



DRAFT TANZANIA STANDARD

Code of practice for the prevention and reduction of dioxins, dioxin-like and non-dioxin-like Polychlorinated biphenyls in food and feed

DRAFT FOR STAKEHOLDERS' COMMENTS

TANZANIA BUREAU OF STANDARDS

0 FOREWORD

Dioxins are a group of persistent chemicals which are not produced intentionally but are formed during combustion (burning) processes and as by-products of industrial processes. PCBs, or polychlorinated biphenyls, are similar chemically to the dioxins. They have been used in transformers, building materials, lubricants, coatings, plasticizers and inks, although their use has now largely been phased out. Both the dioxins and the PCBs are highly resistant to breakdown processes, and consequently persist in the environment, followed by uptake into the food chain, mainly foodstuffs of animal origin with a high fat content, since these contaminants accumulate in fatty tissues. Foodstuffs in which dioxins can occur include meat, fish, eggs and milk.

Dioxins and PCBs are toxic chemicals that can provoke serious health effects such as cancer, hormone disruption, reduced ability to reproduce, skin toxicity and immune system disorders, when exposure to them continues over an extended period (a number of years). Short periods of exposure are not considered to have adverse effects on health, unless the levels are very high. Because of their potentially serious health effects and their persistence in the environment, it is essential to minimize their release into the environment, including the establishment of emission limits for dioxins to air, prohibition of the use of PCBs, and safe collection, storage and environmentally compatible disposal or destruction of dioxin and PCB-contaminated devices and products.

This code of practice is therefore aiming to guide regulators, farmers, feed and food manufacturers as well as consumers to prevent or reduce dioxin and PCBs contamination in foods and feeds.

In the preparation of this code of practice, assistance was drawn from; - CXC 62-2006 code of practice for the prevention and reduction of dioxins, dioxin-like PCBs and non-dioxin-like PCBs in food and feed.

DRAFT FOUR STAKEHOLDERS' COMMENTS

1 SCOPE

This code of practice recommends on measures based on Good Agricultural Practices, Good Manufacturing Practices, Good Storage Practices, Good Animal Feeding Practices, and Good Laboratory Practices for regulators, farmers, feed and food manufacturers as well as consumers to prevent or reduce dioxin and PCB contamination in foods and feeds. This code applies to the production and use of all materials intended for feed (including grazing or free-range feeding, forage crop production and aquaculture) and food at all levels whether produced industrially, on farms or in households.

This code of practice represents a standard of good practice for the prevention and reduction of Dioxins, Dioxin-like PCBs and non-Dioxin-like PCBs in food and feed. Compliance with this code does not confer immunity from relevant statutory and legal requirements.

2 TERMS AND DEFINITIONS

For the purposes of this document, the following terms and definitions apply;

2.1 anticaking agent

substance that reduces the tendency of particles of a feed or food to stick

2.2 binder

substance that increases the tendency of individual particles of a feed or food to stick

2.3 Congener

one of two or more compounds of similar chemical structures with respect to classification

2.4 dioxins (PCDD/PCDF)

include 7 polychlorinated dibenzo-p-dioxins (PCDDs) and 10 dibenzofurans (PCDFs) with similar toxicological properties and belong to a group of lipophilic and persistent organic substances. Depending on the degree of chlorination (1–8 chlorine atoms) and the substitution patterns, 75 different PCDDs and 135 different PCDFs (“congeners”), can be distinguished

2.5 dioxin-like PCBs (DL-PCBs)

include 12 non-ortho and mono-ortho substituted polychlorinated biphenyls (PCBs) showing toxicological properties (dioxin-like activity) that are similar to dioxins

2.6 feed

any single or multiple materials, whether processed, semi-processed or raw which is intended to be fed directly to food producing animals

2.7 food

any substance, whether processed, semi-processed or raw which is intended for direct human consumption, and includes drink, chewing gum and any substance which has been used in the manufacture, preparation or treatment of “food” but does not include cosmetics, tobacco, medicinal products, narcotic or psychotropic substances, residues and contaminants

2.8 feed or food ingredient

component 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 may originate from other organic or inorganic substances.

2.9 HACCP

Hazard Analysis Critical Control Point

system that identifies, evaluates and controls hazards which are significant for food safety

2.10 maximum levels

legally binding maximum concentration of a substance in feed or food, established by a national or international authority

2.11 minimum limit of quantification (LOQ)

lowest concentration at which the performance of a method or measurement system is acceptable for a specified use

2.12 minerals

inorganic compounds used in food and feed being required for normal nutrition or used as processing aids

2.13 non dioxin-like PCBs (NDL-PCBs)

includes the 197 PCB congeners other than the 12 non-ortho and mono-ortho substituted PCBs. The NDL-PCBs account for the majority of the total PCB contamination, the remainder being DL-PCBs.

2.14 PCBs

polychlorinated biphenyls belonging to a group of chlorinated hydrocarbons, 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. The 209 congeners of PCBs include the dioxin-like PCBs (12 congeners) and the non-dioxin-like PCBs (197 congeners)

2.15 Persistent organic pollutant (POP)

chemical substance that persists in the environment, bio-accumulates through the food web, and poses a risk of causing adverse effects to human health and the environment

2.16 trace elements

chemical elements essential for plant, animal and/or human nutrition in small amounts

3. RECOMMENDED PRACTICES BASED ON GOOD AGRICULTURAL PRACTICES (GAPs), GOOD MANUFACTURING PRACTICES (GMPs), GOOD STORAGE PRACTICES (GSPs), GOOD ANIMAL FEEDING PRACTICES (GAFFs), AND GOOD LABORATORY PRACTICES (GLPs)

3.1. Control measures within the food value chain

3.1.1 Air, Soil, Water

3.1.1.1 To reduce dioxin and PCB contamination in the air, food regulators should recommend to the regulator responsible for air pollution measures to restrict uncontrolled burning of wastes, including the burning of landfill sites or backyard burning, and the use of PCP treated wood for domestic heaters.

3.1.1.2 Control measures to prevent or reduce contamination of the environment by dioxins and PCBs are important. To reduce possible contamination of feed or food, agricultural land with unacceptable dioxin and PCB contamination due to local emission, accidents, or illegal disposal of contaminated materials should be identified by responsible regulators.

3.1.1.3 Agricultural production on contaminated areas should be avoided or should be restricted if a significant transfer of dioxins and PCBs to feed or food produced on these areas is anticipated.

3.1.1.4 The spreading of sewage sludge contaminated with dioxins and PCBs can lead to dioxins and PCBs adhering to vegetation which can increase livestock exposure. Sewage sludge used in agriculture should be monitored, as necessary, for dioxins and PCBs and treated, as necessary.

3.1.1.5 Livestock, and poultry exposed to contaminated soil may accumulate dioxins and PCBs by consumption of contaminated soil or plants. These areas should be identified and access by certain food producing animals controlled. If necessary, the outdoor production in these areas should be restricted.

3.1.1.6 Source-reduction measures may take many years to reduce contamination levels in wild fish due to the long half-lives of dioxins and PCBs in the environment. To reduce exposure to dioxins and PCBs, highly contaminated areas (e.g. lakes, rivers or contaminated marine catching areas) and relevant fish species should be identified and fishing in these areas should be controlled and, if necessary, restricted.

3.1.2 Feed

3.1.2.1 General

3.1.2.1.1. The bulk of human dietary intake of dioxins and PCBs is due to the concentration of these substances in the lipid component of animal derived foods (e.g., poultry, fish, eggs, meat and milk). In lactating animal's dioxins and PCBs can be excreted in milk, and in laying hens they may concentrate in the fat content of the egg yolk. To reduce this transfer, control measures at the feed and feed ingredients level should be considered. Measures to reduce dioxin and PCB levels in feed would have a rapid effect on their concentrations in food of animal origin originating from farm animals, including farmed fish. 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 established maximum levels.

3.1.2.1.2 Regulators should periodically sample and analyse suspect feed and feed ingredients using recognized national or international methods to verify dioxin and PCB levels. This information will determine actions, if needed, to minimize dioxin and PCB levels and allow alternative feed and feed ingredients, if necessary.

3.1.2.1.3 The purchaser and user should pay attention to and request guarantees from their supplier as regards

- origin of feed and feed ingredients to ensure that producers and/or companies have certified production facilities, production processes and quality assurance programs (e.g. GMP and HACCP-like principles);
- accompanying documents confirming compliance with maximum levels, if available, according to national requirements.

3.1.2.2 Feed of animal origin

3.1.2.2.1 Due to the position of their precursors in the food chain, animal derived feed has a higher risk for dioxin and PCB contamination compared to plant derived feed. Attention should be paid to avoid dioxins and PCBs 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 PCBs. Feed of animal origin that exceeds maximum levels or contains elevated levels of dioxins or PCBs should not be fed to animals unless the fat has been removed.

3.1.2.2.2 If intended for use in feed, fish-oil and other products derived from fish or animal fats should be monitored to the extent practicable for dioxins and PCBs. Animal feeds should be in compliance with their established maximum levels.

3.1.2.3 Feed of plant origin

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

3.1.2.3.2 Cultivation sites irrigated with water or treated with sewage sludge or municipal compost that may contain elevated dioxin and PCB levels should be monitored, , for contamination and take actions where necessary.

3.1.2.3.3 Prior treatment of fields with herbicides from the chlorinated phenoxyalkanoic acid type or chlorinated products like pentachlorophenol should be considered as a potential source for dioxin contamination. Dioxin levels in soil and forage plants from sites treated previously with dioxin-contaminated herbicides should be regularly monitored to prevent the transfer of dioxins (and PCBs) to the food chain.

3.1.2.3.4 Oilseeds and vegetable oil are not significantly contaminated with dioxins and PCBs. This also applies to other by-products of oilseed processing (e.g. oilseed cakes) used as feed ingredients. However, certain vegetable and animal oil refining by-products (e.g. fatty acid distillates and deodistillates) and spent products used in oil refining (e.g. bleaching clays) may contain increased levels of dioxins and PCBs and should be analysed, as necessary, if used for feed.

3.1.3 Feed and food processing

3.1.3.1 Drying processes

3.1.3.1.1 Certain processes for the artificial drying of feed and food (and feed or food ingredients) and the heating of indoor growing facilities (e.g. greenhouses) require a flow of heated gases, either a flue gas-air mix (direct drying or heating) or heated air alone (indirect drying or heating). Accordingly, fuels not expected to generate dioxins and dioxin-like compounds 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 PCBs.

3.1.3.1.2 The quality of commercial dried feed materials, in particular green fodder, and commercially dried foods depends on the selection of the raw material and the drying process. The purchaser should consider requiring a certificate from the manufacturer/supplier, confirming that the dried goods are produced applying Good Manufacturing Practices, particularly in the choice of the fuel used for drying or heating and are in compliance with nationally-established maximum levels.

3.1.3.2 Smoking

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. Such processed products should be monitored for dioxins and PCBs, as necessary, by the manufacturer and regulators.

3.1.3.3 Milling / Disposal of contaminated milling fractions

Airborne external deposition of dioxins and 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 dioxins and PCB contaminations are significantly reduced during aspiration and sieving. Certain grain fractions, especially dust, chaff and mixed screenings including brans, can have increased dioxin and

PCB levels and should be monitored, as necessary. If there is evidence of elevated contamination, such fractions should not be used in food or feed and should be treated as waste.

3.1.3.4 Food preparation

3.1.3.4.1 Food selection and preparation such as skinning, trimming the fat, in addition to the disposing of pan drippings and poaching/boiling liquids) are practical approaches to reduce exposure to dioxins and PCBs.

3.1.4 Substances added to feed and food

3.1.4.1 Minerals and trace elements

3.1.4.1.1 Some 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.

3.1.4.1.2 Reclaimed mineral products or by-products from certain industrial processes may contain elevated levels of dioxins and PCBs. The user of such feed ingredients should verify that dioxin and PCBs are within nationally established maximum levels, through certification by the manufacturer or supplier.

3.1.4.1.3 Elevated levels of dioxins have been found in ball clay used as an anticaking agent in soybean meal in feed. Attention should be paid to minerals used as binders or anticaking agents (e.g. bentonite, montmorillonite, kaolinitic clay, diatomaceous earth) and carriers (e.g. calcium carbonate) used as feed ingredients. As assurance to the user that these substances do not contain minerals with elevated levels (e.g. exceeding nationally- established maximum levels,) of dioxins and PCBs, the distributor should provide appropriate certification to the user of such feed ingredients.

3.1.4.1.4 Feed of some food producing animals is supplemented with trace elements (e.g. copper or zinc). Minerals, including trace elements, which are by-products or co-products of industrial metal production, have been shown to contain elevated levels of dioxins. Such products should be monitored for dioxins and PCBs, as necessary.

3.1.4.2 Ingredients

Feed and food manufacturers should ensure that all ingredients in feed and food comply with nationally established maximum levels of dioxins and PCBs.

3.1.5 Harvesting, transport and storage of feed and food

3.1.5.1 Measures to control the risks to contamination with dioxins and PCBs during the harvest and storage of feed and food should be established.

3.1.5.2 After flooding, crops harvested for feed and food should be monitored for dioxins and PCBs, if there is evidence of dioxin and/or PCB contamination in the flood water.

3.1.5.3 To avoid cross-contamination, the transport of feed and food should only be performed in vehicles (including ships) and in containers that are free of dioxins and PCBs. Storage containers for feed and food should be painted only with dioxin and PCB-free paint. The vehicles transporting feeds and foods should not transport the dioxins and PCBs rich products at the same time e.g. Gasoline.

3.1.5.4 Storage sites for feed or food should be free from dioxins and PCB contamination (i.e do not keep gasoline and feeds and foods in one store). Surfaces (e.g. walls, floors) treated with tar-based paints may result in transfer of dioxins and 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 PCBs. These sites should be monitored as necessary for contamination before use for storage of feed and food.

3.1.5.5 Avoid using wood shaving during transport of frozen fish to prevent contamination by dioxin and PCBs.

3.1.6 Special considerations of animal keeping (Housing)

3.1.6.1 Food producing animals may be exposed to dioxins and 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 PCBs should be minimized. In addition, sawdust from treated wood containing dioxins and PCBs should not be used as bedding material.

3.1.6.2 Due to the potential for soil contamination, eggs from free living or free-range hens (e.g. organic farming) may have higher levels of dioxins and PCBs compared to eggs from caged hens and should be monitored, as necessary.

3.1.6.3 Attention should be paid to older buildings as they may have building materials and varnishes that may contain dioxins and PCBs. If they have caught fire, measures should be taken to avoid contamination of the feed and feed value chain by dioxins and PCBs.

3.1.6.5 Pentachlorophenol-treated wood in animal facilities has been associated with elevated levels of dioxins in beef. Wood (e.g. railroad ties, utility poles) treated with chemicals such as pentachlorophenol or other unsuitable substances should not be used as fence posts for enclosures of free-range animals. Hay racks should not be constructed from such treated wood. The preservation of wood with waste oils should also be avoided.

3.1.7 Monitoring

3.1.7.1 Farmers and industrial feed and food manufacturers have the primary responsibility for feed and food safety. Testing could be conducted within the framework of a food safety program (e.g. Good Manufacturing Practices, On-Farm Safety programmes, Hazard Analysis and Critical Control Point programs, etc.) Regulators should enforce the primary responsibility of farmers, feed and food manufacturers, distributors and retailers for feed and food safety through the operation of surveillance and control systems at appropriate points along food or feed value chain. In addition, regulators should establish their own monitoring programs.

3.1.7.2 Monitoring programs dealing with contaminations originating from the environment, accidents or illegal disposals should be organized by operators in the feed and food chain and by regulators in order to obtain additional information on food and feed contamination. Products or ingredients at risk or found with elevated concentrations should be monitored more intensively. For example, monitoring programs may include major fish species used in food or feed that have been shown to contain elevated levels of dioxins and PCBs.

3.1.8 Sampling, analytical methods, data reporting and laboratories

3.1.8.2 Methods for the analysis of dioxin and DL-PCBs could be gas chromatography coupled to high-resolution mass spectrometry (GC-HRMS) or gas chromatography coupled to tandem mass spectrometry (GC-MS/MS), and bioassay techniques

3.1.8.3 Gas chromatography (GC) coupled to Electron Capture Detection (ECD) and mass spectrometers (including ion trap, low-resolution (LRMS), high-resolution (HRMS) and tandem mass (MS/MS) spectrometers) are used in the analysis of NDL-PCBs. The analysis of NDL-PCBs generally does not require as extensive a clean-up procedure as the DL-PCBs or dioxins. For screening purposes, GC-ECD is often used. GC/MS may also be used for screening purposes.

3.1.9 Sampling

Important aspects of sampling for dioxin and PCB analysis are collecting representative samples, avoiding cross contamination and deterioration of samples and unambiguously identifying and tracing back samples. To avoid cross-contamination, samples should be put in containers or other receptacles that are not reactive and that have been chemically cleaned or certified to be free of contaminants. 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.

3.1.10 Analytical methods and data reporting

3.1.10.1 Analytical methods should be applied only if they meet minimum allowable limits of quantification (LOQ) of the method of analysis should be in the range of one fifth of the established levels.

3.1.10.2 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 level with an acceptable coefficient of variation for repeated analysis. The difference between upper bound and lower bound levels should not exceed 20% for feed and food with a dioxin concentration of about 1 pg WHO-PCDD/PCDF-TEQ/g fat. If needed, another calculation based on fresh weight or dry matter could be considered.

3.1.10.3 Except for bioassay techniques, the results of total dioxin and DL-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 TEF (toxic equivalent factor) and subsequently summing them up to give the total concentration expressed as TEQ. The three different TEQ (toxic equivalents) 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 DL-PCB congener. For the analysis of NDL-PCBs the analytical result should also be reported as lower-bound, medium bound and upper-bound and indicate clearly to what the analytical result refers to (sum of six indicator PCBs, total PCBs, etc.)

3.1.10.4 Depending on the sample type, the reported information may also include the lipid or dry matter content of the sample as well as the method used for lipid extraction and for the determination of dry matter. This report should also include a specific description of the procedure used to determine the LOQ.

3.1.10.5 A high throughput screening method of analysis with proven acceptable validation could be used to screen the samples with significant levels of dioxins and 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 PCBs allows for specific control of possible losses of the analytes in each sample. As such, false-negative results

can be avoided thus preventing contaminated food or feed from 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 PCBs in positive samples (above the level of interest) should be determined by a confirmatory method.

3.1.11 Laboratories

3.1.11.1 Laboratories involved in the analysis of dioxins and 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: as revised by ISO/IEC 17011 or have quality assurance programs that address all critical elements of accrediting agencies to ensure that they are applying analytical quality assurance. Accredited laboratories should follow the ISO/IEC/17025 standard "General requirements for the competence of testing and calibration laboratories" or other equivalent standards.

3.1.11.2 Regular participation in interlaboratory studies or proficiency tests for the determination of dioxins and PCBs in the relevant feed and food matrices should be conducted according to ISO/IEC/17025 standard.

4 QUALITY MANAGEMENT AND EDUCATION

Good Agricultural Practices, Good Manufacturing Practices, Good Storage Practices, and Good Animal Feeding Practices are valuable systems for further reduction of dioxin and PCB contamination in the food value chain. Farmers as well as feed and food manufacturers, distributors and retailers should implement and train their employee on control measures to prevent contamination. Good Laboratory Practices is a valuable system to ensure high quality of the analytical outcome.

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