



Dioxins and PCBs in feed products: Maximum levels and action levels

Legislative background

Polychlorinated dibenzodioxins and –furans (PCDD/Fs, commonly known as dioxins) and polychlorinated biphenyls (PCBs) are a group of toxic and persistent chemicals whose negative effects on human health and on the environment raised public, scientific and regulatory concern. Over the past decades the European Commission has proposed wide-ranging legislation aimed at directly or indirectly reducing the release of these compounds into the environment, with the objective of reducing human exposure and protecting human health and the environment.

[Strategy of the European Union to reduce the presence of dioxins and PCBs in feed and food](#)

Food of animal origin is a predominant source of human exposure to dioxins and PCBs. As food contamination is directly related to feed contamination, an integrated approach is followed to reduce dioxin/PCB incidence all along the food chain, i.e. from feed materials through food-producing animals to humans. Taking measures with regard to feed is therefore a decisive step to reduce human intake. These legislative measures concerning feeding stuffs and foodstuffs consist mainly of two pillars [1]:

- Maximum values as a strict but feasible level in food and feed:

If these are exceeded, products intended for animal feed should not enter the European Union from third countries, should not be put into circulation and/or should not be used in the EU.

- Action thresholds acting as a tool for early warning of higher than desirable levels of dioxin in food or feed:

If these are exceeded, work must be carried out to identify and eliminate the source of contamination.

[Legally binding documents \(European Union only\)](#)

Within the European Union *maximum values* for feed products are laid down in Directive 2002/32/EC [2], as regards dioxins / PCBs last amended by Commission Regulation (EU) 2019/1869 [3]. An overview about these actual maximum values is given in figure 1.

Within the European Union *action thresholds* for feed products are laid down in Directive 2002/32/EC [2], as regards dioxins / PCBs last amended by Commission Regulation (EU) No 744/2012 [4]. An overview about these actual action thresholds is given in figure 2.

Specific requirements concerning the *methods of sampling and analysis* for the official control of feed are laid down in Commission Regulation (EC) No 152/2009 [5], as regards dioxins / PCBs last amended by Commission Regulation (EU) No 2017/771 [6]. These documents distinguish between screening and confirmatory methods for determination of dioxins and PCBs. The analytical methods used by Eurofins GfA Lab Service GmbH for determination of dioxins and PCBs are confirmatory methods following strictly the requirements of the corresponding EU-legislation. The analytical methods are established on basis of HRGC-HRMS as well as the recently for confirmatory purposes approved GC-MS/MS-technique. An overview about the different fields of application as foreseen in Commission Regulation (EC) No 152/2009 [5] in its current version is given in figure 3.

Maximum values for feed products

Figure 1: Maximum values for feed products (status as of 28th November 2019)

| Products intended for animal feed | Dioxins (sum of PCDD/Fs): Maximum content in WHO- PCDD/F-TEQ ¹ | Sum of dioxins and dioxin-like PCBs (sum of PCDD/Fs and DL- PCBs): Maximum content in WHO-PCDD/F-PCB-TEQ ¹ | Non-dioxin-like PCBs: Maximum content ² |
|--|---|--|--|
| | relative to a feed with a moisture content of 12 % | | |
| Feed materials of plant origin with the exception of: | 0,75 ng/kg | 1,25 ng/kg | 10 µg/kg |
| - vegetable oils and their by- products | 0,75 ng/kg | 1,5 ng/kg | 10 µg/kg |
| Feed materials of mineral origin | 0,75 ng/kg | 1,0 ng/kg | 10 µg/kg |
| Feed materials of animal origin: | | | |
| - Animal fat, including milk fat and egg fat | 1,50 ng/kg | 2,0 ng/kg | 10 µg/kg |
| - Other land animal products including milk and milk products and eggs and egg products | 0,75 ng/kg | 1,25 ng/kg | 10 µg/kg |
| - Fish oil | 5,0 ng/kg | 20,0 ng/kg | 175 µg/kg |
| - Fish, other aquatic animals, and products derived thereof with the exception of fish oil, hydrolysed fish protein containing more than 20 % fat and crustacea meal | 1,25 ng/kg ³ | 4,0 ng/kg ³ | 30 µg/kg ³ |
| - Hydrolysed fish protein containing more than 20 % fat | 1,75 ng/kg | 9,0 ng/kg | 50 µg/kg |
| - Crustacea meal | 1,75 ng/kg | 4,0 ng/kg | 30 µg/kg |
| Feed additives belonging to the functional groups of binders and anti-caking agents (including functional groups of substances for the control of radionuclide contamination and substances for reduction of the contamination of feed by mycotoxins) | 0,75 ng/kg | 1,5 ng/kg | 10 µg/kg |
| Feed additives belonging to the functional group of compounds of trace elements. | 1,0 ng/kg | 1,5 ng/kg | 10 µg/kg |
| Premixtures | 1,0 ng/kg | 1,5 ng/kg | 10 µg/kg |
| Compound feed with the exception of: | 0,75 ng/kg | 1,5 ng/kg | 10 µg/kg |
| - compound feed for pet animals and fish | 1,75 ng/kg | 5,5 ng/kg | 40 µg/kg |
| - compound feed for fur animals | --- | --- | --- |

¹ expressed in World Health Organisation (WHO) toxic equivalents, using the WHO-TEFs (toxic equivalency factors, 2005) as upper-bound concentrations; upper-bound concentrations are calculated on the assumption that all values of the different congeners below the limit of quantification are equal to the limit of quantification.

² expressed as sum of PCB 28, PCB 52, PCB 101, PCB 138, PCB 153 and PCB 180 (ICES – 6) as upper-bound concentrations; upper-bound concentrations are calculated on the assumption that all values of the different congeners below the limit of quantification are equal to the limit of quantification

3 Fresh fish and other aquatic animals directly delivered and used without intermediate processing for the production of feed for fur animals are not subject to the maximum levels, while maximum levels of 3,5 ng WHO-PCDD/F-TEQ/kg product, 6,5 ng WHO-PCDD/F-PCB-TEQ/kg product and 75 µg/kg product (sum of NDL-PCBs) are applicable to fresh fish and 20,0 ng WHO-PCDD/F-PCB-TEQ/kg product resp. 200 µg/kg product (sum of NDL-PCBs) is applicable to fish liver used for the direct feeding of pet animals, zoo and circus animals or used as feed material for the production of pet food. The products or processed animal proteins produced from these animals (fur animals, pet animals, zoo and circus animals) cannot enter the food chain and cannot be fed to farmed animals which are kept, fattened or bred for the production of food

Action levels for feed products

Figure 2: Action levels for feed products (status as of 28th November 2019)

| Products intended for animal feed | Dioxins (sum of PCDD/Fs): Action threshold in WHO-PCDD/F-TEQ ¹ | Sum of dioxin-like PCBs (sum of DL-PCBs): Action threshold in WHO-PCDD/F-PCB-TEQ ¹ | Comments and additional information (e.g. nature of investigations to be performed) |
|--|---|---|---|
| | relative to a feed with a moisture content of 12 % | | |
| Feed materials of plant origin with the exception of: | 0,5 ng/kg | 0,35 ng/kg | 2 |
| - vegetable oils and their by-products | 0,5 ng/kg | 0,5 ng/kg | 2 |
| Feed materials of mineral origin | 0,5 ng/kg | 0,35 ng/kg | 2 |
| Feed materials of animal origin: | | | |
| - Animal fat, including milk fat and egg fat | 0,75 ng/kg | 0,75 ng/kg | 2 |
| - Other land animal products including milk and milk products and eggs and egg products | 0,5 ng/kg | 0,35 ng/kg | 2 |
| - Fish oil | 4,0 ng/kg | 11,0 ng/kg | 3 |
| - Fish, other aquatic animals, and products derived thereof with the exception of fish oil, hydrolysed fish protein containing more than 20 % fat and crustacea meal | 0,75 ng/kg | 2,0 ng/kg | 3 |
| - Fish protein, hydrolysed, containing more than 20 % fat | 1,25 ng/kg | 5,0 ng/kg | 3 |
| - Crustacea meal | 1,25 ng/kg | 2,0 ng/kg | 3 |
| Feed additives belonging to the functional groups of binders and anti-caking agents | 0,5 ng/kg | 0,5 ng/kg | 2 |
| Feed additives belonging to the functional group of compounds of trace elements | 0,5 ng/kg | 0,35 ng/kg | 2 |
| Premixtures | 0,5 ng/kg | 0,35 ng/kg | 2 |
| Compound feed with the exception of: | 0,5 ng/kg | 0,5 ng/kg | 2 |
| - compound feed for pet animals and fish | 1,25 ng/kg | 2,5 ng/kg | 2 |
| - compound feed for fur animals | --- | --- | |

¹ expressed in World Health Organisation (WHO) toxic equivalents, using the WHO-TEFs (toxic equivalency factors, 2005) as upper-bound concentrations; upper-bound concentrations are calculated on the assumption that all values of the different congeners below the limit of quantification are equal to the limit of quantification.

² Identification of source of contamination. Once source is identified, take appropriate measures, where possible, to reduce or eliminate source of contamination.

3 In many cases it might not be necessary to perform an investigation into the source of contamination as the background level in some areas is close to or above the action level. However, in cases where the action level is exceeded, all information, such as sampling period, geographical origin, fish species etc., shall be recorded with a view to future measures to manage the presence of dioxins and dioxin-like compounds in these materials for animal nutrition.

Field of application of GC-HRMS and GC-MS/MS

Figure 3: Field of application of GC-HRMS and GC-MS/MS versus GC-MS-based and bioanalytical methods (status as of 28th November 2019)

| Field of application | Gas chromatography / high resolution mass spectrometry (GC-HRMS) | Gas chromatography / tandem mass spectrometry (GC-MS/MS) | Bioanalytical methods ("bio-assays") and GC-MSD |
|---|--|--|---|
| Selection of those samples with levels of PCDD/Fs and dioxin-like PCBs that exceed the maximum levels or the action levels | Approved as confirmatory method | Approved as confirmatory method | Approved as screening method only |
| Confirmation of compliance of a feed product with the EU maximum level resp. action level | Approved | Approved | Not approved |
| Confirmation of results obtained by screening methods | Approved | Approved | Not approved |
| Identification of congener patterns in order to identify the source of a possible contamination | Possible | Possible | Not possible or partly possible |
| Determination of low background levels in feed monitoring | Approved | Not approved | Not approved |
| Following of time trends | Approved | Not approved | Not approved |
| Exposure assessment | Approved | Not approved | Not approved |
| Building of a database for possible re-evaluation of action levels and maximum levels | Approved | Not approved | Not approved |

References

- [1] Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee Community - Strategy for Dioxins, Furans and Polychlorinated Biphenyls (2001/C 322/02) (COM(2001) 593 final) (OJ C 322, 17.11.2001, p. 2-18)
- [2] Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed (OJ L 140, 30.5.2002, p.10-21)
- [3] Commission Regulation (EU) 2019/1869 of 7 November 2019 (OJ L 289, 8.11.2019, p. 32-36)
- [4] Commission Regulation (EU) No 744/2012 of 16 August 2012 (OJ L 219, 17.8.2012, p. 5–12)
- [5] Commission Regulation (EC) No 152/2009 of 27 January 2009 laying down the methods of sampling and analysis for the official control of feed (OJ L 54, 26.2.2009, p. 1-130)
- [6] Commission Regulation ((EU) 2017/771 of 3 May 2017 amending Regulation (EC) No 152/2009 as regards the methods for the determination of the levels of dioxins and polychlorinated biphenyls (OJ L 115, 4.5.2017, p. 22-42).