CODEX ALIMENTARIUS COMMISSION

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Food and Agriculture Organization of the United Nations

World Health Organization

Viale delle Terme di Caracalla, 00153 Rome, Italy - Tel: (+39) 06 57051 - E-mail: codex@fao.org - www.codexalimentarius.org

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

12th Session
Utrecht, The Netherlands, 12 - 16 March 2018

DISCUSSION PAPER ON FUTURE WORK ON MAXIMUM LEVELS FOR LEAD FOR INCLUSION IN THE GENERAL STANDARD FOR CONTAMINANTS AND TOXINS IN FOOD AND FEED
(CXS 193-1995)

(Prepared by the Electronic Working Group led by Brazil)

BACKGROUND

1. At the 73rd Meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA) meeting a new toxicological evaluation of lead in food was conducted, at the request of Committee on Contaminants in Food (CCCF). In the evaluation[1] JECFA stated that exposure to lead is associated with a wide range of effects, including various neurodevelopmental effects, impaired renal function, hypertension, impaired fertility and adverse pregnancy outcomes. Because of the neurodevelopmental effects, fetuses, infants and children are the subgroups that are most sensitive to lead. JECFA withdrew the previously established provisional tolerable weekly intake (PTWI) of 25 µg/kg bw and concluded that since there is no indication for a threshold of effect it was not able to establish a new tolerable intake level. JECFA also concluded that, in populations with prolonged dietary exposures to higher levels of lead, measures should be taken to identify major contributing sources and, if appropriate, to identify methods of reducing dietary exposure that are commensurate with the level of risk reduction.

2. Since no safe level of lead has been identified by JECFA, CCCF06 (March 2012) agreed[2] to establish an Electronic Working Group (eWG) led by the United States of America (USA) to revise the maximum levels (MLs) for lead in foods in the *General Standard for Contaminants and Toxins in Food and Feed* (GSCTFF) (CXS 193-1995). This work is still ongoing. In addition to evaluating and revising the MLs in the GSCTFF, another goal was to consolidate the MLs for canned fruit and vegetable products (REP12/CF, para. 118). Where possible, the Committee has moved to consolidate MLs and reduce the number of individual MLs carried over from commodity standards.

3. CCCF11 (April 2017) noted that current work on the revision of the MLs for lead is limited to those food categories listed in the GSCTFF. There was however wide support to continue working on new MLs for lead for a range of categories e.g. tea, herbal infusions, spices, vegetable juices, dried fruits and stalk vegetables. Some of these categories had been proposed at previous sessions, but the decision was deferred until the end of the review of the MLs for lead in the GSCTFF.

4. Noting the interest of the Committee to continue working on MLs for lead, CCCF11 agreed to establish an eWG led by Brazil to prepare a discussion paper on a structured approach to prioritize commodities not included in the GSCTFF. The basis for new work will consider the relationship between the impact in public health and international trade. The Codex Secretariat noted that the guidance provided in the Procedural Manual and the GSCTFF should assist the Committee in the establishment of work priorities for lead in new food categories.[3]

5. This document aims to provide recommendations on a prioritization list of foods that do not have Codex MLs for lead in order to initiate new work on the establishment of MLs for lead for relevant categories. Revision of MLs for the food categories in GSCTFF is out of the scope of this document.

[1] JECFA. Evaluation of Certain Food Additives and Contaminants. Seventy-third report of the Joint FAO/WHO Expert Committee on Food Additives. WHO Technical Report Series 960.
[2] REP12/CF paras. 126-127
[3] REP17/CF paras. 85-89

6.   In order to present a scenario and compose the food category and subcategory, the available data and the information in the GEMS-Food database (food category, name local food, food state name) were considered. For some food categories, it was possible to establish subcategories for all kind of food. For others, the eWG considered only some food to create the subcategories.

7.   The prioritization criteria to build a food category list took into consideration the importance of lead reduction intake to human health, the importance of the commodities to international trade, the occurrence levels and the data availability.

8.   The work process followed for the analysis of the food categories is provided in Appendix II.

9.   The list of the eWG participants is available in Appendix IV.

PRIORITIZATION CRITERIA

10.   MLs do not need to be set for all foods that contain a contaminant or a toxin. The Preamble of the GSCTFF states in Section 1.3.2 that "*Maximum levels (MLs) shall only be set for those foods in which the contaminant may be found in amounts that are significant for the total exposure of the consumer, taking into consideration the Policy of the Codex Committee on Contaminants in Foods for Exposure Assessment of Contaminants and Toxins in Foods or Food Groups (Section IV of the Procedural Manual)*". Setting standards for foods that contribute little to dietary exposure would mandate enforcement activities that do not contribute significantly to health outcomes.

11.   Paragraph 9 of the Policy of the CCCF states that "*From dietary exposure estimates JECFA identifies foods/food groups that contribute significantly to the exposure according to CCCF's criteria for selecting food groups that contribute to exposure*".

12. Paragraph 10 of the Policy of the CCCF states that "*The CCCF determines criteria for selecting foods/food groups that contribute significantly to total dietary exposure of a contaminant or toxin. These criteria are based upon the percentage of the tolerable intake (or similar health hazard endpoint) that is contributed by a given food/food group and the number of geographic regions (as defined by the GEMS/Food Consumption Cluster Diets) for which dietary exposures exceed that percentage*".

13. The criteria in paragraph 11 of the Policy of the CCCF are as follows:

a) Foods or food groups for which exposure to the contaminant or toxin contributes approximately 10% or more of the tolerable intake (or similar health hazard endpoint) in one of the GEMS/Food Consumption Cluster Diets;

or,

b) Foods or food groups for which exposure to the contaminant or toxin contributes approximately 5% or more of the tolerable intake (or similar health hazard endpoint) in two or more of the GEMS/Food Consumption Cluster Diets;

or,

c) Foods or food groups that may have a significant impact on exposure for specific groups of consumers, although exposure may not exceed 5% of the tolerable intake (or similar health hazard endpoint) in any of the GEMS/Food Consumption Cluster Diets. These would be considered on a case-by-case basis.

14.   JECFA73 withdrew the previous PTWI of 25 µg/kg bw, so it is difficult to select food groups that contribute significantly to total dietary exposure of lead based on the percentage of the tolerable intake in accordance with above criteria determined by CCCF. Additionally, lead is present in most food categories, and the approach to reduce the intake by setting MLs in a wide range of commodities seems more feasible and appropriate.

15.   It was defined by the Committee[3] that prioritization commodities list should consider the relationship between the impact on public health and to international trade (exportation or importation data). In some way, the amount of the commodity traded is proportional to the availability of the commodity for consumption. In accordance with this decision, the first step was to classify the food categories in:

- Food categories with high occurrence level and high impact in international trade
- Food categories with high occurrence level and intermediate impact in international trade
- Food categories with high occurrence level and low impact in international trade
- Food categories with intermediate occurrence level and high impact in international trade
- Food categories with intermediate occurrence level and intermediate impact in international trade
- Food categories with intermediate occurrence level and low impact in international trade
- Food categories with low occurrence level and high impact in international trade
- Food categories with low occurrence level and intermediate impact in international trade
- Food categories with low occurrence level and low impact in international trade

16. To define these groups, lead concentration was classified empirically in three groups based on the mean: high occurrence level (≥ 0.05 mg/kg), intermediate occurrence level (0.01 ≤ x < 0.05 mg/kg) and low occurrence level (< 0.01 mg/kg) (Table 1). A food category which had high P95TH value (> 0.10 mg/kg) was also classified as a group of high occurrence level (i.e. processed fishes). International trade was also classified in three groups, considering the percentage contribution of each category in total quantity of international trade (Table 2): high impact (>10%), intermediate impact (1 ≤ x < 10%) and low impact (< 1%) in international trade (Table 2 and Table 3), where total quantity refers to the sum of commodities in the table, not all international trade.

17. The eWG considered that the food categories with high occurrence level and high or intermediate impact in international trade are the priority to work on new MLs for lead. Products with a high occurrence level and low impact in international trade, products with intermediate occurrence level and high or intermediate impact in international trade as well as low occurrence level and high impact in international trade have intermediate prioritization. Products with intermediate occurrence level and low impact in international trade and product with low occurrence level and intermediate or low impact in international trade have low prioritization. The products without international trade data were considered as low impact in international trade.

Table 1: Classification of food categories based on mean lead concentration.

Mean lead concentration		
≥ 0.05 mg/kg High occurrence level	0.01 ≤ x < 0.05 mg/kg Intermediate occurrence level	< 0.01 mg/kg Low occurrence level
Tea and herbal tea (herbs/fruits for infusions) Products for special nutritional use Eggs Algae and seaweeds Cocoa and cocoa products Seafood (except fish) Dried fruits	Nuts and oilseeds Sugar and confectionary. excluding cocoa Cereal flours and starches Spices and Aromatic herbs Processed fishes* Dried vegetables Stalk vegetables Alcoholic beverages (excluding wine) Coffee (beverage)	Vegetable juice Ice and desserts Non-alcoholic beverages

*P95TH > 0.1

Table 2: Classification of food categories based on contribution in total quantify international trade, considering exportation data.

Percentage of total quantity of international trade*		
High impact (≥10%)	Intermediate impact (1 ≤ x < 10%)	Low impact (<1%)
Sugar and confectionary. excluding cocoa Dried fruits Cereal flours and starches	Products for special nutritional use Coffee beverage Cocoa and cocoa products Seafood (except fish) Nuts and oilseeds Alcoholic beverages Processed fishes Spices and Aromatic herbs	Tea and herbal tea (herbs/fruits for infusions) Ice and desserts Dried vegetable Eggs Stalk vegetables Algae and seaweeds[NF] Vegetable juice[NF] Non-alcoholic beverages[NF]

NF: trade information not found
* Total quantity refers to the sum of commodities in the table, not all international trade.

Table 3: Classification of food categories based on contribution in total quantity to international trade*, considering importation data.

Percentage of total quantity of international trade		
High impact (≥10%)	**Intermediate impact** (1 ≤ x < 10%)	**Low impact** (<1%)
Dried fruits Sugar and confectionary. excluding cocoa Cereal flours and starches	Products for special nutritional use Cocoa and cocoa products Coffee beverage Nuts and oilseeds Seafood (except fish) Alcoholic beverages Processed fishes Spices and Aromatic herbs Tea and herbal tea (herbs/fruits for infusions) Dried vegetable	Eggs Stalk vegetables Ice and desserts Algae and seaweeds [NF] Vegetable juice[NF] Non-alcoholic beverages[NF]

NF: trade information not found
* Total quantity refers to the sum of commodities in the table, not all international trade.

KEY POINTS DISCUSSED IN THE ELETRONIC WORKING GROUP

18. In developing this discussion paper, the following points were raised by the eWG:

- It was highlighted by one member that data for some categories or subcategories did not have global representation and the number of samples for some of them would be low to establish a limit. Meanwhile, the document's proposal is to establish categories that should be worked out in the future and countries would be encouraged to submit data in GEMS/Food Database in a timely manner.

- The same country has also requested clarification on subcategories that will be considered and also proposed to start a new work just for food categories considered as high priority, taking into account the load of work that will be undertaken based on the subcategories identified in this document for each category. The values and subcategories established in this document were used just to present the scenario in order to allow the prioritization of the categories. It was not the purpose of the document to establish subcategories, but to verify the different behaviors among the foods of the same group. During the future work, the subcategories will be stablished considering the available data in GEMS/Food Database.

- One member questioned how the name of the food categories were defined. The data were extracted from the database according to the names entered by the countries in the fields: Food Category, Food Name, Local Food Name and Food State Name.

- It was also suggested removing the category of fruit juices for children since the occurrence data were considered in setting maximum limits for fruit juices. Nevertheless, the data considered in the proposed document refers to foods intended specifically for children under 3 years of age, extracted from the specific category on Gems/Food database, namely Food for Infants and small children.

- One country suggested that nuts-based creams should be considered for setting limits once that they are consumed by children. However, other food products consumed by the general population, which were not identified in the document as high priority, are also consumed by children and the criteria of being consumed by children were not considered in this case.

CONCLUSIONS

19. To identify and prioritize commodities which are not included in the GSCTFF to work on new MLs for lead, the approach above mentioned for prioritization has been fulfilled, taking into consideration, global data of lead occurrence in these foods and the impact on international trade. Data about lead levels and international trade were presented on this work as tables (1 – 3) and in Appendix III (Tables 1-14).

20. Based on this work, it was possible to identify which food categories are priority to work on new MLs for lead considering the occurrence level and international trade (Table 4).

21. Beside this, given the health impact of lead, particularly for infants and young children, as they constitute the most sensitive subpopulation in terms of neurodevelopmental effects, all food for infants and young children identified in this work were considered critical for establishing new MLs for lead.

22. Values and subcategories established in this document were used to present the scenario and the prioritization of the categories. It was not the purpose of the document to establish subcategories, but to verify different behaviors among the foods of the same group. For future work, subcategories should be considered.

23. It was observed in most categories that data did not represent all world regions and often, neither the main production areas, or processes of products, and in this way members should be encouraged to submit data in GEMS FOOD in a timely manner.

24. It was also observed a wide range of LOD and LOQ values in each food category and this should be considered during the work to establish MLs for lead.

Table 4: Proposed prioritization list of foods that do not have Codex MLs for lead in order to orientate new work on the establishment of lead MLs for relevant categories.

High priority	1. Cereal-based food for infants and young children
	2. Fruit juice and herbal tea for infants and young children
	3. Canned baby food
	4. Tea and herbal tea (herbs/fruits for infusions)
	5. Products for special nutritional use
	6. Cocoa and cocoa products
	7. Seafood (except fish)
	8. Dried fruits
	9. Processed fishes
Intermediate priority	1. Eggs
	2. Algae and seaweeds
	3. Nuts and oilseeds
	4. Sugar and confectionery (excluding cocoa)
	5. Cereal flours and starches
	6. Dried vegetables
	7. Spices and Aromatic herbs
	8. Alcoholic beverages (except wine)
	9. Coffee and coffee-based beverages
Low priority	1. Stalk vegetables
	2. Vegetable juice
	3. Ice and desserts
	4. 4. Non-alcoholic beverages

RECOMMENDATIONS

25. The Committee is invited to consider the following:

- To agree on the prioritization criteria (paragraphs 14-17) and on the proposed prioritization list of foods (Table 4).

- To encourage Codex Members to submit data of lead in the food categories under discussion to GEMS/Food database to reflect the occurrence data in all world regions.

- To encourage Codex Members to identify others food categories that follow the prioritization criteria and are not listed in this document with their respective occurrence and international trade data.

26. The Committee is invited to decide:

- To start new work to set ML for lead only for categories identified as high priority mentioned in Table 4;

<div align="center">or</div>

- to start new work to set lead ML for all food categories identified in Table 4, following the schedule proposed in the project document (**Error! Not a valid bookmark self-reference.**)

PROJECT DOCUMENT

**PROPOSAL ON NEW WORK ON MAXIMUM LEVELS FOR LEAD FOR INCLUSION IN THE
GENERAL STANDARD FOR CONTAMINANTS AND TOXINS IN FOOD AND FEED
(CXS 193-1995)**

(For consideration by CCCF)

1. Purpose and scope

The purpose of this work is to protect public health by establishing new MLs for lead in food categories not included in GSCTFF and ensure fair practices in international food trade.

2. Its relevance and timeliness

Lead was evaluated by the Joint FAO/WHO Expert Meeting on Food Additives (JECFA) at its 16th, 22nd, 30th, 41st, 53rd and 73rd meetings. At the JECFA73 meeting a new toxicological evaluation of lead in food was conducted, at the request of the Committee on Contaminants in Food (CCCF). In the evaluation[4] JECFA stated that exposure to lead is associated with a wide range of effects, including various neurodevelopmental effects, impaired renal function, hypertension, impaired fertility and adverse pregnancy outcomes. Because of the neurodevelopmental effects, fetuses, infants and children are the subgroups that are most sensitive to lead. JECFA withdrew the previously established provisional tolerable weekly intake (PTWI) of 25 μg/kg bw and concluded that since there is no indication for a threshold of key effects of lead, it was not able to establish a new tolerable intake level. JECFA also concluded that, in populations with prolonged dietary exposures to higher levels of lead, measures should be taken to identify major contributing sources and, if appropriate, to identify methods of reducing dietary exposure that are commensurate with the level of risk reduction.

Food is the major source of exposure to lead. The *General Standard for Contaminants and Toxins in Food and Feed* (GSCTFF) (CXS 193-1995) does not have MLs for lead established for several food categories. Nevertheless, some food categories are broadly consumed and/or may contain high levels of lead and can significantly contribute to the intake of lead.

In this context, a new work for MLs for lead in different food categories should be developed aiming to lower dietary lead exposure.

3. The main aspects to be covered

MLs for lead in several food categories, considering the following:

a) Results of discussions of the CCCF

b) Risk assessments conducted by JECFA

c) Food categories for which no ML for lead is established in the GSCTFF

d) Achievability of the MLs

e) Occurrence in the food category

f) Availability of data

g) Rejection rates

4. An assessment against the criteria for the establishment of work priorities

a) *Consumer protection from the point of view of health, food safety, ensuring fair practice in the food trade and taking into account the identified needs of the developing countries.*

The new work will establish Maximum Level(s) for lead in several categories.

b) *Diversification of national legislations and apparent resultant or potential impediments to international trade.*

The new work will provide harmonized international maximum levels.

c) *Work already undertaken by other organizations in this field*

The risk assessment has already been done for lead by JECFA[5] and EFSA[6].

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[4] JECFA. Evaluation of Certain Food Additives and Contaminants. Seventy-third report of the joint FAO/WHO Ex-pert Committee on Food Additives. WHO Technical Report Series 960. [6] EFSA - European Food Safety Authority SCIENTIFIC REPORT OF EFSA. Lead dietary exposure in the European population. EFSA Journal 2012;10(7):2831.

5. Relevance to the Codex Strategic Objectives

The work proposed falls under the following Codex Strategic Goals of the Codex Strategic Plan 2014-2019:

Strategic goal 1 Establish international food standards that address current and emerging food issues

This work was proposed in response to needs identified by JECFA to decrease lead dietary exposure.

Strategic goal 2 Ensure the application of risk analysis principles in the development of Codex standards

The establishment of MLs considering the necessity to reduce the lead intake as a result of risk assessment performed by JECFA[5].

6. Information on the relation between the proposal and other existing Codex documents

This new work is recommended following the GSCTFF.

Since no safe level of lead has been identified by JECFA, CCCF06 (March 2012) agreed to to revise the MLs for lead in foods in the GSCTFF. This work is still ongoing in CCCF.

7. Identification of any requirement for and availability of expert scientific advice

Expert scientific advice has been already provided by JECFA[5] and EFSA[6].

8. Identification of any need for technical input to the standard from external bodies so that this can be planned for the proposed timeline for completion of the new work

Currently, there is no need for additional technical input from external bodies.

9. Proposed timeline for completion of work

Subject to the approval by the Codex Alimentarius Commission in 2018, the following working plan:

- *Food categories classified as high priority*

The proposed draft ML(s) for lead in different food categories will be considered at CCCF13 and CCCF14 with a view to its finalization in 2021.

- *Food categories classified as intermediate priority*

The proposed draft ML(s) for lead in different food categories will be considered at CCCF15 and CCCF16 with a view to its finalization in 2023.

- *Food categories classified as low priority*

The proposed draft ML(s) for lead in different food categories will be considered at CCCF17 with a view to its finalization in 2024.

BACKGROUND INFORMATION
(For information to Codex Members and Observers
when considering the conclusions and recommendations)

INTRODUCTION

1.   This document aims to provide recommendations on a prioritization list of foods that do not have Codex MLs for lead in order to initiate a new work on the establishment of MLs for lead for relevant categories. Revision of MLs for the food categories in GSCTFF is out of the scope of this document.

2.   The prioritization criteria to build a food categories list took in consideration the importance of the lead reduction intake to human health, the importance of the commodities to international trade, the occurrence levels and the data availability.

INITIAL LIST OF FOOD CATEGORIES

3.   The collection and initial categorization of data were performed based on food categories which are currently not listed in the GSCTFF with ML for lead and followed one of these criteria:

   •   It was designated as important for working on new ML for lead by CCCF11;

   •   There was a Codex standard, considering that commodities standards are, also, the reference used to identify foods for establishment of MLs;

   •   There was available data in GEMS/Food.

   •   There was international trade data available

4.   Tea, herbal infusions, spices, vegetable juices, nectars, dried fruits and stalk vegetables were pointed as relevant by CCCF11 to new work on MLs for lead. In the discussion paper on MLs for Lead in various foods in the GSCTFF and the related *Code of practice for the prevention and reduction of lead contamination in foods* (CXC 56-2004) and the *Code of practice for source directed measures to reduce contamination of foods with chemicals* (CXC 49-2001)[5], it was suggested to take into consideration new work on MLs for food supplements, game meat, and sugar. These categories were all included in the initial list for further discussion in this document, except game meat because of its low impact in international trade and because of lack of available data on GEMS/Food.

5.   Table 1 summarizes food categories defined in Codex standards not currently listed in the GSCTFF for lead. Regional food, such as non-fermented soybean products (CXS 322R-2015), gari (CXS 151-1985), halwa tehenia (CXS 309R-2011) and harissa (CXS 308R-2011) were not considered in this work due to their low impact on international trade.

6.   Although there was no ML for lead in edible fungi and mushrooms in the GSCTFF, considering the difficulty to establish MLs for wild mushrooms in view of the variability of the levels of lead due to seasonal and other geo-climatic conditions, CCCF11 agreed to establish an eWG chaired by USA to work on farmed fungi and mushrooms to further consider an ML at its next session[6]. In this way this category was not included.

Table 1. Food categories defined in Codex standards and which are currently not listed in the GSCTFF with ML for lead.

Food name or food category	CXS	Note
Seafood	CXS 312-2013	Live abalone and for raw fresh chilled or frozen abalone for direct consumption or for further processing
	CXS 292-2008	Live and raw bivalve molluscs
	CXS 92-1981	Quick frozen shrimps or prawns
	CXS 315-2014	Fresh and quick frozen raw scallop products
	CXS 37-1991	Canned shrimps or prawns

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[5] CX/CF 12/6/13
[6] REP17/CF. para. 83 and 89

Food name or food category	CXS	Note
Processed fish	CXS 3 -1981	Canned salmon
	CXS 70-1981	Canned tuna and bonito
	CXS 94-1981	Canned sardines and sardines type products
	CXS 119-1981	Canned finfish
	CXS 166-1989	Quick frozen fish sticks (fish fingers), fish portions and fish fillets breaded or in batter
	CXS 167-1989	Salted fish and dried salted fish of the Gadidae family of fishes
	CXS 291-2010	Sturgeon caviar
	CXS 311-2013	Smoked fish, smoke flavoured fish and smoke-dried fish
	CXS 189-1995	Dried shark fins
	CXS 236-2003	Boiled dried salted anchovies
	CXS 244-2004	Salted atlantic herring and salted sprat
Honey	CXS 12-1981	
Sugar	CXS 212-1999	Including sugar for further processing and sugar ready to eat.
Cocoa butter	CXS 86-1981	
Cocoa powder (cocoas) and dry mixtures of cocoa and sugars	CXS 105-1981	
Chocolates and chocolate products	CXS 87-1981	
Cocoa mass (cocoa/chocolate liquor) and cocoa cake	CXS 141-1983	
Peanuts	CXS 200-1995	
Nuts	CXS 131-1981	unshelled pistachio nuts
	CXS 177-1991	Desiccated coconut
Coconut products	CXS 240-2003	Aqueous coconut products - coconut milk and coconut cream
Edible fungi and fungus products	CXS 38-1981	
Dried edible fungi	CXS 39-1981	

Food name or food category	CXS	Note
Dried fruits	CXS 67-1981	Raisins
	CXS 130-1981	Dried apricots
Foods for infants and young children	CXS 73-1981 CXS 74-1981	Canned Baby Foods Processed cereal-based foods for infants and young children
Spices and aromatic herbs	CXS 218-1999	Ginger
	CXS 307-2011	Chili peppers
Flours	CXS 173-1989	Sorghum flour
	CXS 176-1989	Edible cassava flour
	CXS 170-1989	Pearl millet flour
	CXS 152-1985	Wheat flour
	CXS 178-1991	Durum wheat semolina and durum wheat flour
Noodles	CXS 249-2006	Instant noodles

WORK PROCESS ON LEAD OCCURRENCE

7.   The eWG extracted occurrence data from the GEMS/Food database covering approximately the last 15 years. Data were extracted from the database according to the names entered by the countries in the fields: Food Category, Food Name, Local Food Name and Food State Name. The first step in analysis of the data was to reduce bias excluding data corresponding for aggregated samples or individual sample reported without limit of detection/limit of quantification (LOD/LOQ), as the eWG could not evaluate whether these samples achieve LOQ criteria. In addition, no data were excluded considering outliers analysis or the limit of detection and quantification reported. The second step was to treat the censored values and prepare a dataset based on the LOD and LOQ of the analytical method associated with each sample. The eWG adopted for not detected (ND) results values half of LOD in the analysis and values between LOD and LOQ were treated as (LOD + LOQ)/2.

8.   The third step was to organize, if necessary, the dataset in food categories/subcategories or food, e.g.: FOOD CATEGORY: Cocoa and Cocoa products. FOOD SUBCATEGORY: cocoa powder or FOOD CATEGORY: Nuts and oilseeds, FOOD: peanut. After that it was determined the summary statistics including N+/N (number of positive results/number of total samples) mean, 95th percentile concentrations (abbreviated as P95TH), maximum concentrations and range values for LOD/LOQ.

OCCURRENCE IN FOODS

9.   In total, 31567 results from 13 countries and one region (Australia, Brazil, Canada, China, France, Japan, New Zealand, Nigeria, Republic of Korea, Singapore, Thailand, USA and Uruguay) and one region (European Region) were downloaded and analyzed. Alcoholic beverages (31.2%) and seafood (20.1%) dominated the food category coverage, representing more than 50% of the samples. They were followed by teas and herbs/fruits for infusion (7.2%), food supplement (6.8%), egg and eggs products (6.7%), processed fish products excluding frozen and sliced (5.8%), spices and aromatic herbs (4.5%), cocoa and cocoa products (3.6%), flours and starches (2.6%), non-alcoholic beverages (2.1%), nuts and oilseeds (0.7%). Lead concentration were not detected (<LOD) in 43.1% of samples. The LOD and LOQ of the methods of analysis varied into categories, with LODs ranging from 0.00005 mg/kg to 1.0 mg/kg and LOQ values ranged from 0.0002 mg/kg to 3.3 mg/kg. "

10.   Foods categories with the highest proportion of positive samples were nuts and oilseeds (95%), stalk vegetables (86%), teas (84%) and seafood (79%). The overall mean for the categories varied between 0.003 and 0.93 mg/kg (Table 2). Higher mean results were recorded for tea (0.93 mg/kg), eggs and egg products (0.30 mg/kg), algae and seaweeds (0.27 mg/kg), cocoa and cocoa products (0.24 mg/kg), seafood (0.12 mg/kg) and dried fruits (0.070 mg/kg).

11.   Tea and herbal tea (herbs/fruits for infusions) category was split into two subcategories: solid tea and infusion tea. The mean in the subcategories varied between 0.03 mg/kg (white tea infusion) - 1.2 mg/kg (green tea-solid) (Appendix III - Table 1). Solid teas were subdivided in black, green and white tea. Beside solid teas, 1512 results were from herbal tea (herbs/fruit for infusion) such as chamomile, hibiscus, jasmine, peppermint, apple, boldo, lemon, ginger teas. This wide range of results indicates that it is important to evaluate the need for different MLs in this category.

12.   In coffee and coffee-based beverage category, all products made with coffee were included while in coffee beverage subcategory just products made exclusively with coffee were considered, i.e. the mixtures as cappuccino and frappuccino were not included. The mean of lead in this category was 0.01 mg/kg (Appendix III - Table 1); however, it was observed LOD higher than this mean. Thus, if only data from more sensitive methods were used, the profile could be different.

13.   The eWG considered the spices and aromatic herbs categorization established by the Committee on Spices and Culinary Herbs (CCSCH) into according to 10th session of the CCCF[7]. The spices and aromatic herbs category was split into two subcategories: dried fruit and berries (peppers, chili, sweet peppers, paprika and pim(i)ento) and dried roots and rhizomes (just garlic data available) comprising a total of 1336 results from 10 countries. The major data contribution was from Republic of Korea (33%). The number of all positive samples reported was 59%. The mean occurrence of lead varied among subcategories at 0.013 - 0.058 mg/kg and it was higher in dried roots and rhizomes compared to dried fruit and berries (Appendix III - Table 2).

14.   The category sugar and confectionary (excluding cocoa products) was split into 5 products (honey, sugar, syrup, molasses, candies) totalizing 790 analytical results from 8 countries. The major data contribution was from Canada with 30%. The mean levels of subcategories varied between 0.01 and 0.03 mg/kg (Appendix III - Table 3). Data concerning the concentration of lead in this category ranged from not detected to 0.72 mg/kg. The highest level was found in candies (0.72 mg/kg), but the mean level found in candies was equal to or lower than in the other 4 products. No data was found for table top sweeteners in GEMS/Food.

15.   Cocoa and cocoa products category was split into 4 products (cocoa butter, cocoa mass, cocoa powder and chocolate) with a total of 1061 analytical results from 6 countries. The major data contribution was from Singapore with 80%. Data concerning the concentration of lead in this category ranged from not detected to 45.5 mg/kg with 56% of positive samples. The mean levels of lead in products range between 0.03 and 0.31 mg/kg (Appendix III - Table 4). The higher mean of lead level was in cocoa powder (0.31 mg/kg) with 52% of positive samples. It seems lead have the same behavior of cadmium in cocoa products, i.e. it is concentrated in cocoa powder and there are little residues in cocoa butter. Although mean levels of lead in chocolate were low in the category, chocolate had 94% of positive samples.

16.   For cereal flours and starches category the eWG considered wheat, durum wheat, spelt and emmer as wheat. A total of 772 analytical results from 4 countries was reported in Gems/Food – Food Category: Cereals and cereal based products. The major data contribution was from Canada with 83%. In this case the category was split into 9 foods: rice, barley, wheat, buckwheat, maize, millet, oat, rye and triticale flours. Beside these, 246 results were from others flours and starches such as amaranth flour, quinoa flour, soya flour, manioc flour (tapioca). The mean level of the 9 flour groups varied considerably (0.001 - 0.12 mg/kg) and wheat showed the highest level (0.92 mg/kg) (Appendix III - Table 5).

17.   For food for infant and young children, the eWG considered 3 categories (fruit juice and herbal tea, dessert and cereal-based food for infants and young children) covering a total of 946 results reported by 6 countries. The data considered in the proposed document refers to foods intended specifically for children under 3 years old and the occurrence levels were taken from the specific category on Gems/Food database, namely Food for Infants and small children. All data from fruit juice and herbal tea for infant and young children corresponded of fruit juice. The major data contribution was from one country with 90% of all subcategories data. The mean levels for the categories varied between 0.006 and 0.011 mg/kg (Appendix III - Table 6). The higher levels of lead were found in cereal-based food (0.24 mg/kg). The number of results reported with positive samples varied considerably between the food subcategories from dessert at 14% to fruit juice and herbal tea for infant and young children at 58%.

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[7] REP16/CF, para 133

18. Nuts and oilseeds category was split into two major subcategories: nuts and oilseeds, covering a total of 1082 analytical results. In this category, spread, butter, creamy and canned products were not included. The major data contribution was from Canada with 86% of data. Each subcategory was split into major based on processing: nut, nut roasted or salted, coconut, coconut desiccated, peanut, peanut roasted or salted and raw oilseeds. The levels varied considerably between the foods, from coconut at <0.001 mg/kg to raw oilseeds at 0.667 mg/kg (Appendix III - Table 7). However, the number of samples from peanut (n=21) was lower than nuts (n=74).

19. The category dried fruit comprised 101 results expressed on as consumed from 4 countries. The major data contribution was from Canada (65%). The mean level obtained was 0.07 mg/kg. The concentration of lead in samples ranged between 0.001 - 2.7 mg/kg. The number of results above the LOD corresponded to 40% of samples. The variability observed to LOD and LOQ ranged between 0.001 - 0.2 mg/kg and 0.001-0.6 mg/kg, respectively.

20. The category dried vegetable was composed only by dried tomato comprising 3 data from Canada, which mean level was 0.02 mg/kg.

21. Eggs category, composed for chicken, duck and quail eggs, was split into 2 subcategories (raw and processed) corresponding to a total of 2004 analytical results from 9 countries. The only processing considered was the cooked, there is not century eggs data. The major data contribution was from China with 61%. Data concerning the concentration of lead in this category ranged from not detected to 27.7 mg/kg and the mean levels of lead was 0.30 mg/kg (Appendix III - Table 8). Besides this, the mean levels of lead in raw eggs (0.32mg/kg) was higher than processed eggs (0.004 mg/kg), however there were just 132 results to processed eggs compared to 1872 results to raw eggs.

22. Seafood category was split into 6 subcategories (bivalve molluscs, cephalopods, crustaceans, sea cucumber, sea urchin and sea snails) comprising a total of 5974 analytical data from 10 countries. The major data contribution was from China with 54%. The overall mean levels for seafood category were 0.12 mg/kg. Data concerning the concentration of lead in this category ranged from not detected to 17 mg/kg. The higher mean levels were observed for bivalve molluscs (0.16 mg/kg). On the opposite, the lower mean level was observed for sea snails (0.03 mg/kg). The positive results of sea snails category was the highest (99%), as well as bivalve molluscs (90%). Only a few results were reported covering sea cucumber category (Appendix III - Table 9).

23. Edible snails, including escargot and land snails, were identified in GEMS/Food database and so, its data were also analyzed. A total of 150 results were reported for edible snails, which mean levels of lead were 0.19 mg/kg. Beside this, 90% of samples were positive.

24. For processed fishes it was obtained 1742 analytical results from 8 countries. The major data contribution was from Thailand (87%). The overall mean levels of lead for processed fish category were 0.02 mg/kg and the mean levels for the subcategories varied between 0.02 to 0.07 mg/kg (Appendix III - Table 10). Salted fishes showed the highest mean of lead (0.07 mg/kg) and the highest individual result (0.81 mg/kg).

25. The ice and desserts category was split into two major subcategories based on ingredients (milk and fruit) comprising a total of 124 analytical results from 10 countries. The major data contribution was from one country with 87%. The subcategories covered only milk-based and fruit-based ice cream, gelato, and sorbet. The mean level was higher in milk-based ice cream (0.006 mg/kg) than fruit-based ice cream (0.002 mg/kg) (Appendix III - Table 11).

26. The non-alcoholic beverages category (not included cocoa beverage) was split into two subcategories (soft drink and others beverages). A total of 611 results from 8 countries was considered. The major data contribution was from one country with 48.5%. The overall mean was 0.003 mg/kg (Appendix III - Table 12), but the mean level for soft drink (0.002 mg/kg) was lower than other non-alcoholic beverages (0.004 mg/kg).

27. Alcoholic beverages (excluding wine) category was composed for 16 products comprising a total of 9311 analytical data from 7 countries. The major data contribution was from Canada (99%). The overall mean levels of lead for alcoholic beverages category was 0.01 mg/kg and the percentage of positive samples was 64%. Data concerning the concentration of lead in this category ranged from not detected to 0.78 mg/kg (Appendix III - Table 13). The highest mean level was observed for rum (0.78 mg/kg), followed by liqueur (0.22 mg/kg), cooler 0.17 mg/kg, sake 0.16 mg/kg) and beer (0.15 mg/kg).

28. For products for special nutritional use, the eWG observed that the data included (n=2898) was from two countries and one region. This category was split into five subcategories: dietary supplements, dietetic food, food for sports, food for weight reduction and medical food. The overall mean levels of lead for food supplement was 0.32 mg/kg. The highest mean level was observed for dietary supplements (0.37 mg/kg), followed by food for sports (0.24 mg/kg). (Appendix III - Table 14)

Table 2. Lead concentrations in different food commodities - N⁺/N = positive samples/total samples.

Food Category	Countries data	N + / N	Mean (mg/kg)	95TH Percentile (mg/kg)	Maximum (mg/kg)	LOQ (mg/kg)
Teas and herbal tea	Australia, Brazil, Canada, China, France, New Zealand, Singapore, USA	1973/ 2144	0.93	2.7	325	0.001 -0.60
Products for special nutritional use	Canada, Singapore, WHO European Region	877/2898	0.32	0.99	40.2	0.0004 - 3.3
Eggs and eggs products	Australia, Canada, China, France, New Zealand, USA, Singapore	973/2004	0.30	0.99	27.7	0.0006-0.6
Algae and seaweeds	Canada, Singapore	341/464	0.27	0.87	2.9	0.004 - 0.30
Cocoa and cocoa products	Australia, Canada, China, France, New Zealand, Singapore	600/1061	0.24	0.43	45.5	0.0006-0.3
Seafood	Australia, Brazil, Canada, China, France, New Zealand, Nigeria, Singapore, USA	4718/5974	0.12	0.40	17	0.001 -0.30
Dried fruits	Australia, Canada, Singapore, Thailand	40/101	0.070	0.10	2.7	0.001 – 0.6
Nuts and oilseeds	Australia, Canada, China, France, New Zealand, Singapore, USA, Uruguay	207/1082	0.03	0.045	0.67	0.0006-0.3
Sugar and confectionary. excluding cocoa	Australia, Brazil, Canada, China, France, New Zealand, Singapore, USA	135/491	0.024	0.05	0.72	0.001 -0.30
Cereal flours and starch	Japan, Canada, Singapore, USA	235/772	0.02	0.049	0.92	0.0006 – 0.6
Spices and Aromatic Herbs	Australia, Canada, China, France, Japan, New Zealand, Republic of Korea, Singapore, Thailand, USA	742/1336	0.02	0.08	1.4	0.00015 – 0.3

Food Category	Countries data	N + / N	Mean (mg/kg)	95TH Percentile (mg/kg)	Maximum (mg/kg)	LOQ (mg/kg)
Processed fishes	Australia, Canada, China, France, New Zealand, Nigeria, Singapore, Thailand, USA	343/1742	0.02	0.13	0.81	0.005 – 0.6
Dried vegetables	Canada	1/3	0.02	0.05	0.06	0.001
Stalk vegetables	Japan, China	12/14	0.01	0.05	0.07	0.001 – 0.01
Cereal-based food for infants and young children	Australia, Canada, Japan, New Zealand, Singapore, USA	116/451	0.01	0.03	0.24	0.004 – 0.3
Alcoholic beverages	Australia, Canada, China, France, New Zealand, Singapore, USA	5959/9311	0.01	0.021	0.78	0.002 - 0.30
Coffee and based-coffee (beverage)	Australia, Canada, China, France, USA, New Zealand, Singapore	36/232	0.01	0.03	0.20	0.0006 – 0.3
Vegetables juices	Canada, Japan, China, Thailand	41/74	0.007	0.02	0.02	0.0006 - 0.15
Ice and desserts	Australia, Canada, China, France, Japan, New Zealand, Republic of Korea, Singapore, Thailand, USA	13/124	0.006	0.02	0.05	0.0006 - 0.3
Dessert for infants and young children	Australia, New Zealand, USA	28/207	0.005	0.02	0.02	0.001 – 0.03
Fruit juice and herbal tea for infants and young children	Canada, USA	168/288	0.008	0.01	0.03	0.002 – 0.02
Non-alcoholic beverages	Australia, Canada, China, France, Japan, New Zealand, Singapore, USA	61/611	0.003	0.006	0.045	0.0006- 0.010
Edible snails	China, Singapore	135/150	0.19	0.61	2.38	0.001- 0.3

INTERNATIONAL TRADE

29.   International trade data were obtained mainly from Trade Map (http://www.trademap.org) that covers 220 countries and territories and 5300 products of the Harmonized System. It includes the global data for imports and exports in 2016 (quantities in tons and value in thousand dollars). The quantities of export and import alcoholic beverages were obtained from FAOSTAT (http://www.fao.org/faostat/en/#data/BC), however about 2013.

30.   Trade data for fruit juice and herbal tea for infants and young children and for dessert for infants and young children was not found. However, it is important to emphasize that infant and young children are the group most susceptible to the toxic effects of lead and, therefore, these groups, even if they do not have a high impact on international trade, should be evaluated in more detail.

31.   Foods categories with the highest percentage of total import and export quantity were sugar and confectionery excluding cocoa, dried fruits, and flours and starches representing together more than 70% of tons of foods in international trade among the food categories evaluated. Cocoa and cocoa products, as well coffee beverages, seafood, nuts and oilseeds, alcoholic beverages, food supplements, processed fishes and spices and aromatic herbs showed less than 10% each (Table 3).

32.   Foods categories with the highest percentage of total import and export value were dried fruits, alcoholic beverages, cocoa and cocoa products, sugar and confectionery excluding cocoa and seafood, representing together more than 60% of the values of international trade among the food categories evaluated. Coffee beverages, as well as nuts and oilseeds, processed fishes, cereal flours and starches, spices and aromatic herbs, teas, eggs and eggs products and food supplements were responsible for less than 10% each (Table 4).

Table 3. Estimated quantity (in tons) of imports and exports of food categories, percentage of the contribution of each category in total trade and their relation with lead occurrence (mg/kg)

Food Category	Lead mean (mg/kg)	Imported[b]		Exported[b]	
		Quantity (tons)	% total trade	Quantity (tons)	% total trade
Teas	0.93	1,856,806	1.1	1,910,836	0.9
Food supplements[a]	0.32	3,507,922	2.1	3,177,544	1.5
Eggs	0.30	410,989	0.2	369,209	0.2
Algae and seaweeds	0.27	NF	-	NF	-
Cocoa and cocoa products	0.24	11,515,865	6.9	8,167,067	3.8
Seafood	0.12	6,626,703	3.9	6,916,416	3.2
Dried fruits	0.070	47,235,467	27.7	47,323,619	21.7
Nuts and oilseeds	0.030	5,113,881	3.0	5,482,963	2.5
Sugar and confectionary. excluding cocoa	0.024	42,960,685	25.2	78,562,432	36.1
Flours and starches	0.02	28,696,290	16.8	41,059,744	18.9
Spices and Aromatic herbs	0.019	3,100,043	1.8	3,073,367	1.4
Processed fishes	0.020	3,521,041	2.1	3,671,340	1.7
Dried vegetables	0.020	1,898,494	1.1	1,728,909	0.8

Food Category	Lead mean (mg/kg)	Imported[b]		Exported[b]	
		Quantity (tons)	% total trade	Quantity (tons)	% total trade
Stalk vegetables	0.014	331,565	0.2	334,303	0.2
Cereal-based food for infants and young children	0.011	1,302,047	0.8	1,277,932	0.6
Alcoholic beverages[c]	0.011	4,274,143	2.5	4,687,565	2.2
Coffee and based-coffee beverages	0.010	8,382,551	4.9	8,710,059	4.0
Fruit juice and herbal tea for infants and young children	0.008	NF	-	NF	-
Vegetables juices	0.007	NF	-	NF	-
Ice and desserts	0.006	0	-	1,211,830	-
Dessert for infants and young children	0.005	NF	-	NF	-
Non-alcoholic beverages	0.003	NF	-	NF	-
Edible snails	0.19	NF	-	NF	-

NF = not found. [a]Whey and modified whey data; [b]Trade Map data (2016); [c]FAOSTAT data (2013)

Table 4. Estimated value (in US Dollar) of imports and exports of food categories, percentage of the contribution of each category in total trade and their relation with lead occurrence (mg/kg)

Food Category	Lead mean (mg/kg)	Imported[a]		Exported[a]	
		Value (dollar thousand)	% total trade	Value (dollar thousand)	% total trade
Teas	0.93	6728199	1.8	7204677	2.0
Products for special nutritional use	0.32	3614971	1.0	3711535	1.0
Eggs	0.30	4353060	1.2	4228860	1.2
Algae and seaweeds	0.27	1784064	0.5	1616396	0.4
Cocoa and cocoa products	0.24	47822269	12.7	47387744	12.9
Seafood	0.12	37927679	10.0	39041381	10.6
Dried fruits	0.070	55407308	14.7	46955824	12.8
Nuts and oilseeds	0.030	24105612	6.4	24552287	6.7

Food Category	Lead mean (mg/kg)	Imported[a]		Exported[a]	
		Value (dollar thousand)	% total trade	Value (dollar thousand)	% total trade
Sugar and confectionary. excluding cocoa	0.024	47582425	12.6	45605429	12.4
Cereals flours and starches	0.02	17915219	4.7	16775590	4.6
Spices and Aromatic herbs	0.019	10098981	2.7	9810478	2.7
Processed fishes	0.020	19935797	5.3	20477591	5.6
Dried vegetables	0.02	3566913	0.9	4812604	1.3
Stalk vegetables	0.014	1740331	0.5	1519417	0.4
Cereal-based food for infants and young children	0.011	9546416	2.5	8848550	2.4
Alcoholic beverages	0.011	52165213	13.8	49891191	13.6
Coffee (beverage)	0.010	29908810	7.9	30790946	8.4
Fruit juice and herbal tea for infants and young children	0.008	NF	-	NF	-
Vegetables juices	0.007	NF	-		-
Ice and desserts	0.006	3385822	0.9	3391336	0.9
Dessert for infants and young children	0.005	NF	-	NF	-
Non-alcoholic beverages	0.003	NF	-	NF	-
Edible snails	0.19	66,949	0.02	79,679	0.02

NF = not found. [a]Whey and modified whey data; [b]Trade Map data (2016)

TABLES

TABLE 1: DATA CONTRIBUTION BY COUNTRY, MEAN AND 95TH PERCENTILE FOR TEA AND COFFEE DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Teas and herbal tea (herbs/fruits for infusions)	**Australia, Brazil, Canada, China, France, New Zealand, USA, Singapore**	**1973/2144**	**0.93**	**0.0002 - 0.2**	**0.001 -0.6**	**2.7**	**<LOD - 325.6**
Tea (solid)	**Brazil, Canada, China, Singapore**	**1691 /1831**	**1.1**	**0.002 - 0.2**	**0.001 - 0.6**	**2.8**	**<LOD - 325.6**
Black tea	Canada, Brazil, Singapore	70/72	0.69	0.001 - 0.090	0.004 - 0.30	2.7	<LOD - 3.75
Green tea	Canada, Brazil	191/200	1.2	0.001 - 0.090	0.004 - 0.30	3.3	<LOD - 20.51
White tea	Canada, Brazil, Singapore	46/47	1.1	0.001 - 0.003	0.004 - 0.010	2.5	<LOD - 3.77
Tea (Infusion)	**Australia, Brazil, Canada, China, France, USA, New Zealand, Singapore**	**102/313**	**0.17**	**0.0002 - 0.15**	**0.0006 - 0.60**	**1.0**	**<9.71**
Black tea	Brazil, Singapore	19/40	0.32	0.003 - 0.15	0.010 - 0.50	0.98	<1.26
Green tea	Brazil, Canada, Singapore	27/64	0.21	0.001 - 0.090	0.004 - 0.30	1.3	<0.51
White tea	Brazil, Singapore	1/19	0.03	0.003 - 0.090	0.010 - 0.30	0.05	<0.51
Herbal tea (herbs/fruits for infusions)	Australia, Canada, China, Brazil, France, USA, New Zealand. Singapore	59/190	0.16	0.0002 - 0.090	0.001 - 0.30	0.85	<9.71
Coffee and based-coffee beverage[a]	**Australia, Canada, China, France, New Zealand, Singapore, USA**	**36/232**	**0.01**	**0.0002 - 0.090**	**0.0006 - 0.30**	**0.03**	**LOD < 0.20**
Coffee beverage	USA, New Zealand, Singapore	11/100	0.01	0.001 - 0.090	0.003 - 0.30	0.05	<LOD - 0.195

N+/N = positive samples/total samples. a. The difference between the sum of the subcategory samples and the total N/N+ corresponds to other unlisted foods (coffee-based beverage).

TABLE 2: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR SPICES AND AROMATIC HERBS DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Spices and herbs	**Australia, Canada, China, France, Japan, New Zealand, Republic of Korea, Singapore, Thailand, USA**	**742/1336**	**0.02**	**0.00005 - 0.090**	**0.0002 - 0.3**	**0.084**	**<LOD - 1.42**
Dried fruit and berries: i.e: Peppers; Chili; Peppers, sweet paprika (incl. pim(i)ento)	Australia, Canada, China, France, USA, New Zealand. Singapore, Thailand, Republic of Korea, Japan	684/1147	0.013	0.00005 - 0.090	0.0002 - 0.3	0.044	<LOD - 1.42
Dried roots and rhizomes (Garlic)	Canada, China, Japan	58/189	0.058	0.0003 - 0.050	0.010 - 0.15	0.33	<0.58

N+/N = positive samples/total samples.

TABLE 3: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR SUGAR AND CONFECTIONARY (EXCLUDING COCOA PRODUCTS)

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Sugar and confectionary (excluding cocoa products)	**Australia, Brazil, Canada, France, New Zealand, Singapore, USA**	**135/491**	**0.024**	**0.002 -0.090**	**0.001 - 0.30**	**0.045**	**< LOD - 0.72**
Honey	Australia, Brazil, Canada, France, New Zealand, Singapore, USA	73/289	0.02	0.002 -0.090	0.001 - 0.30	0.046	<LOD - 0.22
Sugar	Australia, Canada, China, France, New Zealand, Singapore, USA	7/114	0.03	0.0002 - 0.090	0.0006 - 0.30	0.045	<LOD - 0.57
Syrup	Canada, USA	46/78	0.01	0.0002 - 0.010	0.0006 - 0.040	0.03	<LOD - 0.04
Molasses	Canada	9/10	0.03	0.001	0.004	0.16	<LOD - 0.27
Candies	Canada, France, Singapore, USA	138/299	0.01	0.0002 - 0.090	0.0006 - 0.30	0.045	<LOD - 0.72

N[+]/N = positive samples/total samples.

TABLE 4: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR COCOA AND COCOA PRODUCTS DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Cocoa Products[a]	**Australia, Canada, China, France, New Zealand, Singapore**	**600/1061**	**0.24**	**0.0002 - 0.090**	**0.0006 - 0.30**	**0.43**	**<LOD - 45.50**
Cocoa powder	Canada, Singapore	411/783	0.31	0.001 -0.09	0.004 - 0.3	0.51	<LOD - 45.40
Chocolate	Australia, Canada, China, Singapore	164/174	0.03	0.0002 - 0.090	0.0006 - 0.30	0.080	<LOD - 0.20

N[+]/N = positive samples/total samples. a. The difference between the sum of the subcategory samples and the total N/N+ corresponds to other unlisted foods (cocoa butter and cocoa mass).

TABLE 5: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR FLOURS AND STARCH DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Cereal flours and starch[a]	**Japan, Canada, Singapore, USA**	**235/772**	**0.02**	**0.0002-0.2**	**0.0006-0.6**	**0.049**	**<LOD - 0.92**
Rice	Canada, USA	25/88	0.01	0.001 - 0.0072	0.004 - 0.018	0.020	<LOD - 0.1388
Barley	Canada	10/48	0.02	0.001 - 0.005	0.004 - 0.0051	0.17	<LOD - 0.2620
Wheat	Canada, Singapore, USA	51/145	0.02	0.001 - 0.2	0.003 - 0.6	0.092	<LOD - 0.92
Buckwheat	Canada	37/57	0.03	0.001 - 0.005	0.004 - 0.0051	0.073	<LOD - 0.1770
Maize	Singapore, USA	4/52	0.12	0.001 - 0.09	0.004 - 0.30	0.44	<LOD - 0.573
Millet	Canada	6/32	0.02	0.001 - 0.005	0.004 - 0.0051	0.035	<LOD - 0.2660
Oat	Canada	13/28	0.004	0.001 - 0.090	0.004 - 0.30	0.012	<LOD - 0.045
Rye	Canada, Singapore	10/74	0.01	0.001 - 0.090	0.004 - 0.30	0.044	<LOD - 0.045
Triticale	Canada	1/2	0.002	0.001	0.004	0.002	<LOD - 0.0025

N[+]/N = positive samples/total samples. a. Considered all data of cereal flours and starch insert in Food Category (Gems/Food) Cereal and cereal-based products. The difference between the sum of the samples of subcategories and the total N/N+ corresponds to other unlisted foods.

TABLE 6: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR FOOD FOR INFANTS AND YOUNG CHILDREN - N+/N = positive samples/total samples.

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Cereal-based food	Australia, Canada, Japan, New Zealand, Singapore, USA	116/451	0.011	0.001 - 0.090	0.004 - 0.3	0.030	< LOD - 0.240
Fruit juice and herbal tea	Canada, USA	169/288	0.008	0.002 - 0.15	0.002 - 0.02	0.012	<LOD - 0.029
Dessert	Australia, New Zealand, USA	28/207	0.006	0.0002 - 0.007	0.001 - 0.03	0.022	<LOD - 0.022

TABLE 7: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR NUTS AND OILSEEDS DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Nuts and oilseeds	**Australia, Canada, China, France, New Zealand, Singapore, USA, Uruguay**	**207/1082**	**0.03**	**0.001 - 0.09**	**0.0006 - 0.3**	**0.045**	**<LOD - 0.667**
Nuts	Australia, Canada, Singapore	74/74	0.02	0.001-0.090	0.001-0.3	0.058	0.003 - 0.280
Nuts roasted or salted	Canada, Thailand, Singapore	28/28	0.04	0.001-0.090	0.001-0.3	0.20	0.001 - 0.352
Coconut	Canada, Thailand	1/10	0.005	0.001 - 0.005	0.0021 - 0.006	0.0026	<LOD - 0.003
Coconut desiccated	Australia	¾	0.015	0.005	0.0250	0.022	<LOD - 0.023
Peanut	Canada, Thailand	6/21	0.07	0.001-0.0450	0.004-0.15	0.29	0.01 - 0.320
Peanut roasted or salted	Canada, Singapore	15/15	0.03	0.001-0.090	0.004-0.3	0.14	0.01 - 0.111
Raw oilseeds	Canada, France, Singapore, Thailand	79/930	0.03	0.0002-0.090	0.0006-0.3	0.025	0.0001-0.667

N+/N = positive samples/total samples. The difference between the sum of the sample samples and the total N/N+ corresponds to other unlisted foods.

TABLE 8: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR EGGS AND EGG PRODUCTS DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Eggs (all)	**Australia, Canada, China, France, New Zealand, USA, Singapore**	**973/2004**	**0.30**	**0.0002 - 0.2**	**0.0006 - 0.6**	**0.99**	**<LOD - 27.70**
Eggs (raw)	Canada, China, Singapore	953/1872	0.32	0.005 - 0.2	0.0170 - 0.6	1.1	<LOD - 27.70
Cooked eggs	Australia, China, France, New Zealand, USA	20/132	0.004	0.001-0.007	0.005-0.03	0.006	<LOD - 0.0419

N+/N = positive samples/total samples.

TABLE 9: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR SEAFOOD DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Seafood	**Australia. Brazil, Canada. China. France, New Zealand, Nigeria. Singapore. USA**	**4718/5974**	**0.12**	**0.0003 - 0.1**	**0.001 - 0.3**	**0.40**	**<LOD - 17.0**
Bivalve molluscs	Canada, China, France, New Zealand, Singapore	1187/1317	0.16	0.001 - 0.04	0.005 - 0.12	0.46	<LOD - 17.0
Cephalopods	Canada, China, France, New Zealand, Singapore	77/105	0.11	0.001 - 0.09	0.006 - 0.3	0.56	<LOD - 1.85
Crustaceans	Australia, Brazil, Canada, China, France, Nigeria, Singapore, USA	786/1136	0.10	0.0003 - 0.1	0.001 - 0.3	0.38	<LOD - 5.80
Sea cucumber	Canada, China	9/9	0.05	0.001 - 0.01	0.006 - 0.02	0.21	0.001 - 0.34
Sea Snails	Canada, Nigeria	279/281	0.03	0.001 - 0.001	0.006 - 0.05	0.080	<LOD - 0.23
Sea urchin	Canada, China	12/12	0.10	0.001 - 0.01	0.006 - 0.02	0.33	0.01 - 0.52

N+/N = positive samples/total samples. The difference between the sum of the samples categories and the total N/N+ corresponds to other unlisted foods.

TABLE 10: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR PROCESSED FISHES DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Processed fishes	**Australia, France, China, New Zealand, Nigeria, Singapore, Thailand, USA**	**343/1744**	**0.020**	**0.001 - 0.20**	**0.005 - 0.60**	**0.13**	**<LOD - 0.81**
Canned fish	Australia, France, New Zealand, Thailand, USA	252/1406	0.020	0.001 - 0.0012	0.005 - 0.10	0.13	<LOQ - 0.27
Salted fish	Nigeria, Singapore	30/38	0.070	0.001 - 0.2	0.05 - 0.6	0.20	<LOQ - 0.81
Others fish products	Australia, China, France, New Zealand, Singapore, Thailand, USA	51/300	0.010	0.002 - 0.09	0.005 - 0.3	0.080	<LOQ - 0.30

N+/N = positive samples/total samples.

TABLE 11: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR ICE CREAM DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Ice and desserts	**Canada, New Zealand, Australia, China, Singapore, USA**	**13/124**	**0.006**	**0.0002 - 0.090**	**0.0006- 0.3**	**0.021**	**<LOD - 0.045**
Milk-based ice cream	China, Singapore, USA	8/108	0.006	0.002 - 0.090	0.006- 0.3	0.019	<LOD - 0.045
Fruit-based ice-cream	Canada, New Zealand, Australia	5/16	0.002	0.0002 - 0.020	0.0006 - 0.060	0.004	<LOD - 0.004

N+/N = positive samples/total samples.

TABLE 12: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR NON-ALCOHOLIC BEVERAGES DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Non-Alcoholic beverages	**Australia, Canada, France, China, New Zealand, Japan, Singapore, USA**	**61/611**	**0.003**	**0.0002 - 0.0020**	**0.0006 - 0.10**	**0.006**	**<LOD - 0.045**
Soft drink	Australia, Canada, France, China, New Zealand, Japan, Singapore, USA	161/271	0.002	0.0002 - 0.002	0.0006 - 0.10	0.005	<LOQ - 0.012
Others drink excluding soft drink	Australia, Canada, France, China, New Zealand, Japan, Singapore, USA	45/340	0.004	0.0002 - 0.002	0.0006 - 0.10	0.008	<LOQ - 0.045

N+/N = positive samples/total samples.

TABLE 13: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR ALCOHOLIC BEVERAGES DATASET

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Alcoholic beverages	**Australia, Canada, France, China, New Zealand, Singapore, USA**	**5959/9311**	**0.01**	**0.001 - 0.090**	**0.002 - 0.30**	**0.021**	**<LOD - 0.78**
Beer and beer-like beverage	Australia, Canada, China, France, USA, New Zealand, Singapore	1899/3456	0.01	0.0002 - 0.090	0.0006 - 0.3	0.020	<LOD - 0.15
Whisky	Canada, USA	800/1184	0.01	0.001 - 0.004	0.002 - 0.020	0.020	<LOD - 0.06
Absinthe	Canada	8/16	0.01	0.001	0.002	0.020	<LOD - 0.02
Armagnac and Eau de vie	Canada	79/93	0.01	0.001	0.002	0.026	<LOD - 0.06
Bitter	Canada	30/40	0.01	0.001	0.002	0.020	<LOD - 0.03
Bourbon	Canada	8/13	0.01	0.001	0.002	0.020	<LOD - 0.02
Brandy	Canada	235/328	0.01	0.001	0.002	0.020	<LOD - 0.10
Cider, Ice Cider and Cidre	Canada, France	375/412	0.01	0.001 - 0.003	0.002 - 0.005	0.020	<LOD - 0.08
Cognac	Canada	127/128	0.01	0.001	0.002	0.022	<LOD - 0.04
Cooler	Canada	270/552	0.01	0.001	0.002	0.020	<LOD - 0.17
Gin and Dry Gin	Canada	58/136	0.01	0.001	0.002	0.020	<LOD - 0.02
Liqueur	Canada	550/889	0.01	0.001	0.002	0.020	<LOD - 0.22
Rum	Canada	205/321	0.01	0.001	0.002	0.020	<LOD - 0.78

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min -Max (mg/kg)
Vodka	Canada	133/315	0.01	0.001 - 0.090	0.002 - 0.3	0.020	<LOD - 0.07
Sake	Canada	417/519	0.01	0.001	0.002	0.020	<LOD - 0.16
Tequila	Canada	112/169	0.01	0.001	0.002	0.020	<LOD - 0.06

N+/N = positive samples/total samples. The difference between the sum of the samples categories and the total N/N+ corresponds to other unlisted foods (for example: fortified wine, mezcal, shochu, spirits).

TABLE 14: DATA CONTRIBUTION BY COUNTRY. MEAN AND 95TH PERCENTILE FOR FOOD FOR FOOD SUPPLEMENTS

Food	Countries	N + / N	Mean (mg/kg)	LOD (min – max)	LOQ (min – max)	95TH Percentile (mg/kg)	Min - Max (mg/kg)
Products for special nutritional use	**Singapore, Canada, WHO European Region**	**877/2898**	**0.32**	**0.00015 - 1**	**0.0004 - 3.33**	**0.99**	**0.130 - 40,22**
Dietary supplement	Singapore, Canada, WHO European Region	798/2426/1628	0.37	0.0002 - 1	0.001 – 3.33	1.08	**0.0004 - 40,22**
Dietetic food	WHO European Region	2/36	0.03	0.002 - 0.05	0.005 - 0.167	0.108	0.006 - 0.370
Food for sports	WHO European Region	60/256	0.24	0.001 - 0.25	0.004 - 0.833	0.49	0.003 - 4.89
Food for weight reduction	WHO European Region	14/57	0.10	0.0001 - 0.14	0.0004 - 0.467	0.29	0.006 - 1.00
Medical food	WHO European Region	3/121	0.05	0.005 - 0.12	0.010 - 0.4	0.11	0.011 - 0.260

N+/N = positive samples/total samples. No data of products for special nutritional use NES was considered, although there are data for this subcategory.

LIST OF PARTICIPANTS

CHAIR
Brazil
Larissa Bertollo Gomes Pôrto
Health Regulation Expert
Brazilian Health Regulatory Agency
E-mail: larissa.porto@anvisa.gov.br

Argentina
Lic. Silvana Ruarte
Instituto Nacional de Alimentos
E-mail: sruate@anmat.gov.ar

Gabriela Catalani
Codex Contact Point
Agroindustry Ministry

Silvana Ruarte
Codex Secretariat
ANMAT/INAL

Australia
Mr Matthew O'Mullane
Section Manager
Food Standards Australia New Zealand
E-mail: Matthew.O'Mullane@foodstandards.gov.au

Glenn Stanley
E-mail: glenn.stanley@foodstandards.gov.au

Kate Slater
Codex Contact Point
Department of Agriculture and Water Resources

Matthew Joseph O'Mullane
Food Standards Australia New Zealand

Luisa Trevisan
Food Standards Australia New Zealand

Austria
Daniela HOFSTÄDTER
E-mail: Daniela.hofstaedter@ages.at

Belgium
Korati Safia
Federal Public Service Health Food Safety

Brazil
Lígia Lindner Schreiner
Health Regulation Expert
Brazilian Health Regulatory Agency
E-mail: ligia.schreiner@anvisa.gov.br

Carolina Araújo Vieira
Health Regulation Expert
Brazilian Health Regulatory Agency
E-mail: carolina.vieira@anvisa.gov.br

Ms Flávia Beatriz Custodio
Professor
Universidade Federal do Rio de Janeiro - Campus
Macaé Rua Aloísio da Silva Gomes, 50 - Granja dos
Cavaleiros Macaé Brazil Tel: +55 22 997820185
E-mail: flaviabcustodio@gmail.com

Mr Milton Cabral De Vasconcelos Neto Health and
Technology Analyst Sanitary Surveillance Division -
DIVISA Ezequiel Dias Foundation - FUNED Conde
Pereira Carneiro, Street, 80 - Gameleira Belo
Horizonte/MG Brazil Tel: +553134144695
E-mail: milton.cabral@funed.mg.gov.br

Ms Patricia Diniz Andrade Professor Brasília Federal
Institute of Education, Science and Technology - IFB
Lote 01, DF 480, Setor de Múltiplas Atividades - Gama
Brasília Brazil Tel: +556131072017
E-mail: patricia.andrade@ifb.edu.br

Bulgaria
Dr. Svetlana Tcherkezova
E-mail: STcherkezova@mzh.government.bg

Canada
Stephanie Glanville
Scientific Evaluator, Food Contaminants Section
Bureau of Chemical Safety
Health Canada
E-mail: stephanie.glanville@hc-sc.gc.ca

Canada
Elizabeth Elliott
Head, Food Contaminants Section
Bureau of Chemical Safety
Health Canada
E-mail: elizabeth.elliott@hc-sc.gc.ca

Chile
Lorena Delgado
Coordinator National Committee CCCF
E-mail: ldelgado@ispch.cl

China
Mr Yongning WU
Professor, Chief Scientist
China National Center of Food Safety Risk Assessment
(CFSA)
Director of Key Lab of Food Safety Risk Assessment,
National Health and Family Planning Commission
E-mail: wuyongning@cfsa.net.cn   ,
china_cdc@aliyun.com

Ms Xiaohong Shang
Researcher
China National Center for Food Safety Risk Assessment
(CFSA)
Key Lab of Food Safety Risk Assessment, National
Health and Family Planning Commission
E-mail: shangxh@cfsa.net.cn

Wang Songxue
Email: wsx@chinagrain.org

Liping Li
Henan University of Technology,
Email: lilp@haut.edu.cn

Yi Shao

Colombia
Wilmer Humberto Fajardo Jimenez
E-mail: wfajardoj@invima.gov.co

Giovanny Cifuentes Rodriguez
E-mail: gcifuentes@minsalud.gov.co

Dominican Republic
Fatima del Rosario Cabrera
General Directorate of Medicines
Food and Health Products (DIGEMAPS)
Ministry of Public Health and Social Assistance
(MISPAS)
E-mail: codex.pccdor@msp.gob.do

Ecuador
Natalia Quintana
Engineer
AGROCALIDAD – Ecuador
E-mail: natalia.quintana@agrocalidad.gob.ec

Egypt
Noha Mohammed Atyia
Food Standards Specialist
Egyptian Organization for Standardization & Quality
(EOS)
Ministry of Trade and Industry
16 Tadreeb AlMutadrbeen St., AlAmeriah
E-mail: nonaaatia@yahoo.com

European Union
Veerle Vanheusden

India
National Codex Contact Point
E-mail: codex-india@nic.in

Mr. Parmod Siwach
Assistant Director(Tech.)
Export Inspection Council of India
E-mail: tech5@eicindia.gov.in

Mr. Kannan B
Assistant Manager Regulatory Affairs
ITC Limited
E-mail: Kannan.B@itc.in

Dr. A. K. Barooah
Director
Tockali Tea Research Institute, TRA, Jorhat, Assam
E-mail: ak.b@rediffmail.com

Mr. Sunil Bakshi
NCCP
Food Safety and Standards Authority of India
E-mail: sbakshi@fssai.gov.in

Mr. P Karthikeyan
Assistant Director
Food Safety and Standard Authority of India

Anoop Kumar Barooah
Tea Research Association, Tocklai Tea Research Ins

Indonesia
Tepy Usia
Director of Food Product Standardization
National Agency of Drug and Food Control
+622142875584
E-mail: codexbpom@yahoo.com

Iran
Shahrokh Hassanpour
Head of the CCCF in Iran
E-mail: msh_55@yahoo.com

Mansooreh Mazaheri
ISIRI-Standard Research Institute

Japan
Mr. Tetsuo URUSHIYAMA
Plant Products Safety Division
Food safety and Consumer Affairs Bureau Ministry of
Agriculture, Forestry and Fisheries of Japan
E-mail: tetsuo_urushiyama530@maff.go.jp

Tsuyoshi ARAI
Food Standards and Evaluation Division Pharmaceutical
Safety and Environmental Health Bureau
Ministry of Health, Labour and Welfare of Japan
E-mail: codexj@mhlw.go.jp

Kazakhstan
Gauhar Amirova
National center for expertise

Zhanar Tolysbayeva
The Ministry of Healthcare

Mexico
Tania Daniela Fosado Soriano
Secretaría de Economía

New Zealand
Andrew Pearson
Senior Adviser Toxicology
Ministry for Primary Industries
E-mail: Andrew.pearson@mpi.govt.nz

John Edward Reeve
New Zealand Ministry for Primary Industries

Norway
Hege Ø.Sørheim
Norwegian Food Safety Authority
Codex Contact Point for Norway
E-mail: Codex@mattilsynet.no

Republic of Korea
Min Yoo
Codex researcher Food Standard Division, Ministry of
Food and Drug Safety(MFDS)
E-mail: Codexkorea@korea.kr
E-mail: minyoo83@korea.kr

Russian Federation
Irina Sedova
Scientific researcher Laboratory of Enzimology of
Nutrition of Federal Research
Center of food, biotechnology and food safety, 2/14
Ustinsky proezd,
Moscow
E-mail: isedova@ion.ru

South Africa
Malose Matlala
Codex Contact Point
Department of Health

Sweden
Mrs. Karin Bäckström
Codex Coordinator
Principal Regulatory Officer
National Food Agency, Sweden
E-mail: Karin.backstron@slv.se

United States of America
Henry Kim
U.S. Food and Drug Administration
Center for Food Safety and Applied Nutrition
5001 Campus Drive
College Park, MD 20740
E-mail: henry.kom@fda.hhs.gov

Lauren Posnick Robin
U.S. Food and Drug Administration
Center for Food Safety and Applied Nutrition
5001 Campus Drive
College Park, MD 20740
E-mail: lauren.robin@fda.hhs.gov

Uruguay
Raquel Huertas
Laboratorio Tecnologico del Uruguay
E-mail: rhuertas@latu.org.uy

Ecowas Commission
Gbemenou Joselin Benoit Gnonlonfin

European Cocoa Association
Julia Manetsberger

FEDIOL - EU Vegetable Oil & Proteinmeal Industry
Tiziana Viotto

Grocery Manufacturers Association
Rene Vinas

ICGA - International Chewing Gum Association
Christophe LePrêtre
International Confectionery Association - ICA
Alice Costa

International Council of Grocery Manufacturers
Nicholas M. Gardner

ICGMA
Nichole Marie Mitchell

IFU (International Fruit and Vegetable Juice Association)
John Collins
Executive Director
IFU (International Fruit and Vegetable Juice Association)
E-mail: john@ifu-fruitjuice.com

Institute of Food Technologists
Dr. James R. Coughlin
E-mail: jrcoughlin@cox.net

FAO
Dr Markus Lipp
Food Safety Officer
Agriculture and Consumer Protection
Department Food and Agriculture Organization of the UN
Viale delle Terme di Caracalla
Rome, Italy
Tel: +39 06 570 56951
E-mail: markus.lipp@fao.org

Dr Vittorio Fattori
Food Safety Officer
Agriculture and Consumer Protection
Department Food and Agriculture Organization of the UN
Viale delle Terme di Caracalla
Rome, Italy
Tel: +39 06 570 56951
E-mail: vittorio.fattori@fao.org