Annex C - Statement for use of the 2020 EFSA Opinion on the risks to human health related to the presence of perfluoroalkyl substances in food in UK risk assessments

In this guide

Dust exposures

1.   A literature search was carried out for concentrations of PFAS in dust. There were few UK data. Therefore, data from countries in the EU where dust samples in the home had been collected, were also considered. Only studies with samples collected in homes that had median and/or maximum values were included in the exposure calculations. Tables 1 to 4 show the study information and dust concentrations for PFOS and PFOA, PFHxS and PFNA, respectively.

Table 1. Concentrations of PFOS in dust (ng/g) in UK and EU studies where samples were taken in homes, after 2008.

Region, country	Year of sampling	No. of samples	Mean LB-UB (ng/g) (SEM[a], SDb or 95% CI[c])	Median (ng/g)	Range (ng/g)	LOD[a] LOQ[b] (ng/g)	Detection frequency (%)	Reference
Birmingham, UK	2007 - 2009	45	450	140	3.5 - 7400		100	Goosey and Harrad, 2011
Annecy, France	2007 - 2009	10	330	160	54 - 1700		100	Goosey and Harrad, 2011
Augsburg and Michelstadt, Germany	2007 - 2009	10	310	170	47 - 1000		100	Goosey and Harrad, 2011
Ireland	2016 - 2017	32	6	0.96	0.1 - 140	0.1	63	Harrad et al., 2020
Belgium	2016 - 2017	22	NC	0.77	ND - 6.81	0.04	73	de la Torre et al., 2019
Italy	2016 - 2017	22	NC	0.33	ND - 11.9	0.04	73	de la Torre et al., 2019

Region, country	Year of sampling	No. of samples	Mean	Median	Range	LOD/LOQ	Detection frequency	Reference
Spain	2016 - 2017	21	NC	0.03	ND - 2.45	0.04	43	de la Torre et al., 2019
Catalonia, Spain	2009	10	2.8[#]	2.5[#]	1.1 - 12	0.13[a]	100	Jogsten et al., 2012

Values are given to 2 significant figures. SEM – standard error of the mean; LB - lower bound assigns the value of zero to non-quantified data; UB - upper bound assigns the value of the LOD/LOQ to non-quantified data; SD – standard deviation; 95% CI – 95th percent confidence interval; NC not calculated; ND – not determined; LOD – limit of detection; LOQ – limit of quantification; #calculated from individual data in the published paper.

Table 2. Concentrations of PFOA in dust (ng/g) in UK and EU studies where samples were taken in homes, after 2008.

Region, country	Year of sampling	No. of samples	Mean LB-UB (ng/g) (SEM[a], SD[b] or 95% CI[c])	Median (ng/g)	Range (ng/g)	LOD[a] LOQ[b] (ng/g)	Detection frequency (%)	Reference
Birmingham, UK	2007 - 2009	45	310	190	0.98 - 4100	0.98	98	Goosey and Harrad, 2011
Annecy, France	2007 - 2009	10	52	31	15 - 220	0.98	100	Goosey and Harrad, 2011

Augsburg and Michelstadt, Germany	2007 - 2009	10	290	300	19 - 730	0.98	100	Goosey and Harrad, 2011
Ireland	2016 - 2017	32	4.7	0.42	0.05 - 83	0.05	66	Harrad et al., 2020
Belgium	2016 - 2017	22	NC	1.54	0.31 - 24.2	0.11	100	de la Torre et al., 2019
Italy	2016 - 2017	22	NC	1.56	0.21 - 53	0.11	100	de la Torre et al., 2019
Spain	2016 - 2017	21	NC	1	0.42 - 12.5	0.11	100	de la Torre et al., 2019
Catalonia, Spain	2009	10	5.4[#]	4.2[#]	1.5 - 36	0.16[a]	100	Jogsten et al., 2012

Values are given to 2 significant figures. SEM – standard error of the mean; LB - lower bound assigns the value of zero to non-quantified data; UB - upper bound assigns the value of the LOD/LOQ to non-quantified data; SD – standard deviation; 95% CI – 95th percent confidence interval; NC not calculated; LOD – limit of detection; LOQ – limit of quantification; #calculated from individual data in the published paper.

Table 3. Concentrations of PFHxS in dust (ng/g) in UK and EU studies where samples were taken in homes, after 2008.

Region, country	Year of sampling	No. of samples	Mean LB-UB (ng/g) (SEM[a], SD[b] or 95% CI[c])	Median (ng/g)	Range (ng/g)	LOD[a] LOQ[b] (ng/g)	Detection frequency (%)	Reference
Birmingham, UK	2007 - 2009	45	450	210	7.6 - 6100		100	Goosey and Harrad, 2011
Annecy, France	2007 - 2009	10	130	77	54 - 320		100	Goosey and Harrad, 2011
Augsburg and Michelstadt, Germany	2007 - 2009	10	290	150	16 - 790		100	Goosey and Harrad, 2011
Ireland	2016 - 2017	32	1.4	0.1	0.1 - 9.9	0.1	47	Harrad et al., 2020
Belgium	2016 - 2017	22	NC	0.13	ND - 11.3	0.18	23	de la Torre et al., 2019
Italy	2016 - 2017	22	NC	0.13	ND - 3.62	0.18	36	de la Torre et al., 2019

Spain	2016 - 2017	21	NC	0.95	ND - 7.16	0.18	76	de la Torre et al., 2019
Catalonia, Spain	2009	10	0.57[#]	0.45[#]	0.17 - 5.3	0.003[a]	100	Jogsten et al., 2012

Values are given to 2 significant figures. SEM – standard error of the mean; LB - lower bound assigns the value of zero to non-quantified data; UB - upper bound assigns the value of the LOD/LOQ to non-quantified data; SD – standard deviation; 95% CI – 95th percent confidence interval; NC not calculated; ND – not determined; LOD – limit of detection; LOQ – limit of quantification; #calculated from individual data in the published paper.

Table 4. Concentrations of PFNA in dust (ng/g) in UK and EU studies where samples were taken in homes, after 2008.

Region, country	Year of sampling	No. of samples	Mean LB-UB (ng/g) (SEM [a], SD [b] or 95% CI [c])	Median (ng/g)	Range (ng/g)	LOD [a] LOQ [b] (ng/g)	Detection frequency (%)	Reference
Ireland	2016 - 2017	32	0.52	0.05	0.05 - 14	0.05	9	Harrad et al., 2020
Belgium	2016 - 2017	22	NC	0.04	ND - 9.04	0.06	36	de la Torre et al., 2019
Italy	2016 - 2017	22	NC	0.1	ND - 6.54	0.06	55	de la Torre et al., 2019

Spain	2016 - 2017	21	NC	0.04	ND - 5.7	0.06	48	de la Torre et al., 2019
Catalonia, Spain	2009	10	1.9[#]	0.87[#]	0.4 - 37	0.038[a]	100	Jogsten et al., 2012

Values are given to 2 significant figures. SEM – standard error of the mean; LB - lower bound assigns the value of zero to non-quantified data; UB - upper bound assigns the value of the LOD/LOQ to non-quantified data; SD – standard deviation; 95% CI – 95th percent confidence interval; NC not calculated; ND – not determined; LOD – limit of detection; LOQ – limit of quantification; #calculated from individual data in the published paper.

2.   The exposure estimates are based on concentrations derived as an average of the median (Table 5) or maximum (Table 6) values reported in the literature.

Table 5. Concentrations derived (ng/g) as an average of the median values reported in the literature.

Chemical	Average of reported median values (ng/g)	References
PFOS	59	Goosey and Harrad, 2011; Harrad et al., 2020; de la Torre et al., 2019; and Jogsten et al., 2012
PFOA	66	Goosey and Harrad, 2011; Harrad et al., 2020; de la Torre et al., 2019; and Jogsten et al., 2012
PFHxS	55	Goosey and Harrad, 2011; Harrad et al., 2020; de la Torre et al., 2019; and Jogsten et al., 2012

		Harrad et al., 2020; de la Torre et al., 2019;
PFNA	0.22	and Jogsten et al., 2012

Concentrations are given to 2 sig. figs.

Table 6. Concentrations derived as an average of the maximum values reported in the literature.

Chemical	Average of reported maximum values (ng/g)	References
PFOS	1300	Goosey and Harrad, 2011; Harrad et al., 2020; de la Torre et al., 2019; and Jogsten et al., 2012
PFOA	660	Goosey and Harrad, 2011; Harrad et al., 2020; de la Torre et al., 2019; and Jogsten et al., 2012
PFHxS	910	Goosey and Harrad, 2011; Harrad et al., 2020; de la Torre et al., 2019; and Jogsten et al., 2012
PFNA	14	Harrad et al., 2020; de la Torre et al., 2019; and Jogsten et al., 2012

Concentrations are given to 2 sig. figs.

3.   Dust ingestion rates were taken from the EPA Exposure Factors Handbook (2011) Exposure Factors Handbook 2011 Edition (Final Report) | Science Inventory | US EPA which had been updated in 2017. Average bodyweights for the UK populations were calculated from NDNS (18 months – 95 years) and DNSIYC (4 – 18 months) data for different age groups. These are all shown in Table 7. Two bodyweights were provided for the toddler age group: 10 Kg for the 7 - 18 months age group and 16 Kg for those aged 18 months to 4

years. As the 16 Kg represented a wider age range, that was used in the exposure calculations.

4.   Exposures from dust ingestion were calculated for median and high concentrations of PFOS, PFOA, PFHxS and PFNA and mean median ingestion rates, for each UK population group (Table 8).

Table 7. Dust ingestion rates and average UK bodyweights for UK population groups.

Population group (age range)	dust ingestion (mg/day), mean +/- SD	average UK bodyweight (Kg)
Infants (0 - 6 months)	36 ± 130	7.8
Toddlers (7 months - 4 yrs)	41 ± 71	16
Children (5 - 11 yrs)	32 ± 59	31
Teenagers (12 - 19 yrs)	2.2 ± 3.6	63
Adults (20 - 59 yrs)	2.6 ± 4.2	79
Seniors (60+ yrs)	2.6 ± 4.2	77

5.   For the average median PFASs concentrations in dust, the following ranges of exposures were calculated for all UK population groups for each of the compounds (Table 8):

- PFOS (59 ng/g): 0.014 – 1.9 ng/kg bw per week
- PFOA (66 ng/g): 0.015 – 2.1 ng/kg bw per week
- PFHxS (55 ng/g): 0.013 – 1.8 ng/kg bw per week
- PFNA (0.22 ng/g): 0.000051 – 0.0071 ng/kg bw per week

6.   For the average maximum PFASs concentrations in dust, the following ranges of exposures were calculated for all UK population groups for each of the compounds (Table 8):

- PFOS (1300 ng/g): 0.30 - 42 ng/kg bw per week
- PFOA (660 ng/g): 0.15 – 21 ng/kg bw per week
- PFHxS (910 ng/g): 0.21 – 29 ng/kg bw per week
- PFNA (14 ng/g): 0.0032 – 0.45 ng/kg bw per week

7.   For all PFASs considered, infants had the highest exposures and teenagers, adults and seniors had the lowest exposures.

Table 8. Estimated exposures for PFOS, PFOA, PFHxS and PFNA (ng/kg bw per week) for UK population groups (mean dust ingestion rates (mg/day).

Exposure (ng/kg bw/week)	Infants	Toddlers	Children	Teenagers	Adults	Seniors
PFOS **(59 ng/g)**	1.9	1.1	0.43	0.014	0.014	0.014
PFOS **(1300 ng/g)**	42	23	9.4	0.32	0.30	0.31
PFOA **(66 ng/g)**	2.1	1.2	0.48	0.016	0.015	0.016
PFOA **(660 ng/g)**	21	12	4.8	0.16	0.15	0.16

PFHxS (55 ng/g)	1.8	0.99	0.40	0.013	0.013	0.013
PFHxS (910 ng/g)	29	16	6.6	0.22	0.21	0.22
PFNA (0.22 ng/g)	0.0071	0.0039	0.0016	0.000054	0.000051	0.000052
PFNA (14 ng/g)	0.45	0.25	0.10	0.0034	0.0032	0.0033

Mean dust ingestion rates: infants 36 mg/day; toddlers 41 mg/day; children 32 mg/day; teenagers 2.2 mg/day; adults and seniors 2.6 mg/day.

COT
October 2022
Statement Number 04/22

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