

EMV - Dioxin & Dioxin-like Compounds – Feed & Food

Recent and future developments as regards the EU strategy to reduce the presence of dioxin-like compounds in feed and food

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I. EU-strategy to reduce the presence of dioxins, furans and dioxin-like PCBs in feed and food – existing measures

The EU legislative measures concerning feed and food consist of three pillars:

- the establishment of **maximum levels** at a strict but feasible level in food and feed
- the establishment of **action levels** acting as a tool for "early warning" of dioxin contamination above background levels in food or feed
- the establishment of **target levels, over time**, to be achieved in food and feed in order to bring human exposure below the tolerable intake recommended by the Scientific Committees.

Maximum levels as **first pillar** have been established at Community level for all feed materials, feedingstuffs and food of animal origin^[1], with only some minor exceptions. The maximum levels were applicable from 1 July 2002 onwards.

For **feed materials and feedingstuffs** the levels are on a product basis relative to a feedingstuff with 12 % moisture content. Following maximum levels have been established as upperbound levels (in ng PCDD/F TEQ/kg):

FEEDINGSTUFFS	DIOXINS + FURANS
Feed materials of plant origin including vegetable oils and by products	0.75
Minerals	1.0
Binders, anti-caking agents and coagulants (includes kaolinic clay)	0.75
Animal fat, incl. milk and egg fat	2.0
Other land animal products including milk and milk products and eggs and egg products	0.75
Fish oil	6.0
Fish and other aquatic animals and their products (fish meal)	1.25
Compound feedingstuffs (except fish and pet food and feedingstuffs for fur animals)	0.75
Feedingstuffs for fish and pet food	2.25
Fish protein hydrolysates containing more than 20 % fat	2.25

For **foodstuffs**, the levels are on a fat basis with the exception of the maximum level for fish. Following maximum levels have been established as upperbound levels (in pg PCDD/F TEQ/kg):

FOOD	DIOXINS + FURANS (WHO-TEQ)	
Meat and meat products originating from	3 pg/g fat	The second pillar consists in setting action levels (lower than the maximum levels) designed to trigger a proactive approach from competent authorities and operators to identify sources and pathways of contamination and to take measures to eliminate them. In order to detect these sources/pathways, permanent monitoring of the presence of dioxins and PCBs in feed and food across the EU is necessary. In case of an abnormal increase in the level of dioxins and dioxin-like PCBs, sources and/or pathways of contamination have to be identified. Once identified, measures to prevent or reduce future contamination from such sources should be defined and implemented. The action levels have been established in a Commission Recommendation of 4 March 2002 on the reduction of the presence of dioxins, furans and PCBs in feedingstuffs and foodstuffs ^[2] .
— Ruminants (bovine animals, sheep)	2 pg/g fat	
— Poultry and farmed game	1 pg/g fat	
— Pigs	6 pg/g fat	The third pillar of the measures concerns the future establishment of target levels . These target levels would be the levels to be achieved in order to bring the exposure of the large majority of the European population below the Tolerable Weekly Intake recommended by the SCF. Target levels will act as the driving force for measures, which are necessary to further reduce emissions into the environment.
Liver and derived products originating from terrestrial animals	4 pg/g fresh weight	
Muscle meat of fish and fishery products and products thereof	3 pg/g fat	With regard to sampling and methods of analysis , requirements for the determination of the levels of dioxins in food and feed have been recently established in Community legislation ^[3] in order to ensure that laboratories use methods of analysis with comparable levels of performance providing reliable results.
Milk and milk products, including butter fat	3 pg/g fat	
Hen eggs and egg products	3 pg/g fat	II. EU-strategy to reduce the presence of dioxins, furans and dioxin-like PCBs in feed and food – ongoing discussions on the inclusion of dioxin-like PCBs in the maximum and action levels The current existing EU-maximum levels are for dioxins and furans alone and do not yet include the dioxin-like PCBs. From a toxicological point of view, maximum levels should include dioxins and dioxin-like PCB. However, as the data on the occurrence of dioxin-like PCBs were very limited it was not yet possible in 2001 to include the dioxin-like PCBs in the maximum levels. Therefore maximum levels were set for dioxins and furans only, awaiting more comprehensive data for dioxin-like PCBs. A pro-active approach has been pursued to obtain these data as the legislation provides for the review of the maximum levels for dioxins for the first time by the end of 2004 in the light of new data on the presence of dioxins and dioxin-like PCBs in food, in particular with a view to the inclusion of dioxin-like PCBs in the levels to be set. It is necessary to generate reliable and comparable data across the European Union on the presence of dioxin-like PCBs in the widest range of foodstuffs and products intended for animal feed in order to have a clear picture of the time trends in background presence of these substances in foodstuffs and products intended for animal feed. The relationship between the presence of dioxins, furans, dioxin-like PCBs and non dioxin-like PCBs is important but to a large extent unknown. It is therefore appropriate to analyse the selected samples also for non dioxin-like PCBs where possible. A recommendation on the monitoring of background levels of dioxins and dioxin-like PCBs in feed and food have been established ^[4] in order to generate these data. These recommendations provide guidance on the frequency of the controls but contain also the format of reporting the results (see Annex 1)
Oils and fats	3 pg/g fat	
— Animal fat	2 pg/g fat	
— from ruminants	1 pg/g fat	
— from poultry and farmed game	2 pg/g fat	
— from pigs	0,75 pg/g fat	
— mixed animal fats	2 pg/g fat	
— Vegetable oil and fats		
— fish oil (fish body oil and fish liver oil) intended for human consumption		

By the end of 2004 analytical results of 1520 samples of foodstuffs and 1085 of products intended for animal feeding were already collected in the format as mentioned in Annex I and compiled into a database. An overview of the obtained analytical results can be seen in Annex II for feed and in Annex III for food.

Based on these analytical results, maximum levels for the sum of dioxins, furans and dioxin-like PCBs have been discussed in the EU, as this is the most appropriate approach from a toxicological point of view. In order to ensure a smooth transition, it is considered appropriate to maintain for a transitional period the existing maximum levels for dioxins and furans, in addition to new proposed maximum levels for the sum of dioxins, furans and dioxin-like PCBs.

As mentioned before action levels are a tool for competent authorities and operators to highlight those cases where it is appropriate to identify a source of contamination and to take measures for its reduction or elimination. Given that different sources of contamination exist for the presence in feed and food of dioxins on the one hand and of dioxin-like PCBs on the other hand, separate action levels are discussed for dioxins/furans and dioxin-like PCBs.

It is also foreseen to stimulate in the coming years the decontamination of in particular highly contaminated fish oil and to a lesser extent fish meal in order to achieve a decrease of the overall dioxin and dioxin-like PCB contamination of the feed and food chain.

In the presentation more details will be provided on the levels which are currently under discussion.

III. EU-strategy to reduce the presence of dioxins, furans and PCBs in feed and food – future discussions on the non-dioxin-like PCBs

The European Commission has requested the European Food safety Authority (EFSA) to provide a scientific opinion on the presence of non dioxin-like PCBs in animal feed and in food.

The scientific opinion on non dioxin-like PCBs should comprise the

- evaluation of the toxicity of the non-dioxin like PCBs for humans, considering all relevant toxicological endpoints and identification of the PCB congeners of toxicological relevance with particular attention to the congeners occurring in food.
- evaluation of the relevance of the metabolites, such as hydroxyl or methylsulfonyl PCBs, for the toxicity of PCBs
- exposure of the EU population to non-dioxin like PCBs, including the identification of the main sources of dietary exposure and the relative importance of dietary and non dietary sources.
- risk characterisation, including the identification of high risk groups of the population
- determination of the toxic exposure levels (daily exposure) of non dioxin-like PCBs for the different animal species of relevance as well from an animal health point of view as well from a public health point of view (transfer/carry over of (the most relevant congeners of) non dioxin-like PCBs from the feed to the products of animal origin)
- identification of feed materials which could be considered as sources of contamination by non dioxin-like PCBs and the characterisation, insofar as possible, of the distribution of levels of contamination.

Particular attention should be paid to the fact that the PCB congener pattern present in feed does not in most cases reflect the PCB congener patterns of the technical mixtures.

The scientific opinion should furthermore contain an assessment of

- the relevance of the current usual monitoring of the 7 (6) indicator PCBs^[5] in feed as an indicator for the presence of total non-dioxin like PCBs and for the toxicity of the non-dioxin-like PCBs.
- the quantitative ratio in feed between the presence of non-dioxin-like PCBs and dioxin-like PCBs and non-dioxin-like PCBs and WHO-TEQs (dioxins, furans and dioxin-like PCBs), respectively.

The European Food safety Authority is currently performing this risk assessment and the scientific opinion is expected to become available in the autumn of 2005.

Based on the scientific opinion, management measures to limit the presence of non-dioxin-like PCBs in feed and food will be considered at EU-level.

Annex 1

Form for reporting of congener specific analytical results of dioxins, furans,

dioxin-like PCBs and other PCBs in feed

Country	Remarks
Year	Lipid extraction method used:
Product	
Production method	
Stage of marketing	

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Expression of results Type of sampling Sample No. Area Number of subsamples Fat content (%) Moisture content (%)	TEF	LOQ	Results (TEQ)	dioxins and furans (ng/kg)	Congeners (ng/kg)
1 dioxins and furans (ng/kg)					
Methods	2,3,7,8 - TCDD	1			
Detection	1,2,3,7,8 - PeCDD	1			
Unit	1,2,3,4,7,8 - HxCDD	0,1			
Accredited	1,2,3,6,7,8 - HxCDD	0,1			
	1,2,3,7,8,9 - HxCDD	0,1			
	1,2,3,4,6,7,8 - HpCDD	0,01			
	OCDD	0,0001			
	2,3,7,8 - TCDF	0,1			
	1,2,3,7,8 - PeCDF	0,05			
	2,3,4,7,8 - PeCDF	0,5			
	1,2,3,4,7,8 - HxCDF	0,1			
	1,2,3,6,7,8 - HxCDF	0,1			
	1,2,3,7,8,9 - HxCDF	0,1	Total TEQ-PCDD/PCDF		
	2,3,4,6,7,8 - HxCDF	0,1			
	1,2,3,4,6,7,8 - HpCDF	0,01	Upperbound		
	1,2,3,4,7,8,9 - HpCDF	0,01	Mediumbound		
	OCDF	0,0001	Lowerbound		
2 non-ortho PCBs (pg/g or ng/kg)					
Methods	PCB-77	0,0001			
Detection	PCB-81	0,0001			
Unit	PCB-126	0,1			
Accredited	PCB-169	0,01			
3 mono-ortho PCBs (pg/g or ng/kg)					
Methods	PCB-105	0,0001			
Detection	PCB-114	0,0005			
Unit	PCB-118	0,0001			
Accredited	PCB-123	0,0001	Total TEQ-PCB		
	PCB-156	0,0005	Upperbound		
	PCB-157	0,0005	Mediumbound		
	PCB-167	0,0001	Lowerbound		
	PCB-189	0,0001			
NON DIOXIN-LIKE PCBs					
4 PCB-7 (6) (µg/kg or ppb)					
Methods	PCB-	28	LOQ	Results	
Accredited	PCB-	52			
Unit	PCB-	101			
Uncertainty (%)	PCB-	118			
	PCB-	138			
	PCB-	153			
	PCB-	180			
5 Other PCBs (µg/kg or ppb)					
Methods	PCB-		LOQ	Results	
Accredited	PCB-				
Unit	PCB-				
Uncertainty (%)	PCB-				
	PCB-				
	PCB-				

Annex II: Occurrence data on dioxins, furans and dioxin-like PCBs in feed

FEEDINGSTUFFS	N SAMPLES	DIOXINS + FURANS				DIOXIN-LIKE PCBs				TOTAL TEQ			
		Average	Median	90 th	95 th	Average	Median	90 th	95 th	Average	Median	90 th	95 th
		%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile
Feed materials of plant origin	(169)	0.17	0.12	0.32	0.5	0.09	0.07	0.17	0.28	0.26	0.22	0.55	0.68
Minerals	(63)	0.16	0.1	0.29	0.42	0.14	0.08	0.36	0.54	0.30	0.19	0.73	1.02
Trace elements	(43)	0.29	0.13	0.58	1.12	0.06	0.03	0.15	0.17	0.35	0.24	0.73	1.19
Binders, anti-caking agents	(11)	0.38	0.3	0.73	0.81	0.13	0.03	0.32	0.45	0.51	0.43	0.88	0.90
Premixes*	(28)	0.17	0.11	0.30	0.37	0.11	0.03	0.18	0.59	0.29	0.23	0.59	1.04
Animal fat, incl. milk and egg fat	(42)	0.31	0.22	0.80	0.81	0.29	0.18	0.78	0.81	0.60	0.41	1.58	1.62
Fish oil	(222)	3.15	3.17	5.0	5.50	7.01	6.75	11.19	13.79	10.16	9.95	16.27	19.00
Fish and other aquatic animals and their products (fish meal)	(104)	0.60	0.46	1.1	1.46	1.29	1.01	2.6	3.46	1.89	1.48	3.68	4.40
Compound feedingstuffs	(203)	0.24	0.11	0.38	0.69	0.28	0.04	0.23	1.27	0.51	0.22	0.71	1.9
Feedingstuffs for fish	(188)	0.75	0.63	1.56	1.85	1.42	1.34	2.64	2.94	2.17	2.01	4.01	4.53
Fish protein hydrolysates (> 20 % fat)	(12)	1.66	1.8	2.20	2.20	6.06	5.8	8.48	8.9	7.72	7.65	10.68	10.93

Average, median, 90th percentile and 95th percentile (ng WHO-TEQ/kg 12% w.c.) for different feedingstuffs sampled between 1997 and 2004 (upperbound concentrations)

Annex III: Occurrence data on dioxins, furans and dioxin-like PCBs in food

FOOD	N SAMPLES	DIOXINS + FURANS				DIOXIN-LIKE PCBs				TOTAL TEQ			
		Average	Median	90 th	95 th	Average	Median	90 th	95 th	Average	Median	90 th	95 th
		%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile	%ile

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MEAT AND MEAT PRODUCTS FROM RUMINANTS	(70)	0.49	0.43	0.77	1.07	0.61	0.46	1.21	1.47	1.10	0.90	2.05	2.28	3.40
MEAT AND MEAT PRODUCTS FROM POULTRY	(36)	0.48	0.35	0.79	1.14	0.58	0.32	0.88	1.66	1.06	0.63	2.15	3.03	6.16
MEAT AND MEAT PRODUCTS FROM PIGS	(34)	0.18	0.14	0.31	0.40	0.17	0.13	0.30	0.39	0.35	0.28	0.65	0.77	0.92
ANIMAL FAT	(14)	0.25	0.21	0.55	0.67	0.18	0.17	0.29	0.35	0.43	0.39	0.91	0.95	0.98
LIVER – terrestrial animals	(16)	2.99	1.20	7.35	8.76	0.84	0.45	1.71	2.57	3.83	1.74	7.88	10.02	13.84
MILK	(190)	0.71	0.60	1.17	1.60	1.40	1.22	2.44	3.16	2.11	1.81	3.39	4.67	9.02
EGGS	(272)	0.84	0.45	1.76	3.05	0.76	0.30	1.90	2.96	1.60	0.77	3.95	6.39	11.04
- cage	(102)	0.46	0.38	0.67	0.83	0.42	0.29	0.72	1.13	0.88	0.67	1.24	2.11	3.88
- free range, barn, organic, open air	(170)	1.06	0.58	2.80	3.36	0.97	0.34	2.40	3.97	2.03	0.91	5.51	8.02	12.38
FISH Total – wild +farmed (except Baltic fish)	(426)	0.55	0.34	1.12	1.76	1.39	0.91	3.20	3.81	1.93	1.23	4.37	5.16	12.09
- wild	(215)	0.59	0.18	1.63	2.19	1.41	0.47	3.16	5.58	2.00	0.70	4.67	7.31	19.09
- farmed	(211)	0.50	0.40	0.89	1.06	1.36	1.01	3.18	3.61	1.87	1.44	4.03	4.60	6.15
BALTIC FISH	(340)	5.44	3.1	14.53	18.14	3.48	2.3	7.52	10.01	8.92	5.39	22.58	27.28	33.73
VEGETABLE OIL	(17)	0.17	0.20	0.27	0.32	0.19	0.17	0.27	0.61	0.37	0.39	0.51	0.84	1.15
FISH OIL 2000-1 (before EC legislation)	(50)	2.69	1.13	6.35	7.84	10.38	7.93	24.59	26.73	13.07	8.58	30.85	33.28	42.04
FISH OIL 2002-3 (after EC legislation)	(55)	0.62	0.49	1.16	1.81	2.38	1.59	5.99	6.84	3.00	1.98	6.35	8.74	13.20

Average, median, 90th percentile and 95th, 99th percentile (ng WHO-TEQ/kg fat except fish, fruits, vegetables ad cereals and baby food based on grain vegetables and fish reported on fresh weight – '-') for different food types sampled between 1997 and 2004 (upperbound concentrations)

[1] Feed: Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed as last amended by Directive 2003/100/EC of 31 October 2003.

Food: Commission Regulation (EC) No 466/2001 of 8 March 2001 setting maximum levels for certain contaminants in foodstuffs as last amended by Regulation 684/2004 of 13 April 2004

[2] Commission Recommendation 2002/201/EC of 4 March 2002 on the reduction of the presence of dioxins, furans and dioxin-like PCBs in feedingstuffs and foodstuffs.

[3] Feed: Commission Directive 2002/70/EC of 26 July 2002 establishing requirements for the determination of levels of dioxins and dioxin-like PCBs in feedingstuffs

Food: Commission Directive 2002/69/EC of 26 July 2002 laying down the sampling methods and the methods of analysis for the official control of dioxins and the determination of dioxin-like PCBs in foodstuffs.

[4] Feed: Commission Recommendation 2004/704/EC of 11 October 2004 on the monitoring of background levels of dioxins and dioxin-like PCBs in feedingstuffs.

Food: Commission Recommendation 2004/705/EC of 11 October 2004 on the monitoring of background levels of dioxins and dioxin-like PCBs in foodstuffs

[5] PCB 28, PCB 52, PCB 101, PCB 118, PCB 138, PCB 153, and PCB 180. As the congener PCB 118 has also a dioxin-like activity and therefore belongs also to the dioxin-like PCBs. PCB 118 is not always analysed together with the other 6 marker PCBs.