgium (Flanders)	2009-2010	40	(0.13; 0.10) *100% (>LOQ)*	(0.08; 0.07) *100% (>LOQ)*	[14]
Italy (Bologna)	2010	21[a]	0.015-0.288 (0.057; -)[a] *90% (>LOQ)*[a]	0.024-0.241 (0.076; -)[a] *81% (>LOQ)*[a]	[25]
Italy (Bologna)	2010	16[b]	0.015-0.116 (0.036; -)[b] *63% (>LOQ)*[b]	0.024-0.100 (0.043; -)[b] *69% (>LOQ)*[b]	[25]
France (Toulouse)	2010-2013	61	<LOD-0.376 (0.04; <0.04) *82%*	<LOD-0.308 (0.041; <0.05) *77%*	[26]
Italy (Siena)	before 2013	49	1.02-4.28 (0.85; -)	n.d.- 7.78 (0.16; -)	[27]

Country (City)	Sampling period	n	PFOS [µg/l]	PFOA [µg/l]	Reference
			range (mean; median) *detection rate %*		
			41%	*2%*	
Netherlands	2014	50	0.045	<0.080	[28]
Czech Republic	2014	164	<0.002-0.095 (0.018; -)	<0.006-0.159 (0.034; -)	[29]
Sweden	2016	10	0.023-0.058 (0.039; -)	<0.002-0.081 (0.042; -)	[30]
			25%	*25%*	
Ireland	probably 2016	92	<0.02-0.12 (0.038; 0.02)	0.016-0.35 (0.13; 0.10)	[31]
			62%	*100%*	
Czech Republic	2017	232	<0.002-0.083 (0.014; -)	<0.003-0.16 (0.024; -)	[29]
Germany (Schleswig-Holstein)	2015-2017	80	(0,018; <0,025)	(0,016; <0,025)	[17]
Germany (Bavaria)	2016-2018	100	(0,017; <0,025)	(0,027; <0,025)	[17]
Austria (Vienna)	2013	21	0.058 – 0.31 (0.124; 0.11)	n.d.-0.83 (0.016; -) *52%*	present study
			100%		
Austria (Vienna)	2014-2016	40	<LOD-0.55 (0.015; 0.012)	<LOQ-0.91 (0.030; 0.025)	present study
			97.5%	*100%*	

Abbreviations: LOQ: limit of quantification; LOD: limit of quantification; "-": not available
[a] primipara
[b] multipara

Table S5: POPs detected in the Austrian pool sample within WHO/UNEP

POP concentrations in WHO/UNEP pooled breast milk sample [ng/g lipid] (n=1)		Health based values [ng/g lipid]	Daily intake via breast milk consumption [µg/kg bw/d][1]		Health based guidance values[2] (TDI, PTDI, MRL[3]) [µg/kg bw/d]
Substance	Concentration		Average intake	High intake	
Aldrin	n.d.	BE: 2,3002	-	-	TDI: 0.1[21]
Chlordane group (sum of α-chlordane, γ-chlordane and oxy-chlordane; calculated as chlordane)	1.5		0.0081	0.0121	PTDI: 0.5[4] MRL: 0.0000006[5]
Dieldrin	2.0	x	0.0108	0.0161	PTDI, TDI: 0.1[6,21] MRL: 0.00000005[5]
DDT group (sum of o,p'-DDT, p,p'-DDT, p,p'-DDE and p,p'-DDD; calculated as DDT)	120	2,300[18]	0.6452	0.9679	PTDI: 0.00001[7] MRL: 0.0000005[8] TDI: 10[21]
Endrin group (sum of endrin and endrin ketone; calculated as endrin)	<0.5		-	-	
Heptachlor group (sum of heptachlor and heptachlor-epoxide (cis/trans); calculated as heptachlor)	1.6		0.0086	0.0129	TDI: 0.0000001[9] MRL: 0.0000001[10]
HCB	14.9		0.0807	0.1210	TDI: 0.17[11] MRL: 0.00000007[5]
HCH-group					
α-HCH	<0.5		-	-	
β-HCH	23.4		0.1258	0.1887	MRL: 0.0000006[12]
γ-HCH	<0.5		-	-	
Endosulfan group (sum of alpha-endosulfan, beta-endosulfan, endosulfan sulfat)	<0.5		-	-	
Toxaphene group (sum of parlar 26, parlar 50 and parlar 62)	<0.5		-	-	
Mirex	<0.5		-	-	
Hexabrombiphenyl	<0.5		-	-	
Pentachlorobenzene	<0.5		-	-	TDI: 1[21]
Pentachlorophenol	<0.5				TDI: 6[21]
Pentachloroanisole	<1.0				
Hexachlorobutadiene	<1.0				
p,p-Dicofol	NA				
Chlordecone	<0.5		-	-	
HBCD group	6.0				
α-HBCD	6.0	BE: 190,000[13]	0.0323	0.0484	-

POP concentrations in WHO/UNEP pooled breast milk sample [ng/g lipid] (n=1)		Health based values [ng/g lipid]	Daily intake via breast milk consumption [µg/kg bw/d][1]		Health based guidance values[2] (TDI, PTDI, MRL[3]) [µg/kg bw/d]
Substance	Concentration		Average intake	High intake	
		HBM-I: 300[14,15]			
β-HBCD	<0.1		-	-	
γ-HBCD	<0.1		-	-	
PBDEs (sum)[16]	1.32				
BDE-17	0.0017				
BDE-28	0.0256				
BDE-47	0.412				
BDE-66	0.0067				
BDE-99	0.128				
BDE-100	0.126				
BDE-138	0.0042				
BDE-153	0.548				
BDE-154	0.0124				
BDE-183	0.0542				
Dioxins and Furans (WHO2005-PCDD/F-TEQ)	0.0032	BE (Dioxin-TEQ): 15[13]			TWI: 2 pg TEQ/kg bw/week[17]
2,3,7,8-TCDF	0.00028				
1,2,3,7,8-PeCDF	0.00017				
2,3,4,7,8-PeCDF	0.00354				
1,2,3,4,7,8-HxCDF	0.00103				
1,2,3,6,7,8-HxCDF	0.00092				
2,3,4,6,7,8-HxCDF	0.00050				
1,2,3,7,8,9-HxCDF	0.000039				
1,2,3,4,6,7,8-HpCDF	0.00073				
1,2,3,4,7,8,9-HpCDF	0.000037				
OCDF	0.00010				
2,3,7,8-TCDD	0.00044				
1,2,3,7,8-PeCDD	0.00103				
1,2,3,4,7,8-HxCDD	0.00054				
1,2,3,6,7,8-HxCDD	0.00218				
1,2,3,7,8,9-HxCDD	0.00065				
1,2,3,4,6,7,8-HpCDD	0.0032				
OCDD	0.0186				
Polychlorinated biphenyls (WHO-PCB-TEQ)	0.00231				TWI: 2 pg TEQ/kg bw/week[20]
PCB 28	0.91				
PCB 52	0.11				
PCB 101	0.18				
PCB 138	9.6				
PCB 153	17.7				
PCB 180	9.6				
sum of indicator PCB	38.0				
PCB 105	0.60				
PCB 114	0.12				
PCB 118	2.88				
PCB 123	0.025				
PCB 156	1.50				
PCB 157	0.24				
PCB 167	0.50				
PCB 189	0.14				

POP concentrations in WHO/UNEP pooled breast milk sample [ng/g lipid] (n=1)		Health based values [ng/g lipid]	Daily intake via breast milk consumption [µg/kg bw/d][1]		Health based guidance values[2] (TDI, PTDI, MRL[3]) [µg/kg bw/d]
Substance	Concentration		Average intake	High intake	
PCB 77	0.004				
PCB 81	0.001				
PCB 126	0.018				
PCB 169	0.010				
WHO-mono-ortho PCB-TEQ	0.00018				
WHO-non-ortho PCB-TEQ	0.00213				
WHO-PCDD/F-PCB-TEQ	0.00551				
Chlorinated paraffins	20				
SCCPs	20				TWI: 100 µg/kg bw/day[19]
MCCPs	n.n.				

[1] Daily intakes were calculated based on results substance concentrations in the Austrian WHO pooled breast milk sample according to calculation procedure published in [32] considering the following assumptions: 800 ml breast milk consumption per day for average intake, 1,200 ml breast milk consumption per day for high intake, 6.1 kg infant bodyweight. Analytical data is expressed in ng/g lipid. The measured lipid content of the pooled breast milk sample is 4.1%, which was used for the calculation. [2] Values are only given for substances found the investigated pooled breast milk sample. [3] [33]. [4] Derived based on liver toxicity in rats; source: [34]. [5] Chronic, oral; endpoint: hepatic. [6] [35]. [7] Derived based on developmental effects in rats; source: [36]. [8] MRL for p,p'-DDT; oral, intermediate; endpoint: hepatic. [9] Derived based on histopathological changes in liver of dogs; source: [37]. [10] Oral, intermediate; endpoint: immunotoxicity. [11] [36]. [12] Oral, intermediate; endpoint: hepatic. [13] [38]. [14] [39]. [15] HBM-I value for total HBCD. [16] sum of BDE-15, -17, -28, -47, -49, -66, -75, -77, -85, -99, -100, -119, -126, -138, -153, -154, -183, -190, -196, -197, -203, -206, -207, -208 and -209. [17] [40]. [18] [41]. [19] [42]. [20] [40]. [21] [43].

Abbreviations: BE: Biomonitoring Equivalent; bw: body weight; d: day; HBM: Human Biomonitoring; MRL: minimal risk level; n.d.: not detected; POP: persistent organic pollutants; PTDI: provisional tolerable daily intake; TDI: tolerable daily intake; TEQ: toxic equivalent; TWI: tolerable weekly intake.

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