European Food Safety Authority

Unit on Biological Hazards and Contaminants

Information Session on the EFSA Opinion on PCDD/Fs and DL-PCBs in food and feed

Parma, 13 November 2018

1. Introduction

In June 2018 the Panel on Contaminants in the Food Chain (CONTAM Panel) adopted the Scientific Opinion on polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (DL-PCBs) in food and feed (the Opinion). Before its publication, EFSA organised an Information Session with European countries to explain and promote the understanding of the CONTAM Panel Opinion.

The adopted Opinion was distributed under confidentiality to the members of the EFSA Advisory Forum end of August 2018, which were invited to submit general comments, and to express interest to attend an Information Session that was held 13 November at EFSA premises.

Twenty-two representatives from European Member States (MS) including Norway and Iceland (hereinafter the Member States) participated in the Information Session. The discussion was based on the different comments of scientific nature submitted by the Member States. The comments as submitted are available in the EFSA website [1] (here). The event was interactive and allowed for an exchange of views and discussions.

2. Discussion Points

Juliane Kleiner, acting Head of EFSA's Risk Assessment and Scientific Assistance Department, opened the Session and welcomed the participants. The objectives of the meeting were:

- to present the methodologies applied in the Opinion,
- to present the main outcomes of the Opinion related to the comments received,
- to provide clarifications ahead of its publication based on the comments submitted by the different Member States, and
- to provide an opportunity for an open dialogue with EFSA and the experts who worked on the Opinion.

Members of the EFSA CONTAM Working Group (WG) on Dioxins and of the EFSA CONTAM Panel 2015–2018 (the Panel that adopted the Opinion) presented aspects of the Opinion to cover the comments raised by the Member States. After each block of presentations the floor was opened for discussion and comments. The comments and discussion mainly related to the following aspects of the Opinion:

(i) Scope of the mandate
(ii) Human exposure assessment
(iii) Critical effect and critical epidemiological studies

[1] The written comments by the representatives from UK were submitted outside the agreed deadline and after the Information Session was held.

(iv) Uncertainty in the current World Health Organisation toxic equivalency factor (WHO_{2005}-TEF) scheme
(v) Toxicokinetic modelling
(vi) Interpretation of the tolerable weekly intake (TWI)

Upon request by the German representatives, a presentation with the German comments was scheduled under agenda item 4 (see Annex 1).

EFSA acknowledged that a public consultation on the draft Opinion before adoption would have been the preferred option, but it was not planned for this specific mandate. Future CONTAM Panel opinions will be considered for public consultation and a planner with the public consultations EFSA expects to hold, including the CONTAM draft opinions, is available on its website (here).

Scope of the mandate

It was clarified that the mandate received by EFSA from the European Commission (EC) did not include a risk-benefit assessment of fish consumption that takes exposure to PCDD/Fs and DL-PCBs into account. This was however one of the recommendations made by the CONTAM Panel in its Opinion.

Human exposure assessment

Questions related to the methodology to estimate the chronic exposure were raised, in particular why the chronic exposure assessment was not performed using statistical modelling in order to adjust for usual exposure. EFSA noted that the exposure in the Opinion was estimated using a deterministic approach based on the mean of pooled EU occurrence data and individual food consumption data and body weight from the EFSA Comprehensive European Food Consumption Database. The use of food consumption data covering only a few days to estimate chronic exposure could result in an overestimation at the high percentiles (P95), as acknowledged in the uncertainty section of the Opinion. The use of statistical models for the adjustment of usual exposure would not be possible for a number of population groups and countries since the basic requirement of these methodologies would not be met (e.g. non-consecutive days) in a number of dietary surveys. In addition, EFSA considered the use of this methodology as not fit for purpose in the current opinion since it would require checking the possibility of the use of the statistical models (e.g. test the log-normality of the exposure distribution) in each of the (around 100) countries and population groups, and then adjust the estimates for each scenarios by means of the statistical models only when all requirements were met.

It was raised that the exposure estimates in the Opinion, which are based on pooled European occurrence data, are anticipated to be higher or lower than in particular countries. This issue is discussed in detail in the uncertainty section of the opinion. In particular, EFSA indicated that chemical concentration data in food from different countries are pooled to derive international summary

representative concentrations for use in multi-national dietary exposure calculations. By doing this, it is assumed that a global market and concentrations from commodities sampled in one country are representative of the others. Considering this assumption, a country-to-country comparison of the exposure estimates is not advisable.

The food occurrence data used in the Opinion were collected from the time period 2010–2016 and were therefore codified according to FoodEx classification system. The FoodEx2 classification and description system was not yet in place when most of the data were submitted to EFSA.

Annex B of the Opinion includes detailed information on the occurrence data in food (and feed) used for the exposure assessment, as well as estimates per survey (country) and age group. Initiatives for the publication of occurrence data on chemical contaminants and other compounds submitted to EFSA from EU coordinated monitoring programmes and surveys are currently on-going and discussed at the EFSA Advisory Forum.

It was noted that the exposure to other dioxin-like compounds (acting via the aryl hydrocarbon receptor (AHR)) was not taken into account. This was not part of the terms of reference (ToR) from the EC and only few data are available on these substances. This was acknowledged in the uncertainty section of the Opinion and supported by a recommendation.

A presentation was given by EFSA indicating that available results on levels in breast milk from the last decade are quite similar (here). This may be an indication that the concentrations of PCDD/Fs and DL-PCBs in human milk are levelling off. This hypothesis is substantiated by the stagnating occurrence levels in food considering that food is the major pathway of human PCDD/F and PCB exposure. However, according to some participants, current levels in human milk still show the decreasing trend observed since the end of the 1980s.

For the risk characterisation, the dietary intake corresponding to the internal exposure (serum levels of the boys in the critical study) was calculated, and this was compared to the estimated dietary exposure across surveys and age groups to conclude on the risk. It was raised whether instead, data from human biomonitoring (e.g. levels in serum or in breast milk) can be compared to the potential critical blood or breast milk levels identified in the study, or modelling, to conclude on the risk. This was acknowledged as an interesting approach (see discussion under Toxicokinetic Modelling), in which ideally also data on the variation in such levels should be available.

Further details of the information given on the occurrence and exposure assessment during the Information Session can be found here.

Critical effect and critical epidemiological study

Concerns were raised on the suitability of the critical effect (sperm concentration) and critical epidemiological study (Mínguez-Alarcón et al., 2017) used for the derivation of the TWI of 2 pg WHO_{2005}-TEQ/kg bw.

The robustness of the parameter 'sperm concentration' as critical effect was questioned, as sperm concentration levels vary substantially and the number of participants in the study was relatively low. The EFSA experts noted that the boys from the Russian Children's Study provided duplicate semen samples with a coefficient of variation (CV) for sperm concentration of 48% (typical intra-individual CV: 40–50%). Misclassification due to intra-individual variability is expected to be non-differential, so a true association would be attenuated. Due to the expected high intraclass correlation, EFSA did not consider the number of participants (n = 133) too low to detect the impact of an external factor.

Questions were also raised on the sensitive window of exposure, and whether levels of the target compounds in blood at age 8–9 were adequate to assess the association with the effects appearing earlier or later in life. It was acknowledged that although there are several hypotheses, the critical period of exposure for effects on sperm quality is not known. In both Seveso studies and the Russian Children's study, the actual effect may have occurred during the same period. The toxicokinetic model did incorporate prenatal exposure and took account of the higher postnatal blood levels resulting from breastfeeding (assuming 12 months), which is thought to be still reflected in higher blood levels at age 8–9 years, as shown in the Opinion (Table 15). The modelling of total exposure from breastmilk at individual level (area under the curve) was acknowledged as an interesting approach to be considered in future assessments, but was not possible in the critical study since there were no maternal samples taken around the birth of the children and individual data on serum levels and individual data on duration of breastfeeding were unknown to the WG.

The possible influence of organochlorine pesticides, lead and non-dioxin-like PCBs (NDL-PCBs) on the outcomes was discussed. The area of residence of the subjects under study, Chapaevsk (Russia), had an extensive manufacturing of chlorine-containing industrial and agricultural chemicals until 1987, widespread contamination by PCDD/Fs, as well as PCBs. Also lead exposure in association with outcomes was studied in the cohort. The blood levels of three organochlorine pesticides (hexachlorobenzene (HCB), β-hexachlorocyclohexane (β-HCH), and p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE)) were measured in the boys under study, and have been reported to be associated with a delay (HCB and β-HCH) in pubertal development, which is also an effect reported for total TEQs. The possible implications of the co-exposure to these organochlorine compounds on sperm concentration and whether delay in the onset of puberty can affect sperm concentration were discussed. The EFSA experts acknowledged the concerns and presented data to support that serum levels of HCB, β-HCH or DDE were not associated with the sperm parameters studied, with the exception that increasing β-HCH or DDE levels were associated with lower sperm volume.

However, the association of sperm parameters with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) was not affected by further adjustment for HCB, β-HCH and DDE. Also the associations between polychlorinated dibenzo-*p*-dioxin (PCDD)-TEQs and sperm concentration were overall unchanged after adjusting for HCB, β-HCH and DDE. There was no significant association between NDL-PCBs and semen parameters. The associations between TCDD and semen parameters were overall unchanged after adjustment for NDL-PCBs. It was also questioned whether concurrent lead exposure could affect sperm parameters. However, lead in blood was not correlated with total TCDD or PCDD at age 8–9 years and adjustment for lead in blood did not change the associations between TCDD and sperm parameters. Furthermore, lead is not known to affect sperm quality and only one paper reported this association in humans, whereas for dioxins this effect has been reported in many animal and several epidemiological studies.

The effect of puberty timing on semen parameters is unknown. Delay in the onset of puberty is considered an adverse effect by itself, and PCDD/Fs and DL-PCBs have shown association with delay in the onset of puberty, with possible confounding by organochlorine pesticides. Reduced growth, considered an adverse effect as well, has also been associated with exposure to both PCDD/Fs and NDL-PCBs in this cohort and may also be a confounder for the delay of pubertal onset.

Concerns on confounding by life-style factors such as smoking and alcohol consumption and how these were controlled for in the critical study were also raised. Although this was adjusted for, the EFSA experts acknowledged that information about smoking and alcohol consumption was not collected in an optimal way in the critical study. Although some studies have shown significant associations, these variables are not strongly associated with either semen quality, or with the compounds under study, and therefore the EFSA experts concluded that it will most probably not change the outcome.

The low number of subjects in the critical study (133 boys), and how the loss of follow-up affected the observed association was asked. The EFSA experts did not consider the loss of follow-up to affect the association between exposure and outcome as most demographic characteristics did not differ significantly between boys who remained in the study and those who dropped out. Also the serum levels were similar in these two groups.

The causal relationship between exposure to PCDD/Fs and DL-PCBs and reduced sperm concentration, and the biological relevance of a decrease in sperm concentration were questioned. EFSA experts noted that reduced sperm concentration is also a sensitive endpoint in rats after exposure to TCDD, as observed in many studies. There are however some strain differences in sensitivity between rats, also for effects on sperm quality, which might explain why it was not observed in all studies with rats. It was noted that this effect was the basis for the Scientific Committee on Food (SCF) TWI and the FAO/WHO

Joint Expert Committee on Food Additives (JECFA) provisional tolerable monthly intake (PTMI) in 2001. In human studies, an association has been observed in three cohorts (two Seveso cohorts and the Russian Children's Study). EFSA experts noted that the dose-response pattern looks similar across cohorts with a steep decline and levelling off at 40–50% reduction in sperm concentrations. This interpretation was questioned arguing that a significant dose-related effect of TCDD was not observed in the Seveso cohorts, and that the extremely steep -41% effect between median levels of 7 pg/g (Q1) and 10.9 pg/g (Q2) in the Russian Children's Study with missing effect at higher levels seems implausible. EFSA noted that there was a significant difference between the control group and the exposed group in the Seveso study. It is correct that the individual quartiles appear not to be significantly different from the control group or each other. Furthermore, EFSA noted that such a steep dose-response cannot be excluded, also based on the various animal studies. Similar is true for the fact that no further decrease is observed at higher exposure. Furthermore, the real NOAEL may actually be included in the lowest quantile, meaning that it could be even lower than 7 pg/g. Further studies, ideally with larger participant numbers, should reveal this.

Concerning the biological relevance, humans have lower sperm production compared to rats, and it is known that reduction of sperm quality can lead to increased time to pregnancy and subfertility, which are considered to be adverse effects.

The mode of action for the effects on sperm concentration is not known, but there is some evidence indicating that it is mediated by the AHR. This is based on mice with a constitutively active AHR. The importance of transgenerational effects was mentioned, and it was noted that studies on the second generation of the Seveso cohort have not yet been reported. In the Opinion, the Panel has recommended that mechanistic studies on transgenerational (third generation) effects are needed.

Concerns were raised about the lack of association for PCDF-TEQs, coplanar DL-PCB-TEQs (Co-PCBs) or Total-TEQs in the critical study. The critical study showed significant associations for TCDD, PCDD-TEQs and PCDD/F-TEQs, but not for PCDF-TEQs, DL-PCB-TEQs or total TEQs (based on WHO_{2005}-TEFs). It was noted that both the Co-PCBs (40%) and the PCDDs (38%) contributed substantially to the average serum TEQ-level in the boys, contrary to PCDFs (16%). The latter might explain the poor association for the PCDF-TEQ. However, when included in the PCDD/F-TEQ, the association was still significant, contrary to the Co-PCBs (included in total-TEQ). In that respect, the EFSA experts pointed out that a possible explanation for this would be the uncertainties in the TEF scheme, and in particular, an overestimation of the relative potency of PCB-126. This has also been suggested by studies from the EU SYSTEQ project that showed that the relative potency of PCB-126 in human cells is much less than suggested by the current WHO_{2005}-TEF value. However,

the TWI was still considered by EFSA to be applicable to PCDD/Fs and DL-PCBs as there are no reasons to exclude the latter from the TEQ-principle. These compounds bind to the AHR, cause similar effects and are persistent. There is a strong recommendation to re-evaluate the current TEFs and in particular the one for PCB-126 which contributes more than 50% to the current exposure.

Concerning the consistency between the effects observed in the Seveso Cohort and the Russian Children's Study, the EFSA experts noted that uncertainty in timing of exposure, the background exposure to other PCDD/Fs and DL-PCBs, lack of TCDD levels in serum of the control group, and congener composition in Seveso makes a direct comparison of dose-response between the Seveso and Russian Children's Study difficult. However, the studies show a similar dose-response pattern although in Seveso, TCDD levels were higher than in the Russian Children's Study. It was argued that although a steep dose-response relationship with a considerable extent of effect was observed in all three studies, this happened at dioxin levels roughly 10-fold higher in the Seveso studies compared to the Russian Children's Study, which was not found to be consistent. If the Russian Children's Study reflects an effect causally related to very low levels of PCDD/Fs and DL-PCBs, such an interpretation would question the Seveso results. EFSA replied that the effects at higher concentration in the Seveso study do not question those from the Russian Children's Study, since it simply extends the dose range of the study including the levelling off of the reduction in sperm concentrations. The only issue, also addressed in the Opinion, is the TCDD level in the controls of the Seveso study, which was not analysed but assumed to be lower than 15 pg/g, i.e. the LOQ of the analytical method. This implies that the level could also have been much lower and in a similar range as the NOAEL observed in the Russian Children's Study. The other issue is the background levels of other PCDD/Fs and DL-PCBs, which were not analysed in either controls or Seveso boys and could only be estimated from a later study. Based on this, it seems likely that the TEQ levels in the controls would have been higher than those in most quartiles of the Russian Children's Study. However, these levels are highly uncertain.

Questions were raised on whether the observed general decrease in sperm concentrations in developed countries matches the likewise decreasing levels of PCDD/Fs and DL-PCBs in food and human samples. The EFSA experts noted that the reported general decrease in sperm quality was not addressed by the Opinion. However, based on the available evidence, PCDD/Fs and DL-PCB exposure could be a contributing factor to decreased sperm count. There is a delay between the actual exposure of boys at young age and the observed effects in adulthood. This means that based on the decrease in exposure and serum levels of PCDD/Fs and DL-PCBs during the last decades, sperm concentration could be expected to increase as long as other factors are not counteracting this effect. However, based on the observed steep dose-response curves in animals and humans, the levels may have to drop below a certain relatively low serum level.

These and other details of the information given during the Information Session on the critical effect(s) and epidemiological studies considered in the Opinion can be found here.

Uncertainty in the current WHO-TEF scheme

Questions were raised on the uncertainty of the current TEF scheme values, and in particular of PCB-126 and other congeners such as 2,3,4,7,8-PeCDF and 1,2,3,4,7,8-HxCDF. The EFSA experts noted that *in vitro* data with human cells suggest that the TEF value of 0.1 for PCB-126 might be overestimated for humans, and that the lack of association for PCB-126 in the Russian Children's Study seems to support lower toxicity of this congener. Thus, the Opinion recommends that the current WHO_{2005}-TEF values, in particular for PCB-126, should be re-evaluated in order to take into account new data.

A presentation was given to provide further insight into the current knowledge and the fact that possibly the TEF value for PCB-126 is overestimated (here). This showed the lower relative potency for PCB-126 in human cells, but also in mice when focussing on gene expression and CYP-1A induction. Some of the mice studies indicate that for immunotoxic effects, the relative potency of PCB-126 may be even higher than 0.1. This requires proper evaluation and was therefore the first recommendation in the opinion.

Toxicokinetic model

Questions were raised on the toxicokinetic modelling used to estimate the daily intake for the general population corresponding to the critical serum levels in the boys from the Russian Children's Study. In particular, questions were posed on the selection of certain parameters as input to the model, such as (i) the duration of breastfeeding (the value of 12 months used in the modeling was considered to be too long), and (ii) the daily milk consumption by the infant during that period (the value of 800 mL per day was considered too high). It was also considered that the breast milk level of 5.9 pg/g fat was above the levels currently found in breast milk samples in most countries. Concerns were expressed that the model was over-conservative and not realistic with respect to breastfeeding duration and daily breast milk consumption.

The Opinion used a value of 12 months as duration of breastfeeding, also based on the WHO recommendations to breastfeed exclusively for 6 months with continued breastfeeding along with appropriate complementary foods up to two years of age or beyond. This is supported by information on breastfeeding 6–12 months and beyond in a number of European countries. Using a duration of breastfeeding of less than 12 months would imply that the TWI would not be protective for women breastfeeding for periods in line with the WHO recommendations[2]. However, applying a longer period than 12 months might be

[2] https://www.who.int/topics/breastfeeding/en/

too conservative and not in line with common practice to breastfeed up to 12 months.

For the first 6 months of life a daily breast milk intake of 800 mL by the infant seems appropriate, but from 6 to 12 months that value is an overestimation. A toxicokinetic modelling output was presented to show what the impact of considering shorter duration of breastfeeding, and lower intake volumes of breast milk would be. This resulted in lower estimated human daily intakes but multiplying by 7 and rounding still resulted in a TWI of 2 pg/kg bw/week (in principle intakes varying between 0.22 and 0.35 pg/kg bw/day are covered by the TWI). It was concluded that due to the applied rounding of the daily intake, the TWI value was fairly robust for factors like using a shorter duration of breastfeeding, and a lower milk consumption per day (see graphs in the corresponding presentation here).

The breast milk level of 5.9 pg/g fat is the outcome of the modelling, aiming at calculating the daily intake by mothers and boys that results in the no-observed-adverse-effect level (NOAEL) serum level at the age of 9 years of 7 pg TEQ/g fat. Compared with data of the last UNEP/WHO round in European countries, this value is on average higher than the PCDD/Fs levels reported, but lower for total TEQs.

The possible decline in the levels of PCDD/Fs and DL-PCBs in the breast milk during lactation was not taken into account in the toxicokinetic model used in the Opinion. Inclusion of such a decline in the total body burden of the mother should also take into account the loss of body fat that may partly counteract the effect on milk levels, as exemplified in the presentation here.

Furthermore, the model was developed for TCDD but was assumed to apply to all congeners, which in practice show different, often longer, half-lives. These uncertainties are acknowledged in the Opinion with the recommendation to further improve toxicokinetic models to take parameters dealing with pregnancy, breastfeeding and occasional exposure to high levels into account, as well as inclusion of PCDD/Fs, other than TCDD, and DL-PCBs.

In establishing the TWI, a twofold higher intake via food by children was taken into account. The EFSA experts clarified this was not an assumption but was based on the result of the exposure assessment presented in the Opinion.

It was shown that critical studies in laboratory animals would result in TWIs close to those derived from the Russian Children's Study, if the same uncertainty factors previously applied by SCF (2001) were used. The critical study used by SCF in 2001 would then result in a TWI of 3 pg TEQ/kg bw. The lower TWI compared to the one derived by SCF (2001) is primarily due to different assumptions in the applied model, like a higher absorption and a longer half-life at low body burdens.

These and other details of the information given during the Information Session on the toxicokinetic modeling and derivation of the TWI can be found here.

Interpretation of the TWI

Questions were raised whether the TWI, considering how it had been derived, should apply to a sub-group of the population only and/or should cover PCDD/Fs only. As mentioned above, the Panel did not identify reasons to exclude DL-PCBs from the TEQ-principle and therefore decided that the TWI should apply for all congeners, but there is a need to re-evaluate the TEFs and in particular that for PCB-126. The TWI was estimated for women of childbearing age and their infants, similarly to the approach taken for the previous SCF TWI, which was based on rodent studies showing similar effects in male offspring of exposed dams. Whether different TWIs are to be established for different population groups is an interesting discussion, not limited to the case of PCDD/Fs and DL-PCBs. In general, tolerable intakes are derived to protect the most sensitive groups in the population.

Concerning other adverse effects, it was indicated that impaired development of teeth enamel in humans was associated with an estimated weekly intake of approximately 3 pg PCDD/F-TEQ/kg bw per week, which is 1.5-fold higher than the TWI. There are also effects on sex ratio, related to exposure of men, and EFSA noted that it is unclear whether this can occur at current background exposure. Discussion on these other adverse effects is presented in the Opinion but was not further discussed during the meeting.

Given the uncertainties in the risk assessment it was raised whether the TWI could be considered as provisional. EFSA noted that in general terms, any health-based-guidance value (HBGV) will be revised if new evidence is available.

These and other details of the information given during the Information Session on the derivation and interpretation of the TWI can be found here.

3. General remarks on future work

Based on the discussion, the following points, of which some are already recommended in the Opinion, were considered relevant for further investigation:

- Studies that would inform on the sensitive window of exposure for the effects observed, as it is currently not known. This would include better use of exposure data for breastfeeding at individual level (i.e. duration and levels in breast milk) for a better estimate of the exposure at younger ages.
- Studies confirming an effect of PCDD/Fs and DL-PCBs on sperm concentrations in humans exposed to current background levels.
- A risk-benefit assessment of the consumption of fish in relation to the presence of PCDD/Fs and DL-PCBs.

- The assessment of the uncertainties in a quantitative manner, as now promoted by the EFSA guidance on uncertainties.
- To include in the risk assessment also a comparison of levels measured in blood, milk or tissues of humans with critical levels identified in the studies or parameters derived in the modelling.

4. Next steps

Dr Kleiner thanked the participants for their comments and discussion. Participants were informed that the Opinion would be published together with the presentations given at this Information Session as well as the comments submitted by the Member States with a reference to this Information Session.

It was noted that a different view on the robustness and related uncertainties of the critical human study still existed between EFSA and some country representatives.

The observer from EC indicated that contacts had been made with WHO in relation to a possible revision of the WHO_{2005}-TEF values. It was also indicated that a mandate for a risk-benefit analysis of fish consumption in relation to the presence of PCDD/Fs and DL-PCBs would be forwarded to EFSA. Preliminary discussions will be initiated after the publication of the Opinion between EC and representatives from European Member States.

The minutes of this report were prepared by EFSA as agreed by all participants of the Information Session.

Annex 1. Draft Agenda

Information Session on the EFSA scientific opinion on PCDD/Fs and DL-PCBs in food and feed

Tuesday 13 November 2018			
Time	***No.***	***Items***	***Presenters and documents***
9.00	***1***	**Opening of the meeting (5')**	*Chair*
9.05	***2***	**General introduction**	
9.05		a. Background of the request (10')	*Marco Binaglia (EFSA BIOCONTAM, CONTAM Team leader)*
9.15		b. Overview of the comments received during the exchange of views with MS (15')	*Luisa Ramos Bordajandi (EFSA BIOCONTAM, CONTAM Officer)*
9.30	***3***	***EFSA opinion on Dioxins and DL-PCBs*:** **Methodology and human exposure assessment**	
9.30		a. Methodology (15')	*Luisa Ramos Bordajandi (EFSA BIOCONTAM, CONTAM Officer)*
9.45		b. Occurrence data in food and human exposure assessment (20')	*Zsuzsanna Horvath (EFSA DATA, Officer)*
10.05		c. Trends in the exposure and in breast milk and exposure (10')	*Peter Fürst (WG Dioxins member)*
10.15		Discussion (15')	*ALL*
10.30		**Coffee break (30')**	
11.00	***4***	***EFSA opinion on Dioxins and DL-PCBs*:** **Hazard identification and characterisation for humans**	
11.00		a. Studies in experimental animals (20')	*Ron Hoogenboom (WG Dioxins Chair, CONTAM Panel)*
11.20		b. Studies in humans (40')	*Helle Knutsen (WG Dioxins member, former CONTAM Panel Chair)*
12.00		c. Uncertainties linked to the TEF scheme used (15')	*Ron Hoogenboom (WG Dioxins Chair, CONTAM Panel)*
12.15		Discussion (30')	*ALL*

12.45		***Lunch***	
13.45		d. Toxicokinetic modelling and derivation of the HBGV (30') Discussion (20')	*Ron Hoogenboom (WG Dioxins Chair, CONTAM Panel)* *ALL*
14.15		e. Uncertainty and recommendations (15') Discussion (10')	*Peter Fürst (WG Dioxins member)* *ALL*
14.35 *14.50*			
15.00	***5***	***EFSA opinion on Dioxins and DL-PCBs*: Concluding remarks**	
15.00		a. Communication plan (10')	*Anthony Smith (EFSA Communications)*
15.10		b. Remaining points (40')	*ALL*
15.50		c. Wrap-up of the meeting (10')	*Chair*
16.00	***6***	Close of meeting	*Chair*

Annex 2. Participants list

Representatives from Members States, Norway and Iceland

	Surname, name	**Organisation**
1.	Abraham, Klaus	BfR, Germany
2.	Ankarberg, Emma	SLV, Sweden
3.	Boberg, Julie	DTU, Denmark
4.	Bulder, Astrid	RIVM, The Netherlands
5.	Diletti, Gianfranco	IZS, Italy
6.	Giovannini, Armando	IZS, Italy
7.	García Henche, Violeta	AECOSAN, Spain
8.	Høie, Ingrid Margaretha	VKM, Norway
9.	Jörundsdóttir, Hrönn Ólína	Matís, Iceland
10.	Leondiadis, Leondios	NRCPS, Greece
11.	Minjajev, Martin	AGRI, Estonia
12.	Mortimer, David	FSA, UK
13.	Ólafsson, Grímur Eggert	MAST, Iceland
14.	Rakkestad, Kirsten Eline	VKM, Norway

15.	Rivière, Gilles	ANSES, France
16.	Schaefer, Bernd	BfR, Germany
17.	Schafft, Helmut	BfR, Germany
18.	Sijm, Dick T.H.M.	NVWA, The Netherlands
19.	Tlustos, Christina	FSAI, Ireland
20.	Tsoulli, Charalampia	FSA, UK
21.	Tuomisto, Juoni	THL, Finland
22.	Undrest, Mart	MTÜ, Estonia

EFSA's Representatives

	Surname, name	**Function**
1.	Arcella, Davide	Evidence Management (DATA) Unit, Exposure Team, Leader
2.	Baert, Katleen	BIOCONTAM Unit, CONTAM Team, Scientific Officer
3.	Barregård, Lars	Member of the CONTAM WG Dioxins Member CONTAM Panel 2015–2018
4.	Binaglia, Marco	BIOCONTAM Unit, CONTAM Team, Leader
5.	Fürst, Peter	Member of the CONTAM WG Dioxins
6.	Hoogenboom, Laurentius (Ron)	Chair of the CONTAM WG Dioxins Member CONTAM Panel 2015–2018
7.	Horváth, Zsuzsanna	DATA Unit, Exposure Team, Scientific Officer
8.	Kleiner, Juliane	Head (*a.i.*) of the Risk Assessment and Scientific Assistance Department (RASA)
9.	Knutsen, Helle	Member of the CONTAM WG Dioxins Chair CONTAM Panel 2015–2018
10.	Liebana Criado, Ernesto	Head (*a.i.*) of the Unit on Biological Hazards and Contaminants (BIOCONTAM)
11.	Ramos Bordajandi, Luisa	BIOCONTAM Unit, CONTAM team, Scientific Officer
12.	Rylander, Lars	Member of the CONTAM WG Dioxins
13.	Smith, Anthony	Communications Unit, Content & Social Science Team, Leader

European Commission Representatives - Observers

	Surname, name	**Function**

1.	Schrenk, Dieter	Chair CONTAM Panel 2018–2021
2.	Verstraete, Frans	DG-SANTE, European Commission