codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD ADDITIVES AND CONTAMINANTS

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PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF DIOXIN AND DIOXIN-LIKE PCB CONTAMINATION IN FOODS AND FEEDS

(At Step 3 of the Elaboration Procedure)

(prepared by Germany with the assistance of Australia, China, Japan, United Kingdom, United States and CEFS)

Governments and international organizations in Observer status with the Codex Alimentarius Commission wishing to submit comments on the following subject matter are invited to do so **no later than 31 January 2006** as follows: Netherlands Codex Contact Point, Ministry of Agriculture, Nature and Food Quality, P.O. Box 20401, 2500 E.K., The Hague, The Netherlands (Telefax: +31.70.378.6141; E-mail: info@codexalimentarius.nl - ***preferably***), with a copy to the Secretary, Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme, Viale delle Terme di Caracalla, 00100 Rome, Italy (Telefax: +39.06.5705.4593; E-mail: Codex@fao.org - ***preferably***).

BACKGROUND

1. The 32nd Session of the Codex Committee on Food Additives and Contaminants (CCFAC 2000) agreed that Germany, in collaboration with Belgium, Japan, the Netherlands and the United States, would develop a proposed draft Code of Practice for Source Directed Measures to Reduce Dioxin Contamination of Foods for circulation, comment and consideration at its next meeting. [1]The 47th Session of the Executive Committee approved the development of the Code as new work, and confirmed that the matter fell within the terms of reference of the CCFAC. [2]

2. The 33rd Session of CCFAC (2001) agreed that the Code of Practice, following a proposal of Norway, should also address dioxin-like polychlorinated biphenyls (PCBs) and that the title should be amended accordingly.

3. The Committee agreed further to return the proposed draft Code of Practice to Step 2 and that the drafting group led by Germany, with the assistance of Belgium, Japan, the Netherlands and the United States, would revise it on the basis of comments submitted for circulation, comment and further consideration at the 34th Session of CCFAC.[3]

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1 ALINORM 01/12, para. 131
2 ALINORM 01/3, paras. 54-55 and Appendix III
3 ALINORM 01/12A, paras 179-180

4. The 34th Session of CCFAC (2002) agreed to request comments on the proposed draft Code of Practice for Source Directed Measures to Reduce Dioxin and Dioxin-Like PCB Contamination of Foods. Furthermore it agreed that the drafting group led by Germany, with the assistance of Canada, Finland, Japan, the Netherlands, the United States and CEFIC would revise the Code of Practice on the basis of the comments submitted for circulation, additional comments and further consideration at the 35th Session of CCFAC.[4]

5. The 35th Session of CCFAC (2003) agreed that the document should be revised in the format of a code of practice on the basis of the current text and written comments submitted, in particular, Annex C of the Stockholm Convention on Persistent Organic Pollutants (POPs), which contains useful information with regard to sources and measures to reduce, and where feasible eliminate, emissions of dioxins and dioxin-like PCBs.

6. The Committee agreed also that the document should be elaborated by a drafting group led by Germany, with the assistance of Belgium, China, Finland, Japan, the Netherlands, EC, FEFAC and WHO, for circulation, additional comments and further consideration at the 36th Session of CCFAC. In this document, comments from Belgium, Canada, Finland, Japan, the Netherlands, the United States, EC and FEFAC have been included. [5]

7. The 36th Session of CCFAC (2004) agreed to return the proposed draft document to Step 2 for revision led by Germany, with the assistance of Australia, Belgium, Canada, China, EC, Finland, Iceland, United States, IBFAN and IDF, for circulation, comments at Step 3, and further consideration at the next Session of the Committee. In this document, comments from Australia, Belgium, Canada, Finland, Iceland, Japan, the United States, CEFIC and IBFAN have been included.[6]

8. The 37th Session of CCFAC (2005) agreed to return the proposed draft document on Step 2 for revision led by Germany, with the assistance of Australia, China, Japan, United Kingdom, United States and CEFS for circulation, comments at Step 3, and further consideration at the next Session of the Committee. In this document comments of Australia, Germany, Japan, the United States and IBFAN have been included.[7]

4 ALINORM 03/12, para. 156
5 ALINORM 03/12A, paras. 171-172
6 ALINORM 04/27/12, para. 185
7 ALINORM 05/28/12, para. 180

PROPOSED DRAFT CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF DIOXIN AND DIOXIN-LIKE PCB CONTAMINATION IN FOODS AND FEEDS

(at Step 3 of the Elaboration Procedure)

INTRODUCTION

GENERAL REMARKS

1. Dioxins (PCDD/PCDF) and dioxin-like PCBs are pervasive in the environment (1; 2). Although dioxins and dioxin-like PCBs show similarities in their toxicological and chemical behaviour, their sources are different.

2. Current sources of dioxins and dioxin-like PCBs entering the food chain include new emissions and remobilisation of deposits or reservoirs in the environment. New emissions are mainly via the air route. Dioxins and dioxin-like PCBs decompose very slowly in the environment and remain there for very long periods of time. Therefore, a large part of current exposure is due to releases of dioxin and dioxin-like PCBs that occurred in the past.

3. PCBs, including dioxin-like PCBs, were produced intentionally and in considerable amounts between the 1930s and 1970s and were used in a wide range of applications. PCBs are still in use in existing closed systems and contained in solid matrices (e.g., sealing materials and electrical capacitors). Certain commercial PCBs are known to be contaminated with dioxins and therefore could be regarded as a source for dioxins (3; 4).

4. Today release of dioxin-like PCBs occurs from leakages, accidental spills and illegal disposal. Emissions via air through thermal processes and migration from sealants and other old matrix applications are of minor importance. The remobilisation of dioxin-like PCBs from environmental reservoirs is similar to dioxins (5).

5. Dioxins are formed as unwanted by-products from a number of human activities including certain industrial processes (e.g., production of chemicals, metallurgical industry) (6) and combustion processes (e.g., waste incineration). Accidents at chemical factories have been shown to result in high emissions and contamination of local areas (7; 8). Other dioxin sources include domestic heaters, agricultural and backyard burning of household wastes (9; 10). Natural processes such as volcanic eruptions and forest fires can also produce dioxins (11).

6. When released into the air, dioxins can deposit locally on plants and on soil contaminating both food and feed. Dioxins can also be widely distributed by long-range atmospheric transport (12). The amount of deposition varies with proximity to the source, plant species, weather conditions and other specific conditions (e.g. altitude, latitude, temperature) (13; 14).

7. Sources of dioxins in soil include deposition from atmospheric dioxins, application of sewage sludge to farm land (15), flooding of pastures with contaminated sludge, and prior use of contaminated pesticides (e.g., 2.4.5-trichlorophenoxy acetic acid) and fertilizers (e.g., certain compost) (13; 16).

8. Dioxins and dioxin-like PCBs are poorly soluble in water. However, they are adsorbed onto mineral and organic particles suspended in water. The surfaces of oceans, lakes and rivers are exposed to aerial deposition of these compounds which are consequently concentrated along the aquatic food chain. The entry of waste water or contaminated effluents from certain processes, such as chlorine bleaching of paper or pulp or metallurgical processes, can lead to contamination of water and sediment of coastal ocean areas, lakes and rivers (13; 17; 18).

9. The uptake of dioxins and dioxin-like PCBs by fish occurs via gills and diet (19; 20; 21; 22). Fish accumulate dioxins and dioxin-like PCBs in their fatty tissue and liver. Bottom dwelling fish species and bottom feeders are more exposed to contaminated sediments than pelagic fish species. However, levels of dioxins and dioxin-like PCBs in bottom dwelling fish are not always higher than those in pelagic fish depending on the size, diet and physiological characteristics of the fish (23). In general, fish shows an age-dependent accumulation of dioxins and dioxin-like PCBs (24).

10. Food of animal origin is the predominant route of human exposure to dioxins and dioxin-like PCBs with approximately 80 - 90 % of the total exposure via fats in fish, meat and dairy products (25). Levels of dioxins and dioxin-like PCBs in animal fat may be related to contamination of feed (e.g., fish-oil and fish-meal), to certain production processes (e.g., artificial drying), or to contamination of the local environment.

11. JECFA (2) and EU SCF (26) derived tolerable intakes and compared these with calculated intakes. They concluded that a considerable proportion of the population may exceed the tolerable intake of dioxins and dioxin-like PCBs.

12. In order to reduce the contamination of food, control measures at the feed level should be considered. These may involve developing Good Agricultural Practice, Good Animal Feeding Practice (see Codex Alimentarius Commission: Code of Practice on Good Animal Feeding (27)), and Good Manufacturing Practice guidance and measures to effectively reduce dioxins and dioxin-like PCBs in feed, including:

- Identification of agricultural areas with increased dioxin and dioxin-like PCB contamination due to local emission, accidents or illegal disposal of contaminated materials, and monitoring of feed and feed ingredients derived from these areas,
- Setting guidance values for soil and recommendation for special agricultural use (e.g., limitation of grazing or use of appropriate agricultural techniques),
- Identification of possibly contaminated feed and feed ingredients,
- Monitoring compliance with nationally-established guideline levels or maximum limits, if available, and minimizing or decontaminating (e.g., refining of fish oil) non-complying feed and feed ingredients, and
- Identification and control of critical feed manufacturing processes (e.g., artificial drying by direct heating).

13. Similar control measures, where applicable, should be considered for reducing dioxins and dioxin-like PCBs in food.

SOURCE DIRECTED MEASURES

14. Reducing sources of dioxins and dioxin-like PCBs is an essential prerequisite for a further reduction of contamination. Measures to reduce dioxin-like PCBs emission sources should be directed to minimizing releases from existing equipment, prevention of accidents and better control of the disposal of dioxin-like PCBs containing oils and wastes. Source directed emission reductions of dioxins should be directed to reducing dioxin formation during thermal processes as well as the application of destruction techniques

15. The Stockholm Convention on Persistent Organic Pollutants (Stockholm Convention) (28) is a global treaty to protect human health and the environment from persistent organic pollutants (POPs) including dioxins and dioxin-like PCBs.

16. Part II of Annex C of the Stockholm Convention lists the following industrial source categories, that have the potential for comparatively high formation and release of dioxins and dioxin-like PCBs to the environment:.

a. Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge,

b. Cement kilns firing hazardous waste,

c. Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching,

d. Thermal processes in the metallurgical industry, i.e. secondary copper production; sinter plants in the iron and steel industry; secondary aluminium production; secondary zinc production,

Part III of Annex C also lists the following source categories that may unintentionally form and release dioxins, PCBs, as well as hexachlorobenzene, to the environment:

a. Open burning of waste, including burning of landfill sites,

b. Thermal processes in the metallurgic industry not mentioned in Part II, Annex C,

c. Residential combustion sources,

d. Fossil fuel-fired utility and industrial boilers,

e. Firing installations for wood and other biomass fuels,

f. Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil,

g. Crematoria,

h. Motor vehicles, particularly those burning leaded gasoline,

i. Destruction of animal carcasses,

j. Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction),

k. Shredder plants for the treatment of end of life vehicles,

l. Smouldering of copper cables,

m. Waste of oil refineries.

Adopting technologies to minimize formation and release of dioxins and dioxin-like PCBs from these sources categories should be considered by national authorities when developing national measures to reduce dioxin and dioxin-like PCBs.

SCOPE

17. This Code of Practice focuses on measures (e.g., Good Agricultural Practices, Good Manufacturing Practices, Good Storage Practices, Good Animal Feeding Practices, and Good Laboratory Practices) for national authorities, farmers, and feed and food manufacturers to prevent or reduce dioxin and dioxin-like PCB contamination in foods and feeds.

18. This Code of Practice applies to the production and use of all materials destined for feed (including grazing or free-range feeding, forage crop production and aquaculture) and food at all levels whether produced industrially or on farm.

19. Since the global limitation and reduction of dioxins and dioxin-like PCBs from industrial and environmental sources may lie outside of the responsibility of CCFAC, these measures will not be considered within this Code of Practice.

RECOMMENDED PRACTICES

BASED ON GOOD AGRICULTURAL PRACTICES (GAPS), GOOD MANUFACTURING PRACTICES (GMPS), GOOD STORAGE PRACTICES (GSPS), GOOD ANIMAL FEEDING PRACTICES (GAFPS), AND GOOD LABORATORY PRACTICES (GLPS)

1. CONTROL MEASURES WITHIN THE FOOD CHAIN

1.1 Air, Soil, Water

20. To reduce dioxin and dioxin-like PCB contamination in the air, national authorities, farmers and feed and food manufacturers should take measures to prevent uncontrolled burning of wastes, including the burning of landfill sites or backyard burning, and the use of PCB treated wood for domestic heaters (9; 10).

21. Contamination of soil by dioxins and dioxin-like PCBs primarily occurs from leakages, accidental spills, and illegal waste disposal and emission from industrial processes and combustion processes. Control measures to prevent or reduce contamination of the environment by dioxins and dioxin-like PCBs are important. To reduce possible contamination of feed or food, agricultural land with unacceptable dioxin and dioxin-like PCB contamination due to local emission, accidents, or illegal disposal of contaminated materials should be identified.

22. Agricultural production on contaminated areas should be avoided or should be restricted if a significant transfer of dioxins and dioxin-like PCBs to feed or food produced on these areas is anticipated. If possible, contaminated soil should be treated and detoxified or removed and stored under environmentally sound conditions.

23. The spreading of sewage sludge contaminated with dioxins and dioxin-like PCBs can lead to adhering of contaminants on the vegetation which can increase livestock exposure (29). Therefore, the spreading of sewage and sewage sludge should be monitored periodically. Additionally, sewage sludge should be treated, as necessary, to render it inert or to detoxify it (15). National guidelines should be adhered to where applicable.

24. Livestock, game, and poultry, exposed to contaminated soil, may accumulate dioxins and dioxin like PCBs by consumption of contaminated soil or plants. These areas should be identified and controlled. If necessary, the production in these areas should be restricted.

25. Source-reduction measures will take many years to show effects on the contamination levels of wild caught fish because of the long half-lives of dioxins and dioxin-like PCBs in the environment. To reduce exposure to dioxins and dioxin-like PCBs, highly contaminated areas (e.g., lakes and rivers) and relevant fish species should be identified and fishing in these areas should be controlled and, if necessary, restricted (30).

26. On the other hand, reduction of dioxin and dioxin-like PCB levels in feed would have an immediate effect on contaminant levels in farmed fish (30).

1.2 Feed

27. The bulk of human dietary intake of dioxins and dioxin-like PCBs is due to the deposition of these substances in the lipid component of animal derived foods (e.g., poultry, fish, eggs, meat and milk). In lactating animals dioxins and dioxin-like PCBs are excreted partly with milk fat, and in laying hens the contaminants are concentrated in fat content of the yolk in laid eggs. To reduce this transfer, control measures at the feed and feed ingredients level should be considered. These measures should involve developing Codes of Good Agricultural Practices, Good Animal Feeding Practices (see (27)), Good Manufacturing Practices, Good Storage Practices, and other control measures (e.g., HACCP-like principles) which may reduce levels of dioxins and dioxin-like PCBs. Such measures may include:

- identification of possibly contaminated areas in the feed supply ecosystem,
- identification of the origin of frequently contaminated feed or feed ingredients, and
- monitoring the compliance of feed and feed ingredients with nationally-established guideline levels or maximum limits, if available. Threshold violating commodities should be investigated by the competent national authority, to determine whether those commodities should be excluded from further feeding.

28. Competent national authorities should periodically sample and analyse, using recognized international methods, suspect feed and feed ingredients to verify dioxin and dioxin-like PCB levels. This information will determine actions, if needed, to minimize dioxin and dioxin-like PCB levels and allow alternative feed and feed ingredients be located, if necessary.

29. The purchaser and user should pay attention to:

- origin of feed and feed ingredients to ensure that producers and/or companies have certified production facilities, production processes and quality assurance programmes (e.g., HACCP-like principles);
- accompanying documents confirming compliance with nationally-established guideline levels or maximum limits, if available.

1.2.1 Feed of animal origin

30. Due to the position of their precursors in the food chain, animal derived feed has a higher risk for dioxin and dioxin-like PCB contamination compared to plant derived feed. Attention should be paid to avoid these contaminants from entering the food chain through the feeding of animal derived feed to food producing animals. Animal derived feed should be monitored, as necessary, for dioxins and dioxin-like PCBs.

31. Accumulation of dioxins and dioxin-like PCBs in adipose tissues of livestock, with possible resultant violations of nationally-established guideline levels or maximum limits, if available, for meat and milk or their derived products should be prevented. Therefore, milk that exceeds nationally-established guideline levels or maximum limits, if available, or contains elevated levels of dioxins or dioxin-like PCBs should not be fed to suckling animals unless the fat has been removed.

32. If intended for use in feed, fish-oil and other products derived from fish, milk and milk substitutes, and animal fats should be monitored to the extent practicable for dioxins and dioxin-like PCBs. If there are nationally-established guideline levels or maximum limits, the feed manufacturer should ensure that the products are in compliance with these provisions.

1.2.2 Feed of plant origin

33. If potential sources of dioxins and dioxin-like PCBs are anticipated in the vicinity of fields, attention should be paid to monitor these areas, as necessary.

34. Cultivation sites irrigated with water or treated with sewage sludge or municipal compost that may contain elevated dioxin and dioxin-like PCB levels should be monitored, as necessary, for contamination (15).

35. Prior treatment of crops with herbicides from the chlorinated phenoxyalkanoic acid type or chlorinated products like pentachlorophenol should be considered as a potential source for dioxin contamination. Monitoring the dioxin content in soil as well as forage plants from treated sites may provide the necessary information to enable competent national authorities, if necessary, to take appropriate management measures in order to prevent the transfer of dioxins (and probably dioxin-like PCBs) into the food chain.

36. Typically, oilseeds and vegetable oil are not significantly contaminated with dioxins and dioxin-like PCBs. This also applies to other by-products of oilseed processing (e.g., oilseed cakes) used as feed ingredients. However, certain oil refining by-products (e.g., fatty acid distillates) may contain increased levels of dioxins and dioxin-like PCBs and should be analysed, as necessary, if used for feed.

1.2.3 Minerals and Trace Elements

37. Minerals and trace elements are obtained from natural sources. However, experience has shown, that geogenic dioxins may be present in certain prehistoric sediments. Therefore, dioxin levels in minerals and trace elements added to feed or food should be monitored as necessary.

38. Reclaimed mineral products or by-products from certain industrial processes may contain elevated levels of dioxins and dioxin-like PCBs. The user of such feed ingredients should verify the absence of dioxin and dioxin-like PCBs through certification by the manufacturer or supplier.

39. Attention should be paid to minerals used as binders or anticaking agents (e.g., bentonite, montmorillonite, kaolinitic clay) and carriers (e.g., calcium carbonate) used as feed ingredients. As assurance to the user that these substances do not contain minerals with critical amounts (e.g., exceeding nationally-established guideline levels or maximum limits, if available) of dioxins and dioxin-like PCBs, the distributor should provide appropriate certification to the user of such feed ingredients.

40. The supplementation of food producing animals with trace elements (e.g., copper or zinc) depends on the species, age and performance. The supplementation of copper or zinc with metallurgic cinders might be a considerable source of dioxins despite their poor bioavailability from the copper containing matrix in the gastro intestinal tract. Such products should be monitored, as necessary, by the feed manufacturer.

1.2.4 Drying Processes

41. Artificial drying of feed, food and feed or food ingredients and heating of hothouses for vegetable requires a flow of heated gases, either a flue gas-air mix (direct drying or heating) or heated air alone (indirect drying or heating). Accordingly, appropriate fuels should be used. Feed, food and feed or food ingredients that are dried or subjected to heated air should be monitored as necessary to ensure that drying or heating processes do not result in elevated levels of dioxins and dioxin-like PCBs.

42. The quality of commercial dried green fodder depends on the selection of the raw material and the drying process. The purchaser should consider requiring a certificate from the manufacturer/supplier, that the dried goods are produced according to Good Manufacturing Practice, especially in the choice of the fuel (e.g., light heating oil, natural gas, by no means treated wood) and are in compliance with nationally-established guideline levels or maximum limits, if available.

1.3 Special Conditions of Food Processing

43. Depending on the technology used, smoking can be a critical processing step for increased dioxin content in foods, especially if the products show a very dark surface with particles of soot (31). Such processed products should be monitored, as necessary, by the manufacturer.

44. 44. Special nationally-used food preparation practices that could lead to elevated levels of dioxins or dioxin-like PCBs should be identified and, if necessary, measures for minimization should be considered.

1.4 Substances added to Feed and Food

45. Feed and food manufacturers should ensure that all ingredients in feed and food have minimal levels of dioxins and dioxin-like PCBs to reduce possible contamination and to comply with nationally-established guideline levels or maximum limits, if available.

1.5 Harvesting, Transport, Storage of Feed and Food

46. To the extent feasible, it should be ensured that minimal contamination with dioxins and dioxin-like PCBs occurs during the harvest of feed and food. This can be achieved in possibly contaminated areas by minimizing soil deposition on feed and food during harvest by using appropriate techniques and tools according to Good Agricultural Practice. Roots and tubers, grown on contaminated soil, should be washed to reduce soil contamination. If roots and tubers are washed, they should be sufficiently dried before storage to prevent mould formation.

47. After flooding, crops harvested for feed and food should be monitored, as necessary, for dioxins and dioxin-like PCBs, if there is evidence for flood water contamination.

48. To avoid cross-contamination, the transport of feed and food should only be performed in vehicles (including ships) or in containers not contaminated with dioxins and dioxin-like PCBs. Storage containers for feed and food should be painted only with PCDD/PCDF- and PCB-free paint.

49. Storage sites for feed or food should be free from contamination with dioxins and dioxin-like PCBs. Surfaces (e.g., walls, floors) treated with tar-based paints may result in transfer of dioxins and dioxin-like PCBs to food and feed. Surfaces that come in contact with smoke and soot from fires always bear a risk of contamination with dioxins and dioxin-like PCBs. These sites should be monitored as necessary for contamination before use for storage of feed and food.

50. Some string for baling straw may be contaminated with dioxin-like PCBs due to certain manufacturing processes. The user of such string should verify the absence of these contaminants through certification by the manufacturer or supplier.

1.6 Special Problems of Animal Keeping (Housing)

51. Food producing animals may be exposed to dioxins and dioxin-like PCBs found in certain treated wood used in buildings, farm equipment and bedding material. To reduce exposure, animal contact with treated wood containing dioxins and dioxin-like PCBs should be minimized. In addition, sawdust from treated wood containing dioxins and dioxin-like PCBs should not be used as bedding material.

52. Due to contamination in certain soil, eggs from free living or free-range hens (e.g., organic farming) may have elevated levels of dioxins and dioxin-like PCBs compared to eggs from caged hens and should be monitored, as necessary.

53. Attention should be paid to older buildings as they may have building materials and varnishes that may contain dioxin and dioxin-like PCBs. If they have caught fire, a thorough cleaning of soot layers with lipid emulsifying solvents is necessary. Removal of ashes and remaining fire-fighting water and flushing with fresh water should reduce the risk of high PCB levels.

54. In housings without a floor covering the animals normally will take up soil particles from the ground. If there are indications of increased levels of dioxins and dioxin-like PCBs, the contamination of the soil should be controlled as necessary. If needed, the soil should be exchanged.

55. Wood (e.g., railroad ties) treated with chemicals such as pentachlorophenol or other unsuitable materials should not be used as fence posts for enclosures of free-range animals or feed lines. Hay racks should not be constructed from such treated wood. Preservation with waste oils should be avoided.

1.7 Disposal of Contaminated Milling Fractions

56. In agricultural land in the vicinity of dioxin and dioxin-like PCB emission sources, the air borne external deposition of dioxins and dioxin-like PCBs on the surface of all parts of the grain plants as well as the adherent dust fraction from the standing crop is widely removed during the milling process and before the final grinding process. If present, most particle-bound contamination is removed in the loading chute with the remaining dust. Further external contaminations are significantly reduced during aspiration and sieving. Certain grain fractions, especially dust, can have increased dioxin and dioxin-like PCB levels and should be monitored, as necessary. If there is evidence for elevated contamination, such fractions should not be used in food or feed and treated as waste.

1.8 Monitoring

57. Farmers and industrial feed and food manufacturers have the primary responsibility for feed and food safety. Therefore, they should periodically test products from areas for which elevated levels of dioxins and dioxin-like PCBs can be anticipated. Competent authorities should periodically test such products as well and enforce this responsibility through the operation of surveillance and control systems.

58. As analyses for dioxins are quite expensive in comparison to determination of other chemical contaminants, periodic tests should be performed to the extent feasible at least by industrial feed and food manufacturers including both incoming raw materials and final products and data should be kept (see para. 66). If there are indications of elevated levels of dioxins and dioxin-like PCBs, farmers and other primary producers should be informed about the contamination and the source should be identified.

59. Monitoring programmes dealing with contaminations originating from the environment, accidents or illegal disposals should be organized by farmers, industrial feed and food manufacturers and competent national authorities in order to obtain additional information on food and feed contamination. Monitoring programmes should also include major fish species intended for human consumption as fish was proven to be a significant source for the daily intake of consumers. Products or ingredients at risk or found with elevated contamination should be monitored more intensively. The results of monitoring programmes should be made available to all interested parties.

2. SAMPLING, ANALYTICAL METHODS AND LABORATORIES

60. Advice concerning analytical requirements and qualification of laboratories is given in the literature (32; 33). These recommendations and conclusions form the basis of the evaluation by JECFA (2) and others (34; 35). Furthermore, consideration of methods of analysis of dioxins and dioxin-like PCBs is currently being addressed by the Codex Committee of Methods of Analysis and Sampling (36).

Sampling

61. Important aspects of sampling for dioxin and dioxin-like PCB analysis are collecting representative samples, avoiding cross contamination and deterioration of samples and unambiguously identifying and tracing back samples (34). All relevant information on sampling, sample preparation and sample description (e.g., sampling period, geographic origin, fish species, fat content, size of fish) should be recorded in order to provide valuable information.

Analytical methods

62. Analytical methods should be applied only if they are fit for purpose meeting a minimum of requirements. If nationally-established maximum limits are available, the limit of quantification (LOQ) of the method of analysis should be in the range of one fifth of this level of interest. For control of time trends of background contamination, the limit of quantification of the method of analysis should be clearly below the mean of the present background ranges for the different matrices (2; 32).

63. Performance of a method of analysis should be demonstrated in the range of the level of interest, e.g. 0.5 x, 1 x and 2 x level of maximum limit with an acceptable coefficient of variation for repeated analysis. The difference between upper bound and lower bound levels (see next para.) should not exceed 20 % for feed and food with a dioxin contamination of about 1 pg WHO-PCDD/PCDF-TEQ/g fat (2; 32). If needed, another calculation based on fresh weight or dry matter could be considered.

64. Except for in vitro cell bioassays, the results of total dioxin and dioxin-like PCB levels in a given sample should be reported as lower bound, medium bound and upper bound concentration by multiplying each congener by their respective WHO Toxic Equivalency Factor (TEF) (37) and subsequently summing them up to give the total concentration expressed as Toxic Equivalency (TEQ). The three different TEQ values should be generated reflecting assignment of zero (lower bound), half the limit of quantification (medium bound), and limit of quantification (upper bound) values to each non-quantified dioxin and dioxin-like PCB congener (38).

65. The report of the analytical results should also include the lipid content and dry matter content of the sample as well as the method used for lipid extraction and for determination of dry matter.

66. A high throughput screening method of analysis with proven acceptable validation could be used to select the samples with significant levels of dioxins and/or dioxin-like PCBs. Screening methods should have less than 1 % false-negative results in the relevant range of interest for a particular matrix. Use of 13C-labelled internal standards for dioxins or dioxin-like PCBs allows for specific control of possible losses of the analytes in each sample. In this way, false-negative results can be avoided preventing contaminated food or feed being used or marketed. For confirmatory methods, use of these internal standards is mandatory. For screening methods without control of losses during the analytical procedure, information on correction of losses of compounds and the possible variability of results should be given. Levels of dioxins and dioxin-like PCBs in positive samples (above the level of interest) need to be determined by a confirmatory method.

Laboratories

67. Laboratories involved in the analysis of dioxins and dioxin-like PCBs using screening as well as confirmatory methods of analysis should be accredited by a recognized body operating in accordance with ISO/IEC Guide 58: 1993 (39) to ensure that they are applying analytical quality assurance. Laboratories should be accredited following the ISO/IEC/17025:1999 standard “General requirements for the competence of testing and calibration laboratories” (40).

68. The regular participation in interlaboratory studies or proficiency tests for the determination of dioxins and dioxin-like PCBs in the relevant feed and food matrices is strongly recommended according to ISO/IEC/17025: 1999 standard (40).

3. QUALITY MANAGEMENT AND EDUCATION

69. Good Agricultural Practices, Good Manufacturing Practices, Good Storage Practices, Good Animal Feeding Practices and Good Laboratory Practices are most valuable systems for further progress in reduction of dioxin and dioxin-like PCB contamination in the food chain. In this respect, farmers and feed and food manufacturers should consider educating their co-workers on how to prevent contamination and control the implementation of these measures.

References

INTRODUCTION

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Annex

Glossary of Terms
(for the purpose of this Code of Practice)

Term	Explanation
anticaking agent	substance that reduce the tendency of individual particles of a feed or food to adhere
binder	substance that increase the tendency of individual particles of a feed or food to adhere
coefficient of variation	statistical parameter expressing: 100 x standard deviation of a set of values/mean value of set
confirmatory method of analysis	method of analysis with high quality parameters capable to confirm analytical results produced with screening methods with lower quality parameters
congener	one of two or more compounds of the same kind with respect to classification
dioxins (PCDD/PCDF)	polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) belonging to a group of lipophilic and persistent organic substances. Depending on the degree of chlorination (1 -8 chlorine atoms) and the substitution patterns, among 75 different PCDDs and 135 different PCDFs ("congeners"), respectively, can be distinguished.
dioxin-like PCBs	non-ortho and mono-ortho substituted PCBs showing toxicological properties that are similar to dioxins (25)
fat fish	fish with a fat content of more than 5 % in the muscle tissue
fish	cold-blooded vertebrate animals including Pisces, Elasmobranches and Cyclostomes. For the purpose of this code of practice, molluscs and crustaceans are also included (41).
feed	any single or multiple materials, whether processed, semi-processed or raw which is intended to be fed directly to food producing animals (27)
food	any substance, whether processed, semi-processed or raw which is intended for direct human consumption
feed or food ingredient	a component part or constituent of any combination or mixture making up a feed or food, whether or not it has a nutritional value in the diet, including additives. Ingredients are of plant, animal or aquatic origin, or other organic or inorganic substances.
guideline levels	not statutory but recommended maximum levels
HACCP	Hazard Analysis Critical Control Point
limit of quantification (LOQ) (valid for dioxins and dioxin-like PCBs only)	the limit of quantification of an individual congener is the concentration of an analyte in the extract of a sample which produces an instrumental response at two different ions to be monitored with an S/N (signal/noise) ratio of 3:1 for the less sensitive signal and fulfilment of the basic requirements such as e.g. retention time, isotope ratio according to the determination procedure as described in EPA method 1613 revision B (38).
maximum limits	statutory maximum limits for contaminants
minerals	ground substances from natural sources (including bulk elements as P, Ca, Mg, Na, K) used as feed or food ingredients or processing aids
PCBs	polychlorinated biphenyls belonging to a group of chlorinated hydrocarbons, which are formed by direct chlorination of biphenyl. Depending on the number of chlorine atoms (1 – 10) and their position at the two rings, 209 different compounds ("congeners") are theoretically possible (25).
pelagic fish species	fish species living in free water (e.g., ocean, lake) without contact to the sediment
persistent organic pollutant (POP)	chemical substance that persists in the environment, bioaccumulates through the food web, and poses a risk of causing adverse effects to human health and the environment

Term	Explanation
Stockholm Convention (POPs Convention)	The Stockholm Convention on Persistent Organic Pollutants is a global treaty to protect human health and the environment from persistent organic pollutants (POPs) including dioxins and dioxin-like PCBs and entered into force on 17th May 2004. In implementing the Stockholm Convention governments will take measures to eliminate or reduce the release of POPs into the environment.
screening method of analysis	method of analysis with lower quality parameters to select samples with significant levels of an analyte
trace elements	chemical elements essential for plant, animal and/or human nutrition in small amounts
Toxic Equivalency (TEQ)	relative value calculated by multiplying the concentration of a congener by the toxic equivalency factor (TEF)
WHO-PCDD/PCDF-TEQ	TEQ value for dioxins without dioxin-like PCBs established by WHO
Toxic Equivalency Factor (TEF)	Estimates of the toxicity of dioxin-like compounds relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), which is assigned a TEF of 1.0