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CODEX ALIMENTARIUS COMMISSION

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World Health Organization

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Agenda Item 8 **CX/CF 20/14/8**

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

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PROPOSED DRAFT MAXIMUM LEVELS FOR LEAD IN SELECTED COMMODITIES (At Step 4)

(Prepared by the Electronic Working Group chaired by Brazil

Codex members and observers wishing to submit comments at Step 3 on this document should do so as instructed in CL 2020/21-CF available on the Codex webpage/Circular Letters: http://www.fao.org/fao-who-codexalimentarius/resources/circular-letters/en/.

BACKGROUND

1. 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, foetuses, infants and children are the subgroups that are most sensitive to lead. Since no safe level of lead could be identified by the Joint FAO/WHO Committee on Food Additives (JECFA), 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. Previous work was done to identify food categories that did not have Maximum Levels (MLs) for lead in the General Standard for Contaminants and Toxins in Food and Feed (GSCTFF) (CXS 193-1995) and to prioritize food categories based on exposure assessment and consideration on trade volumes. The 13th Session of the Codex Committee on Contaminants in Foods (CCCF13, 2019) agreed with the selection and prioritization criteria elaborated and decided to focus the discussion on the food categories identified as high priority for the establishment of MLs (see further details under background information in Appendix II).

3. CCCF13 agreed[1] to establish an Electronic Working Group (EWG) chaired by Brazil to prepare proposals for MLs for lead in eggs and egg products; aromatic herbs and spices; food for infant and young children; sugar and confectionery, excluding cocoa. Food categories were recognized to be broad, therefore CCCF13 agreed[2] that an analysis of available data would assist in determining subcategories for which MLs should be established.

4. Comments were received from the following countries/NGOs: Argentina, Australia, Canada, Cuba, Ecuador, Japan, Saudi Arabia, Thailand, USA, International Confectionery Association (ICA) and International Special Dietary Foods Industries (ISDI). The list of Codex member countries and observer international organizations that joined the EWG can be found in Appendix III.

SUMMARY OF THE EWG WORK

5. A call for data was issued on lead levels in eggs and egg products, aromatic herbs and spices, food for infant and young children and sugar and confectionery, excluding cocoa, requesting submission of data preferably for the past 10 years. The initial categorization of data from the GEMS/Food database was performed by the JECFA Secretariat and by the EWG.

[1] REP19/CF. para. 96

[2] REP19/CF, para. 93, Appendix VI

6. Data since 2008 was extracted from GEMS/Food database. An analysis of results was made to decide which data should be considered and what recommendations should be made by the EWG. The work process and the rationale to support the ML recommendations is provided in Appendix I.

7. During the data analysis, the EWG noticed some inconsistences on submission and extraction of 2019 data for food for infant and young children and for sugar and confectionery categories. The EWG was able to deal with the inconsistencies found for eggs and eggs products and for spices and culinary herbs.

8. A total of 2,228 results were submitted for eggs and eggs products, being 1,257 for fresh eggs and 971 for eggs products. For eggs products, a significant amount of data was available only for preserved eggs, with a total of 907. Analysis of available data on GEMS/Food showed mean occurrence levels of 0.02 mg/kg for eggs and 0.44 mg/kg for preserved eggs. Using the As-Low-As-Reasonably-Achievable (ALARA), establishing ML of 0.1 mg/kg for lead on eggs would have a rejection rate of 0.5%, while a ML of 1.5 or 2 mg/kg for preserved eggs would have a rejection of 5 or 4.1%. The data available for other eggs products don't allow to suggest ML.

9. Spices and culinary herbs were analysed separately, with a total of 1,878 data for culinary herbs and 3,347 data for spices. It was possible to categorize spices in five subcategories, using the classification of the Codex Committee on Spices and Culinary Herbs (CCSCH)[3], but not all samples could be fit in one of the subcategories (e. g. mixture of spices).

10. For culinary herbs,151 data were for fresh herbs and 1,774 for dried herbs. Data showed significant differences in lead occurrence comparing fresh and dried products. With rejection rate less than 2.6%, MLs of 0.2 mg/kg for fresh herbs and 2 mg/kg for dried herbs are proposed. Adopting these proposed MLs, lead intake associated with the consumption of these foods can be reduced in more than 40%.

11. For spices, different profiles were observed for fresh and dried rhizomes, bulbs and roots, with a mean of occurrence level in the fresh products 5 times less than dried products. The MLs proposed based on ALARA are 0.6 mg/kg for fruits spices and berries spices; 2.5 mg/kg for dried rhizomes, bulbs and roots; 0.8 mg/kg for fresh rhizomes, bulbs and roots; 3.0 mg/kg for bark; 1.0 mg/kg for floral parts and 0.9 mg/kg for seeds spices. The proposed MLs would have a rejection rate around or less than 5%. In general, adopting these MLs, the intake reduction of lead is at least 40%, but for seeds spices the intake reduction is 9,1% and for dried rhizomes, bulbs and roots the reduction is 87.5%.

RECOMMENDATIONS

12. CCCF is invited to consider the proposed MLs for the prioritized food categories as well as the proposals made in relation to the establishment of MLs for lead in food for infant and young children and sugar and confectionery as shown in Appendix I, taking into account the information provided in paragraphs 5-11 and Appendix II, and comments submitted in reply to CL 2020/21-CF.

[3] REP17/SCH

APPENDIX I

PROPOSED DRAFT MAXIMUM LEVELS FOR LEAD FOR SELECTED FOOD CATEGORIES
(For comments)

Codex members and observers are kindly invited to consider the following proposals (the numbering does not represent any particular priority order):

1. Establish a ML of 0.1 mg/kg for eggs;
2. Establish a ML of 1.5 or 2 mg/kg for preserved eggs;
3. Establish a ML of 0.2 mg/kg for fresh culinary herbs;
4. Establish a ML of 2.0 mg/kg for dried culinary herbs;
5. Establish the following MLs for spices:
    - Fruits and berries: 0.6 mg/kg
    - Rhizomes, bulbs and roots (dried): 2.5 mg/kg
    - Rhizomes, bulbs and roots (fresh): 0.8 mg/kg
    - Bark: 3.0 mg/kg
    - Floral parts: 1.0 mg/kg
    - Seed: 0,9 mg/kg
6. Postpone to next year the establishment of MLs for lead in food for infant and young children and sugar and confectionery and extract and analyse again occurrence data addressing the inconsistencies identified.
7. When working on food for infant and young children, consider establishing MLs for cereal-based products for infants and young children “as consumed” to align with other food categories for this public in the GSCTFF.

APPENDIX II

SUMMARY REPORT

(For information)

BACKGROUND

1. Based on conclusions of 73rd JECFA Meeting about dietary exposure of lead in 2011, a work to reduce Maximum Levels (MLs) for lead established in the General Standard for Contaminants and Toxins in Food and Feed (GSCTFF) was undertaken since the 6th Session of the Codex Committee on Contaminants in Foods (CCCF06, 2012).

2. CCCF11 (April 2017)[1] noted that the work on the revision was limited to those food categories listed in the GSTCFF. However, there was wide support to continue working on new MLs for lead for a range of food categories. An EWG led by Brazil was established to prepare a discussion paper on a structured approach to prioritize commodities not included in the GSCTFF and propose new MLs.

3. CCCF12 (March 2018)[2] agreed to re-establish an EWG led by Brazil to prepare for CCCF13 a revised discussion paper and project document which also took into consideration exposure data (in addition to other criteria for prioritization of commodities) in establishing the prioritization of the categories, and to propose MLs for the food categories identified as high priority.

4. CCCF13 (April 2019)[3] agreed with the selection and prioritization criteria presented and decided to focus on proposal of MLs for food for infants and young children (except those for which MLs have already been established in the GSCTFF), spices and aromatic herbs, eggs and sugars and confectionery, excluding cocoa. Food categories were recognized to be broad, therefore CCCF13 agreed in the project document for new work that an analysis of available data would assist in determining subcategories for which MLs should be established.

5. An EWG, chaired by Brazil, was established to prepare, subject to approval of CAC42, proposed draft MLs for comments and consideration at CCCF14; and issue a call for data on agreed categories to identify subcategories for which MLs could be proposed for consideration by CCCF14. Since JECFA did not identify safe level of lead, the approach was to propose MLs that were “as low as reasonably achievable” (ALARA).

LEAD OCCURRENCE IN FOODS

6. After the call for data, lead occurrence data were extracted from GEMS/Food database for food categories according to the EWG terms of reference, considering data submitted after 2008. Data were categorized based on the names entered by the countries on the fields: Food Category, Food Name, Local Food Name and Food State Name. The “Remarks” column was checked to see if there was some information to complete the classification.

7. Data that did not meet basic criteria, such as incomplete information, results from aggregated samples (i.e. samples reported as summary statistics rather than individually), total diet studies (TDS), results on dry matter basis and results from multi-ingredient foods were removed. Although TDS samples provide realistic data on food contamination, the EWG considered inappropriate to propose MLs based on these results once they do not represent contamination profiles on products on the market.

8. All data was converted into the same unit (mg/kg). Not detected values (ND) were considered as being half of LOD and values between LOD and LOQ were treated as (LOD + LOQ)/2. This process resulted in the raw dataset.

9. Some results in the dataset were obtained with methods with a high LOQ, with some data reported as non-detected (NDs). This situation may interfere in an accurate evaluation of the data. Since no MLs are established for the food categories analysed on this document, data that reported LOQ values higher than 95th percentile for each food category were excluded and a new dataset was prepared (LOQ-limited dataset).

[1] REP17/CF. paras. 85-86
[2] REP18/CF. para. 131
[3] REP19/CF. paras. 92-93

10. A lot of data did not have information about the LOQ of the method. The absence of a LOQ does not allow an evaluation of whether theses samples achieved the LOQ criteria mentioned on paragraph above. Nevertheless, omitting many samples could affect the results. A comparison was made to see if the statistics parameters would change if data without LOQ reported were omitted. No difference was observed in the mean and high percentiles (data not shown) and for this reason, data with no LOQ reported were included in the analysis.

11. Summary statistics including N+/N (number of positive results/total number of samples), mean, median, 95^{th} and 97.5^{th} percentile concentrations (abbreviated as $P95^{TH}$ and $P97.5^{TH}$), minimum and maximum concentrations were determined considering the raw dataset for each category. The subcategories were identified according to the available data.

12. Raw and LOQ-datasets were compared considering mean and the 95^{th} percentile. In general, no difference was observed between the two approaches. Finally, hypothetical MLs and the rate of sample rejection were analysed aiming to propose MLs to be established.

ANALYSIS OF FOOD CATEGORIES

Eggs and egg products

13. Data for eggs and egg products were submitted from one region (European Union) and five countries: Canada, China, Singapore, Thailand and USA. The raw dataset for eggs and egg products consisted of 2,228 results from GEMS/Food database. 1,257 data of fresh eggs were provided, with 3 samples identified as duck eggs with no detected results and the remaining 1,254 results were considered as chicken eggs. A total of 971 data were submitted for egg products, but only for preserved eggs a significant amount of data is available with a total of 907 (**Table A1**).

14. Data from raw and LOQ-limited datasets are shown in **Table A2**. Only one sample for egg reported LOQ higher than 95^{th} percentile lead occurrence and all data for preserved eggs had appropriate LOQ.

15. Hypothetical MLs for lead in eggs and preserved eggs and the effect on sample rejection are shown in **Table 1.** Establishing a ML of 0.1 mg/kg would have a rejection rate of 0.5%. For preserved eggs, establishing a ML of 1.5 or 2 mg/kg would have a rejection of 5 or 4.1%, respectively.

Table 1. Effect of the implementation of hypothetical MLs for lead in eggs and preserved eggs: Raw dataset

	Eggs (n = 1,254)	
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Sample rejection (%)**
No ML	0.02	0.0
0.2	0.01	0.2
0.1	0.01	0.5
0.05	0.01	3.3
0.03	0.01	5.3
Preserved eggs (n = 907)		
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Sample rejection (%)**
No ML	0.44	0.0
2.5	0.20	3.1
2	0.18	4.1
1.5	0.17	5.0
1	0.15	6.8

Spices and culinary herbs

16. During the EWG, one country indicated that the term “culinary herbs” would be more appropriate than “aromatic herbs” and hence the terminology was adopted on the document. Data for spices and culinary herbs were submitted from one region (European Union) and 14 countries: Australia, Brazil, Canada, Cuba, China, France, India, Japan, Nigeria, New Zealand, Republic of Korea, Singapore, Thailand and USA. Besides the criteria mentioned in paragraph 7, the EWG excluded data reported on this food category that were not considered spices or aromatic herbs by CCSCH[4], for example: condiments, extract, essence, sauce, paste, salted, smoked, cooked, gelatine, yeast, seaweed and salt.

17. Based on the information reported according to paragraph 6, it was possible to classify culinary herbs as fresh and dried. Spices were divided into subcategories considering CCSCH classification, resulting in the subcategories fruits and berries; rhizomes, bulbs and roots (dried and fresh), bark, floral parts and seed. **Table 2** shows examples of products in each subcategory.

Table 2. Examples of foods on each subcategory of culinary herbs and spices.

Food sub-categories	Food
Culinary herbs	Mixed herbs, coriander, basil, parsley, lemon grass, celery, oregano, thyme, dill, sage, rosemary, chives, cilantro, chamomile, celery
Fruits and berries	Chili red pepper, white pepper, black pepper, paprika, ground chili, sumac
Floral parts	Cloves, saffron
Seed	Cumin, anise seed, fenugreek, chili seed, funnel seeds, coriander seed, dill seed, cardamom, mustard, nutmeg
Rhizomes. bulbs and roots	Ginger, garlic (fresh, dried, cooked), galangal, turmeric (curcuma)
Bark	Cinnamon

18. Data were analysed separately for culinary herbs and spices (**Table B1**). Mean and 97.5th percentile from raw and LOQ-limited datasets are shown in **Table B2**. For culinary herbs, 5 samples out of 1,925 reported LOQ higher than 95th percentile lead occurrence. No significant variations were observed for either mean and 95th percentile. For spices, 25 samples out of 3,347 reported LOQ higher than 95th percentile. Removing results with high LOQ values did not affected the mean, but a lower value was observed for the 95th percentile.

19. For culinary herbs, it was possible to split in two subcategories: fresh and dried, with different contamination profiles. A total of 1,878 data for culinary herbs were submitted, being 151 for fresh and 1,774 for dried. MLs of 0.2 mg/kg for fresh herbs and 2 mg/kg for dried herbs are proposed with a rejection rate less than 2.6% (**Table 3**).

Table 3. Effect of the implementation of hypothetical MLs for lead in culinary herbs: Raw dataset

Fresh culinary herbs (n = 151)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	0.04	0.01	0	0.0
0.3	0.04	0.01	0	0.0
0.2	0.02	0.003	45.0	2.6
0.1	0.01	0.002	65.0	15.2

4 REP17/SCH: Report of the 3RD Session of The Codex Committee on Spices and Culinary Herbs, Chennai, India, 6-10 February 2017

Dried culinary herbs (n = 1,774)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	0.29	0.04	0	0.0
2	0.17	0.03	41.4	1.9
1.5	0.13	0.02	55.2	3.9
1	0.13	0.02	55.2	4.5

20. A total of 3,347 data were extracted for spices, but it was not possible to classify all samples in the subcategories mentioned (e.g. mace). The impact of the establishment of hypothetical MLs for lead on dietary intake was evaluated in each subcategory for the Cluster Diet with the highest consumption pattern for that group (worst case scenario). Cluster Diets with higher consumption patterns were G09 for fruit spices and berries spices (8.89 g/person/day); G04 for spices classified as rhizomes, bulbs and roots (1.34 g/person/day), G12 for bark (0.40 g/person/day), G11 for spices classified as floral parts (3.88 g/person/day) and G04 for seeds (1.82 g/person/day).

21. Intake reduction due to the establishment of MLs for lead on spices and the impact on rejection rates are show on **Table 4**. MLs proposed with a rejection rate, in general, from 2,5% to 5% are as follow (**Table 4**):

- Fruits spices and berries spices: 0.6 mg/kg
- Rhizomes, bulbs and roots (dried): 2.5 mg/kg
- Rhizomes, bulbs and roots (fresh): 0.8 mg/kg
- Bark: 3.0 mg/kg
- Floral parts: 1.0 mg/kg
- Seed: 0,9 mg/kg

Table 4. Effect of the implementation of hypothetical MLs for lead on spices on intake and sample rejection (raw dataset).

Fruits and berries (n = 1,352)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	0.29	0.043	0	0.0
1.0	0.19	0.028	34.5	1.5
0.8	0.17	0.025	41.4	2.8
0.6	0.16	0.024	44.8	4.5
Dried rhizomes, bulbs and roots (n = 645)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	1.76	0.039	0	0.0
3	0.24	0.005	86.4	3.7
2.5	0.22	0.005	87.5	4.3
1.5	0.19	0.004	89.2	6.0
1.0	0.18	0.004	89.8	6.9
Fresh rhizomes, bulbs and roots (n = 124)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	0.17	0.004	0	0.0
1	0.13	0.003	23.5	1.6
0.8	0.10	0.002	41.2	4.8
0.6	0.08	0.002	52.9	7.3

Bark (n = 270)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	0.89	0.006	0	0.0
4.0	0.67	0.004	24.7	4.8
3.0	0.62	0.004	30.3	6.6
2.5	0.54	0.004	39.3	10.0
2	0.52	0.003	41.6	11.5
1.5	0.39	0.003	56.2	18.9
Floral parts (n = 30)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	0.47	0.030	0	0.0
1	0.25	0.016	46.8	2.70
0.8	0.23	0.015	51.1	13.5
0.6	0.13	0.008	72.3	20.0
Seeds (n = 371)				
ML (mg/kg)	**Mean lead occurrence (mg/kg)**	**Lead intake (µg/kg b.w.)**	**Intake reduction (%)**	**Sample rejection (%)**
No ML	0.22	0.007	0	0.0
1	0.21	0.006	4.5	2.9
0.9	0.20	0.006	9.1	4.9
0.8	0.19	0.006	13.6	5.9
0.7	0.17	0.005	22.7	9.2

Food for infant and young children

22. Food for infant and young children data were submitted from one region (European Union) and nine countries: Australia, Canada, Cuba, China, Japan, New Zealand, Singapore, Thailand and USA. Excluding data for infant formula, formula for special medical purposes intended for infants and follow-up formula, a total of 3,629 results were obtained. Considering information on the column "WHO Food Identifier", four subcategories were identified: cereal-based food (n = 1,662), fruit juice and herbal tea (n = 242), ready-to-eat meal (n = 1,598) and yoghurt, cheese and milk-based dessert (n = 127). For the subcategory cereal-based infant food, samples from total diet studies were not included (**TableC1**).

23. In 2019, 240 data for cereal-based food for infants and young children, 5 data for yoghurt, cheese and milk-based dessert for infants and young children, 317 data for ready-to-eat meal for infants and young children and 14 data for fruit juice and herbal tea for infants and young children were submitted. During the analysis, inconsistencies were found for 2019 data and thus they were not were not included in Table C1. EWG considered that it would be better to deal with this category next year.

Sugar and confectionery.

24. Sugar and confectionery data were submitted from one region (European Union) and eight countries: Australia, Brazil, Canada, China, France, New Zealand, Singapore and USA. Lead occurrence data from 2008 to 2018 are presented in **Table D1.** During the EWG work on data analysis, inconsistencies were identified related to data submitted and extracted in 2019 after the call for data. Considering the amount of data (2,598), probably is better to deal with this category next year.

ANNEX I: Tables

Table A1. Lead concentrations in eggs and eggs products (raw dataset)

Food Category	Countries data	N + / N	Mean (mg/kg)	Median (mg/kg)	95TH Percentile (mg/kg)	97.5TH Percentile (mg/kg)	Min (mg/kg)	Max (mg/kg)
Eggs	Canada, China, Singapore, Thailand, USA, WHO European Region	178/1,254	0.02	0.01	0.04	0.07	0.00005	13.0
Preserved	China, Singapore, USA	688/907	0.44	0.06	1.51	3.35	0.0001	27.7
Dried, whole	WHO European Region	2/8	0.02	0.004	0.05	0.05	0.0001	0.05
Dried, yolk	WHO European Region	1/1	0.04	-	-	-	-	-
Dried, white	WHO European Region	1/1	0.01	-	-	-	-	-
Salted egg	China, USA	10/21	0.04	0.006	0.21	0.33	0.0005	0.45
Salted yolk	WHO European Region	1/1	0.02	-	-	-	-	-
Boiled	USA	2/2	0.02	0.02	0.03	0.03	0.006	0.03
Braised	Singapore	0/1	0.05	-	-	-	-	-
Liquid yolk egg	WHO European Region	0/1	0.005	-	-	-	-	-

N^+/N = positive samples/total samples.

Table A2. Supplemental table of lead concentrations in eggs and egg products for raw and LOQ-limited datasets

Food Category	Raw dataset			LOQ- limited dataset		
	N	Mean (mg/kg)	95th percentile (mg/kg)	N	Mean (mg/kg)	95th percentile (mg/kg)
Eggs	1,254	0.02	0.04	1,153	0.02	0.04
Preserved eggs	907	0.44	1.51	907	0.44	1.51

Table B1. Lead concentrations in spices and culinary herbs and subcategories (raw dataset).

Food Category	Countries	N+ / N	Mean (mg/kg)	Median (mg/kg)	95th Percentile (mg/kg)	97.5th Percentile (mg/kg)	Min (mg/kg)	Max (mg/kg)
Culinary herbs								
Total	Brazil, Canada, China, India, Japan, Singapore, Thailand, USA, WHO European Region	1489/1,925	0.27	0.03	1.10	2.00	0.0001	22.7
Fresh	Canada, USA	140/151	0.04	0.02	0.18	0.20	0.001	0.271
Dried	Brazil, Canada, China, India, Singapore, Thailand, WHO European Region Thailand, USA	1,349/1,774	0.29	0.032	1.24	2.13	0.0001	22.7

Food Category	Countries	N+ / N	Mean (mg/kg)	Median (mg/kg)	95th Percentile (mg/kg)	97.5th Percentile (mg/kg)	Min (mg/kg)	Max (mg/kg)
Spices								
Total	Brazil, Canada, China, India, Indonesia, Japan, Singapore. Thailand. USA, WHO European Region	2,721/3347	0.64	0.13	1.24	2.5	0.0001	135,7
Fruits and berries	Brazil, India, Indonesia, Singapore. Thailand, USA.WHO European Region	1143/1,352	0.29	0.14	0.60	0.90	0.0001	49.1
Rhizomes, bulbs and roots (dried)	Brazil, India, Singapore, USA Thailand.	571/645	1.76	0.09	1.84	24.4	0.0007	645
Rhizomes, bulbs and roots (fresh)	Brazil. India, Indonesia, Japan, Singapore, Thailand, USA	102/124	0.17	0.02	0.79	1.13	0.001	2.7
Bark	Brazil, India, Indonesia, Singapore, Thailand, USA, WHO European Region	239/270	0.89	0.44	3.03	3.73	0.0005	23.8
Floral parts	Singapore, Thailand, WHO European Region	23/30	0.47	0.20	0.93	1.56	0.018	6.7
Seed	Brazil, India, Canada, Indonesia Singapore, Thailand, USA, WHO European Region	280/371	0.26	0.15	0.82	0.95	0.0003	11.7

N^+/N = positive samples/total samples.

Table B2. Supplemental table of lead concentrations in spices and aromatic herbs for raw and LOQ-limited datasets

Food Category	Raw dataset			LOQ- limited dataset		
	N	Mean (mg/kg)	95th percentile	N	Mean (mg/kg)	95th percentile
Culinary herbs	1,881	0.27	1.08	1,864	0.27	1.07
Spices	2,325	0.34	1.06	2,310	0.33	1.03

Table C1. Lead concentration in food for infants and small children considering all data from 2008 to 2018 (raw dataset).

Food category	Countries	N+ / N	Mean (mg/kg)	Median (mg/kg)	95th Percentile (mg/kg)	97.5th Percentile (mg/kg)	Min (mg/kg)	Max (mg/kg)
Cereal based infant food (expressed "as is")	Australia, Canada, Japan, Singapore, USA, WHO European Region	7/85	0.04	0.05	0.20	0.20	0.025	0.20
Cereal based infant food (expressed "as consumed")	Australia, Canada, Japan, Singapore, USA, WHO European Region	484 / 1577	0.01	0.005	0.04	0.05	0.00001	0.32
Ready-to-eat meal	Australia, Canada, Japan, New Zealand, Singapore, Thailand, USA, WHO European Region	430/1598	0.01	0.004	0.03	0.05	0.00015	0.8
Fruit juice and herbal tea for infant and young children	Canada, China, Cuba, Singapore, USA, WHO European Region	129/242	0.01	0.005	0.02	0.03	0.00001	0.90
Fruit juice	Canada, Singapore, USA, WHO European Region	114/211	0.01	0.006	0.02	0.02	0.00001	0.05
Herbal Tea	WHO European Region	15/31	0.05	0.005	0.42	0.52	0.002	0.90
Yogurt and cheese milk-based dessert for infant and young children	Australia, China, New Zealand, USA, WHO European Region	35/127	0.01	0.004	0.03	0.03	0.0005	0.1
Yogurt	China, WHO European Region	9 /42	0.004	0.01	0.01	0.03	0.0015	0.03
Cheese and milk-based dessert	Australia, New Zealand, USA, WHO European Region	26 /85	0.01	0.004	0.03	0.03	0.0005	0.1

N^+/N = positive samples/total samples.

Table D1. Lead concentrations in sugar and confectionery considering all data from 2008 up to 2018 (raw dataset).

Food Category	**Countries**	**N + / N**	**Mean (mg/kg)**	**Median (mg/kg)**	**95th Percentile (mg/kg)**	**97.5th Percentile (mg/kg)**	**Min (mg/kg)**	**Max (mg/kg)**
Sugars	Australia, Brazil, Canada, China, France, New Zealand, Singapore, WHO European Region	440/622	0.02	0.01	0.05	0.08	0.0001	0.3
White sugar	Australia, Brazil, Canada, China, New Zealand, Singapore, WHO European Region	376/487	0.02	0.01	0.05	0.06	0.0001	0.3
Brown sugar	Singapore, WHO European Region	14/55	0.05	0.03	0.14	0.19	0.003	0.23
Others	Brazil, France, Singapore, WHO European Region	50/80	0.02	0.01	0.05	0.06	0.003	0.20
Honey	Australia, Brazil, Canada, France, New Zealand, Singapore, USA, WHO European Region	1094/2610	0.03	0.01	0.09	0.15	0.0007	2.73
Syrup and molasses	Brazil, Canada, Singapore	76/111	0.02	0.01	0.05	0.05	0.0001	0.27
Confectionery (candies)	Canada, Singapore, USA, WHO European Region	119/295	0.03	0.01	0.06	0.11	0.0005	0.72

N^+/N = positive samples/total samples.

APPENDIX III

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