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CODEX ALIMENTARIUS COMMISSION

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World Health Organization

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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 CADMIUM IN CHOCOLATES AND COCOA-DERIVED PRODUCTS (at Step 4)

(Prepared by the Electronic Working Group chaired by Ecuador and co-chaired by Ghana)

Codex members and observers wishing to submit comments at Step 3 on this document should do so as instructed in CL 2020/19-CF available on the Codex webpage/Circular Letters: http://www.fao.org/fao-who-codexalimentarius/resources/circular-letters/en/.

BACKGROUND

1. Background information on maximum levels (MLs) for chocolates and cocoa-derived products at different sessions of the Codex Committee on Contaminants in Foods (CCCF) is summarized in circular letter CL 2019/81-CF. For full details of the discussions on this matter between 2012 and 2019 please check the reports of the relevant sessions of CCCF in the footnotes of this CL. A summary of the discussion at the last session of the Committee is presented here below to aid consideration of the proposed maximum levels (MLs).

2. CCCF13 (2019) agreed to re-establish the Electronic Working Group chaired by Ecuador and co-chaired by Ghana to continue work on MLs for the categories for chocolate and chocolate products containing or declaring ≥30% to <50% (total cocoa solids on a dry matter basis) and cocoa powder (100% total cocoa solids on a dry matter basis) for consideration by CCCF14 (2020) using a proportional approach. Furthermore, if no consensus were reached at CCCF14 for the remaining chocolate categories the work would be discontinued until the COP for the prevention and reduction of cadmium contamination in cocoa was finalized and implemented. [1]

3. The EWG analyzed available data in GEMS/Food for the aforesaid categories. Such analysis can be found in Appendix II.

CONCLUSIONS

Chocolates containing or declaring ≥30% to <50% total cocoa solids.

4. The EWG analyzed data, as shown in Appendix II, to propose an ML for chocolate containing or declares ≥30% to <50% total cocoa solids on dry matter basis, considering the mandate of the CCCF13 to maintain proportionality with the already adopted MLs for the chocolate categories that contain or declare 1) ≥50% to <70% total cocoa solids (0.8 mg/kg) and 2) >70% total cocoa solids (0.9 mg/kg); as well as the ML proposed to the CAC41 by the CCCF13 for chocolates with <30% total cocoa solids (0.3 mg/kg). See Figure 1.

5. The EWG, based on the data analysis detailed in Appendix I, and the principle of proportionality, proposed an ML ranging from 0.6 mg/kg to 0.7 mg/kg that represents the lowest-possible percentage of rejection worldwide (12.58% and 6.8% respectively). At this level, the regions of Europe, Asia and North America and the Southwest Pacific (NASWP) would have 0% rejections, while region of Latin America and the Caribbean (LAC), in turn, would have percentages of rejections of 15.8% and 8.90% respectively.

[1] REP19/CF, paras. 45-56

Cocoa Powder containing or declaring 100% total cocoa solids ready for consumption.

6. When analyzing the data uploaded to the GEMS/Food platform for cocoa powder, the EWG was able to verify that only 115 of the 4245 samples of data submitted, declared either in the "Remarks" and "Local Food Name" columns if the cocoa powder was: 1) 100% total cocoa solids, 2) *natural* cocoa powder, or 3) *pure* cocoa powder. The rest of the samples did not provide any information that implied the sample had 100% cocoa solids. Furthermore, no data sent to the platform offered information on the intended use of the product (e.g. final consumption).

7. Despite the lack of information on the declaration of cocoa solids, and intended use of the product, in the "Local Food Name" and "Remarks" columns, the EWG decided to consider all cocoa powder data, to propose ML for the cocoa powder category, taking into account that all data for cocoa mixtures and sugars was discarded from the database, following the mandate of the CCCF13 and the importance to propose an ML for such category.

8. The EWG, based on the data analysis detailed in Appendix I, and the principle of proportionality, proposed an ML ranging from 2,0 mg/kg to 3,0 mg/kg representing a percentage of rejection worldwide of 5.5% and 3.65% respectively. At this level, the regions of Europe, Asia and North America and the Southwest Pacific -NASWP would have 0% rejections, while region of Latin America and the Caribbean, in turn, would have percentages of rejections of 17.8% and 12.2% respectively.

9. With the current data analysis detailed in Appendix II, the MLs to be proposed for consideration by CCCF14, following the main objectives of Codex to protect consumers' health and ensure fair practices in trade are shown in Appendix I.

RECOMMENDATIONS

10. CCCF14 is invited to consider the MLs for the categories of chocolate and cocoa-derived products as presented in Appendix I namely: (i) chocolates containing or declaring ≥30% to <50% (total cocoa solids on a dry matter basis) and (ii) cocoa powder (100% total cocoa solids on a dry matter basis) taking into account the conclusions presented in paragraphs 4-9, the data analysis presented in Appendix II and the background information presented in CL 2019/81-CF and the comments submitted in reply to CL 2020/19-CF.

11. In addition, when considering the proposed MLs in Appendix I, the following should also be considered: the proportionality approach when setting MLs for the different categories, the MLs previously adopted at CAC41 (2018) and the discussion held on the proposed ML for chocolates containing or declaring <30% total cocoa solids on a dry matter basis at CCCF13 and CAC42 in 2019 (for consideration under Agenda Item 5).

APPENDIX I

(For comments)

Commodity / Product Name	Maximum Level (ML) (mg/kg)	Notes/Remarks
Chocolate and chocolate products containing or declaring ≥30% to <50% total cocoa solids on a dry matter basis,	0.6 – 0.7	Including sweet chocolate, Gianduja chocolate, semi – bitter table chocolate, Vermicelli chocolate / chocolate flakes, bitter table chocolate, couverture chocolate.
Cocoa powder (100% total cocoa solids on a dry matter basis) ready for consumption.	2.0 – 3.0	Product sold for final consumption

APPENDIX II

DATA COLLECTION AND ANALYSIS

(For information)

DATA COLLECTION

1. The EWG took as a starting point the cadmium occurrence database in 2018, which was updated by the Call for Data issued by WHO the 10th July 2019 and according to the mandate of the CCCF13 and CAC42, took into account only the data from the chocolate categories containing or declaring ≥ 30% to < 50% total cocoa solids on dry matter basis and cocoa powder (100% total cocoa solids on a dry matter basis ready for consumption). The EWG, as well, excluded cadmium occurrence data for the category of dry mixtures of cocoa and sugars.

2. With the resulting database, the EWG, evaluated the information presented in the "Local Food Name" and "Remarks" columns, taking into account two main factors that relate to the mandate of the committee, which are the declaration of percentage of cocoa solids ("total cocoa solids on a dry matter basis") and the intended use of the product ("ready for consumption").

3. Considering those two factors, the EWG categorized the samples according to the information provided, data categorization that can be shown in Table 1.

Table 1. Cocoa products categories and provision of data in GEMS/Food for CCCF13 and CCCF14 proposals.

Categories	Number of Samples in 13CCCF proposal	Number of Samples submitted in Call for Data 2019	Data that declared % of cocoa solids	Data that declared intended use of the product	Countries that submitted the data *
Chocolates that contain or declare ≥ 30% to <50% total cocoa solids	599	164	763	763	Australia, Brazil, Canada, Colombia, Cuba, Ecuador, Ghana, Ivory Coast, United States of America, Japan, Peru, Singapore
Cocoa powder (100% cocoa solids, ready for consumption)	3035	1210	115	0	Germany, Brazil, Cameron, Canada, Chile, Colombia, Congo, Cuba, Ivory Coast, Ecuador, Slovakia, United States of America, France, Ghana, Indonesia, Japan, Malaysia, México, Peru, Singapore, Sierra Leone, Spain, Sweden, Thailand, Czech Republic, Dominican Republic, United Republic of Tanzania, European Union, Vanuatu.

***** Refer to Document CX/CF 19/13/6, pg. 5 for greater detail on countries who submitted data for CCCF13 proposal.

4. As there is a difference by world regions in cadmium content in cocoa beans and, consequently, in cocoa products, all data was analyzed in the same matter as the EWGs proposal in 2017, which analyzed the data by five regions: Latin America and the Caribbean (LAC), Africa, Asia, Europe, North America and South West Pacific (NASWP). For the analysis of the samples only the origin of data was considered, and this is recognized as being a limitation with the available data. Despite the regionalization of the data, which takes into account the data's origin, it is not necessarily indicative of the product's origin and, as such, the content of cadmium in cocoa produced in these regions. However, important differences were observed in the data from the various regions that could have consequences in the trade of cocoa products.

DATA ANALYSIS

5. The CCCF has previously used a figure of approximately 5% of samples as a 'cut-off' point for determining an achievable ML. That is, if 95% of samples have a cadmium content below a certain level, then this level is deemed achievable and may be proposed as a ML (ALARA principle).

Chocolates containing or declaring ≥30% to <50% total cocoa solids.

6. Of 763 chocolate samples that met the criteria (Table 1), 18% (135 samples) are samples of domestic origin, 26% (200 samples) are imported, and 56% (428 samples) were of unknown origin. Since most of the data did not have information on the samples' origin; it was therefore decided to categorize the data according to the countries that submitted the information to GEMS/Food.

7. In Table 2 it can be observed that worldwide, the occurrence of cadmium in chocolates with ≥30% to <50% of total cocoa solids is 0.28 mg/kg; and when comparing the values from the different regions, it can be observed that mean concentrations range between 0.04 mg/kg and 0.34 mg/kg, where the values from the LAC region are the highest. Additionally, the influence of the data from the LAC region for the 95th percentile over the worldwide value can be observed; where the LAC value at P95 is 0.92 mg/kg, and the worldwide P95 value is 0.84 mg/kg, and the African, Asian and NASWP regions have P95 values between 0.12 mg/kg and 0.31 mg/kg. Additionally, average values from LAC (0.34 mg/kg) are above worldwide average, while the values from Africa (0.05 mg/kg), Asia (0.04 mg/kg) and NASWP (0.1 mg/kg) are below the worldwide average.

8. 76% of the data used for the analysis of occurrence of cadmium in chocolates with ≥30% to <50% total cocoa solids come from the LAC region (581 samples), 14% (103 samples) from NASWP, and 7% (53 samples) from Africa; Asia (26 samples= 3%) submitted the least amount of data for this category.

Table 2: Occurrence data for cadmium worldwide and by data on origin region* in chocolates with ≥30% to <50% of total cocoa solids.

Origin of data	Number of Samples	Values (mg/kg)			
		Average	Max	Min	P95
Worldwide	763	0.28	1.58	0.00	0.84
LAC	581	0.34	1.58	0.00	0.92
ASIA	26	0.04	0.18	0.00	0.13
NASWP	103	0.10	0.52	0.01	0.31
AFRICA	53	0.05	0.15	0.01	0.12

LAC: Latin America and the Caribbean; NASWP: North America and the Southwest Pacific; Min: Minimum; Max: Maximum; P95: 95% Percentile. * The origin of data in the table was determined by the country that submitted data to GEMS/Food, and not by the true origin of the chocolate.

Source: GEMS/Food

9. The per capita consumption of cocoa and its derivatives ranges from 0.2 g/day to 7.5 g/day in the 17 Cluster Diets in the GEMS/Food database. The Cluster Diet 7 has the greatest consumption of cocoa products in their diet and is comprised of the following countries: Australia, Bermuda, Finland, France, Iceland, Luxemburg, Norway, Switzerland, United Kingdom and Uruguay (WHO, 2012). Therefore, the estimated cadmium intake of Cluster Diet 7 will serve as the worst-case scenario for the evaluation of the impact of MLs on cadmium intake and in the international trade.

10. Table 3 shows the impact of different MLs on cadmium intake and on international trade. For each proposed ML for the category of chocolates with ≥30% to <50% of total cocoa solids, the average content of cadmium was calculated from the available data per scenario, excluding data higher than the proposed ML. Cadmium intake was calculated considering the average of each scenario (assuming chocolates with ≥30% to <50% of total cocoa solids is the only source of cocoa products in the diet), the Cluster Diet 7 per-capita consumption (7.5 g/day), 30 days in the month and the average body weight (b.w.) of 60 kg. Subsequently, the relationship with the provisional tolerable monthly intake (PTMI) was considered. From data that were excluded for each proposed ML, a percentage of possible rejected samples was calculated for total data available worldwide and by region.

Table 3. Impact of different MLs for cadmium in the statistical distribution of cadmium for chocolates with ≥30% - <50% total cocoa solids, including the expected proportion of PTMI for the intake of cadmium for the Cluster Diet 7 and the projected proportion of rejected samples in the world market.

Scenario with worldwide data					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg bw/month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	763	0.276	1.035	4.141	0.000
0.9	728	0.240	0.900	3.600	4.587
0.8	719	0.240	0.900	3.600	5.767
0.7	711	0.230	0.863	3.450	6.815
0.6	667	0.200	0.750	3.000	12.582
0.5	617	0.170	0.638	2.550	19.135
0.4	571	0.150	0.563	2.250	25.164
0.3	441	0.090	0.338	1.350	42.202
0.2	364	0.050	0.188	0.750	52.294
0.1	299	0.040	0.150	0.600	60.813
LAC					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg bw/month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	581	0.338	1.269	5.077	0.000
0.9	546	0.298	1.118	4.470	6.024
0.8	537	0.290	1.088	4.350	7.573
0.7	529	0.280	1.050	4.200	8.950
0.6	489	0.250	0.938	3.750	15.835
0.5	436	0.210	0.788	3.150	24.957
0.4	391	0.190	0.713	2.850	32.702
0.3	264	0.110	0.413	1.650	54.561
0.2	192	0.050	0.188	0.750	66.954
0.1	164	0.030	0.113	0.450	71.773
AFRICA					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg bw/month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	53	0.049	0.185	0.742	0.000
0.9	53	0.049	0.185	0.742	0.000
0.8	53	0.049	0.185	0.742	0.000
0.7	53	0.049	0.185	0.742	0.000
0.6	53	0.049	0.185	0.742	0.000
0.5	53	0.049	0.185	0.742	0.000
0.4	53	0.049	0.185	0.742	0.000
0.3	53	0.049	0.185	0.742	0.000
0.2	53	0.049	0.185	0.742	4.000
0.1	46	0.038	0.143	0.570	13.208

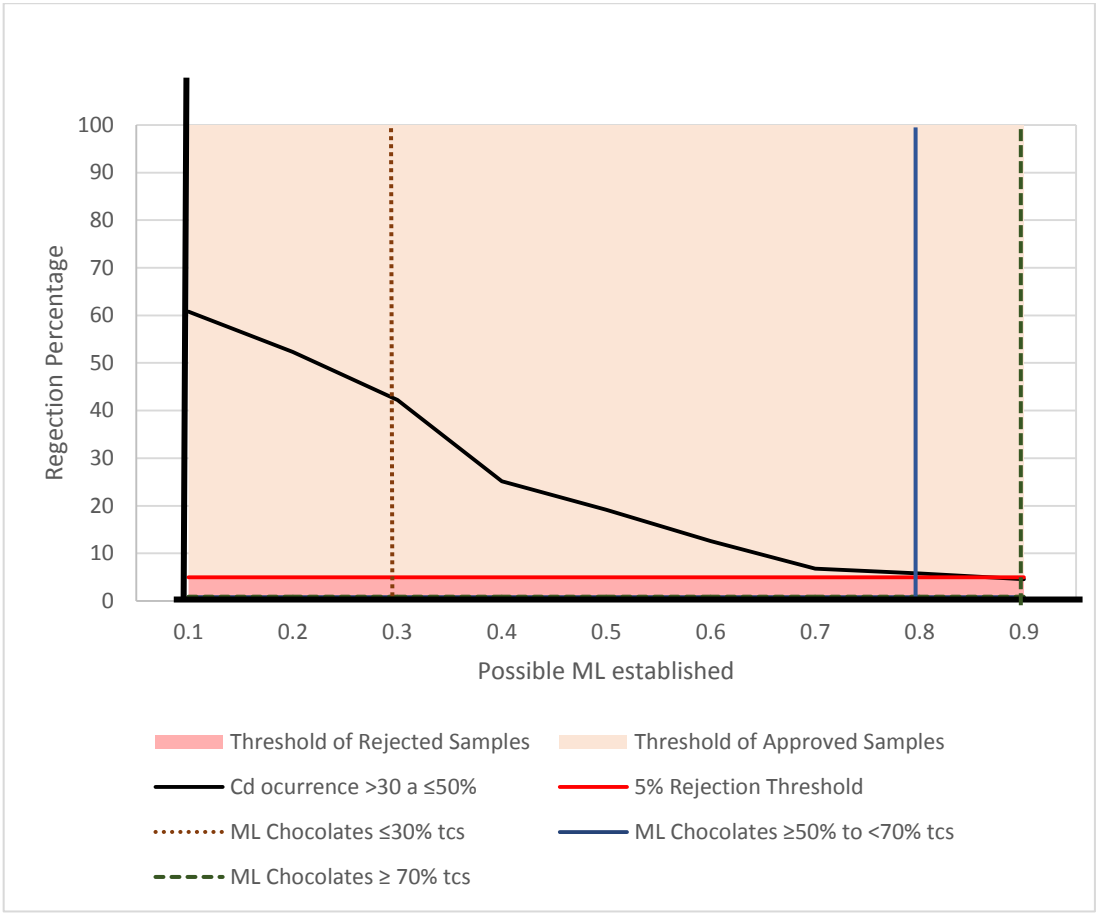
ASIA					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg b.w./ month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	26	0.037	0.140	0.560	0.000
0.9	26	0.037	0.140	0.560	0.000
0.8	26	0.037	0.140	0.560	0.000
0.7	26	0.037	0.140	0.560	0.000
0.6	26	0.037	0.140	0.560	0.000
0.5	26	0.037	0.140	0.560	0.000
0.4	26	0.037	0.140	0.560	0.000
0.3	26	0.037	0.140	0.560	0.000
0.2	26	0.037	0.140	0.560	0.000
0.1	24	0.030	0.113	0.450	7.692
NASWP					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg b.w./ month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	103	0.101	0.379	1.515	0.000
0.9	103	0.101	0.379	1.515	0.000
0.8	103	0.101	0.379	1.515	0.000
0.7	103	0.101	0.379	1.515	0.000
0.6	103	0.101	0.379	1.515	0.000
0.5	102	0.100	0.375	1.500	0.971
0.4	101	0.090	0.338	1.350	1.942
0.3	98	0.080	0.300	1.200	4.854
0.2	93	0.070	0.263	1.050	9.709
0.1	65	0.040	0.150	0.600	36.893

LAC: Latin America and the Caribbean; NASWP: North America and the Southwest Pacific; PTMI: Provisional Tolerable Monthly Intake; Maximum Level: ML; b.w.: body weight (60 kg).

11. Considering Cluster Diet 7 as the one with greatest cocoa intake in their diet, according to "Cluster Diet 2012", from WHO ("Cocoa and their non-liquid derivatives") and after developing all mentioned calculations, it can be observed that without a ML for cadmium for the chocolates with ≥30% to <50% of total cocoa solids, in a world-wide scenario, the intake would represent a maximum of 4.1% of the PTMI estimated by JECFA (0.025 mg/kg b.w). Also, on a worldwide basis with application of the proposed MLs of 0.1 mg/kg to 0.9 mg/kg, estimated cadmium intakes range between 0.6% to 3.6% of the PTMI Additionally, it can be observed that the scenario with the data from the LAC region has the highest value for intake, if setting an ML of 0.9 mg/kg, representing 4.5% of the PTMI, but yet this value is below the 5 percent for a significant effect noted by JECFA[2].

Figure 1: Effects on world trade with several proposed ML for chocolates that contain or declare >30 to ≤50% total cocoa solids, in relation to the 5% cut off point for accepted rejections used by Codex Alimentarius, the MLs already adopted by the CAC41(for chocolates that contain or declare 1)≥ 50% to < 70% and 2) ≥ 70% total cocoa solids) and in Step 5 (ML for chocolates that contain or declare ≤30% total cocoa solids, on dry matter basis).

[2] Codex Alimentarius Commission Procedural Manual pg. 125-127.



*tcs: total cocoa solids; ML: Maximum level

* ML for Chocolates ≤ 30% tcs in Step 5.

Source: GEMS/Food, worldwide data.

12. According to Figure 1, it can be observed that, in the global context, 7% of the samples would fail to comply (compared with the acceptable threshold of rejections of 5%) by setting an ML of less than 0.8 mg/kg; this result what can be corroborated in Table 3.

13. Furthermore, Table 3 shows that 25% and 19% of the samples could be rejected if the proposed MLs of 0.4 mg/kg and 0.5 mg/kg respectively, would be applied in the context of the world data; considering that the ML of 0.3 mg/kg was accepted by the 13th CCCF Meeting for chocolates that contain or declare ≤ 30% total cocoa solids.

14. While performing the same analysis at the regional level, if applying the proposed MLs of 0.4 mg/kg and 0.5mg/kg for Latin America and the Caribbean, it would generate rejection rates of 33% and 25% respectively. Regarding the regions of Asia, Africa and NASWP, there was an opposite result, with 0% to 0.9% rejections for the same ML. This leads to the conclusion that the data on the occurrence of cadmium from LAC significantly affects the world average.

15. While analyzing the results for both global, and regional rejection rates, according to Figure 1 and Table 3, it can be observed that the ML range from 0.7 mg/kg to 0.6 mg/kg would present 6.8% to 12.6% rejected samples worldwide with an PTMI of 4.2% to 3.6% respectively, which will mean 8.9% to 15.8% rejection rates for LAC.

Cocoa Powder containing or declaring 100% total cocoa solids ready for consumption.

16. Following the mandate of the CCCF13, the EWG discarded data from cocoa powder samples that claimed to be mixtures of cocoa with sugars and other added ingredients having 1210 new samples in 2019; which, added to data from previous years, resulted in 4245 total samples.

17. The EWG then classified the data submitted, according to the samples' declaration of intended use of the product, and the percentage of cocoa solids. According to Table 1, only 115 samples of the 4245 samples declared: 1) to have 100% cocoa solids, 2) to be "pure" cocoa powder or 3) to be "natural" cocoa powder; in the "Local Food name" and "Remarks" columns. None of the samples provided, declared their intended use.

18. Considering that the number of samples that provided information on the percentage of cocoa solids and intended use of the product, was not representative (Table 1), and despite the lack of such information would possibly affect the veracity of the ML proposed; the EWG decided to consider all cocoa powder data to propose ML for the cocoa powder category.

19. Although most of the data did not indicate the information on the origin of the samples, it was decided to categorize the data according to the countries that loaded the information into GEMS / Food.

20. Taking into account previous considerations, according to the origin of cocoa powder, 4% (190 samples) were of domestic origin, 8% (325 samples) were imported, 1% (25 samples) were of mixed origin and 87% (3705 samples) were of unknown origin.

21. In Table 4 it can be seen that worldwide the occurrence of cadmium in cocoa powder has an average of 0.56 mg/kg, and the average regional values vary from 0.17 mg/kg to 1.34 mg/kg. This difference can also be observed in the 95th percentile values with variations from 0.37 mg/kg to 4.73 mg/kg between regions.

Table 4. Data on the occurrence of cadmium worldwide and data on region * of origin of cocoa powder

Origin of data	Number of Samples	Values (mg/kg)			
		Average	Max	Min	Average
Worldwide	4245	0.559	9.897	0.000	2.369
LAC	1268	1.344	9.897	0.000	4.732
ASIA	427	0.339	1.800	0.000	0.610
NASWP	218	0.496	2.990	0.000	1.355
AFRICA	179	0.168	1.300	0.011	0.369
EURO	2153	0.178	1.700	0.000	0.490

LAC: Latin America and the Caribbean; NASWP: North America and the Southwest Pacific; EURO: Europe Min: Minimum; Max: Maximum; P95: 95% Percentile. * The origin of data in the table was determined by the country that submitted data to GEMS/Food, and not by the true origin of the chocolate.

Source: GEMS/Food

22. Based on the occurrence data in Table 4, values from 0.20mg/kg to 5 mg/kg were proposed to assess the impact of different MLs on cadmium intake and trade in cocoa powder (Table 5). The same considerations as the previous ones were used for the calculation of cadmium intake, except that the consumption data was specific for cocoa powder for the worst case scenario (cluster diet 7 = 2.78 µg/kg bw/day), the comparison with the security reference value (PTMI) and the number of possible rejections in international trade.

Table 5. Summary of the impact of different ML for cadmium on the statistical distribution for cadmium in cocoa powder, including the estimated proportion of PTMI of cadmium intake for GEMS/ Food Diet Group 7 and the estimated proportion of samples rejected in the world market.

Scenario with worldwide data					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg bw/month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	4245	0.568	0.789	3.158	0.000
4.0	4178	0.500	0.695	2.780	1.578
3.8	4144	0.400	0.556	2.224	2.379
3.2	4101	0.400	0.556	2.224	3.392
3.0	4090	0.400	0.556	2.224	3.651
2.8	4074	0.400	0.556	2.224	4.028
2.4	4041	0.400	0.556	2.224	4.806
2.0	4013	0.400	0.556	2.224	5.465
1.6	3965	0.300	0.417	1.668	6.596
1.2	3822	0.300	0.417	1.668	9.965
0.8	3429	0.200	0.278	1.112	19.223
0.4	3018	0.200	0.278	1.112	28.905
EURO					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg bw/month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	2153	0.178	0.248	0.990	0.000
1.2	2137	0.200	0.750	3.000	0.743
1.0	2125	0.200	0.750	3.000	1.301
0.8	2105	0.200	0.750	3.000	2.229
0.6	2082	0.200	0.750	3.000	3.298
0.4	2006	0.100	0.375	1.500	6.828
0.2	1823	0.100	0.375	1.500	15.327

LAC					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg b.w./ month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	1268	1.344	1.869	7.475	0
5.0	1211	1.100	1.529	6.116	4.495
4.8	1207	1.100	1.529	6.116	4.811
4.2	1185	1.000	1.390	5.56	6.546
4.0	1174	1.000	1.390	5.56	7.413
3.8	1167	1.000	1.390	5.56	7.965
3.2	1124	1.000	1.390	5.56	11.356
3.0	1113	1.000	1.390	5.56	12.224
2.8	1098	1.000	1.390	5.56	13.407
2.4	1068	0.800	1.112	4.448	15.773
2.0	1042	0.800	1.112	4.448	17.823
1.6	989	0.700	0.973	3.892	22.003
1.2	869	0.600	0.834	3.336	31.467
0.8	557	0.300	0.417	1.668	56.073
0.4	368	0.200	0.278	1.112	70.978
AFRICA					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg b.w./ month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	179	0.168	0.234	0.936	0.000
1.2	178	0.161	0.224	0.895	0.559
1.0	177	0.156	0.217	0.867	1.117
0.8	177	0.156	0.217	0.867	1.117
0.6	177	0.156	0.217	0.867	1.117
0.4	170	0.139	0.193	0.773	5.028
0.2	164	0.133	0.185	0.739	8.380
ASIA					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg b.w./ month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	427	0.339	0.471	1.882	0
1.2	423	0.300	0.417	1.668	0.937
1.0	423	0.300	0.417	1.668	0.937
0.8	419	0.300	0.417	1.668	1.874
0.6	411	0.300	0.417	1.668	3.747
0.5	396	0.300	0.417	1.668	7.260
0.4	331	0.300	0.417	1.668	22.482
0.2	111	0.100	0.139	0.556	74.005

NASWP					
Scenario ML (mg/kg)	**Number of samples**	**Average Cd content (mg/kg)**	**Cd intake (µg/kg b.w./ month)**	**% PTMI**	**Possible rejected samples (%)**
No ML	218	0.496	0.690	2.760	0.000
1.4	208	0.420	0.584	2.335	4.587
1.2	205	0.400	0.556	2.224	5.963
1.0	191	0.350	0.487	1.946	12.385
0.8	171	0.280	0.389	1.557	21.560
0.6	153	0.230	0.320	1.279	29.817
0.5	146	0.220	0.306	1.223	33.028
0.4	143	0.210	0.292	1.168	34.404
0.2	92	0.150	0.209	0.834	57.798

LAC: Latin America and the Caribbean; NASWP: North America and the Southwest Pacific; PTMI: Provisional Tolerable Monthly Intake; Maximum Level: ML; b.w.: body weight (60 kg). Consumption of cocoa powder in Cluster Diet 7 = 2.78 µg/kg bw per day.

23. In a global scenario with an ML of 3.2 mg/kg, a cadmium intake of 0.56 µg/kg p.c. monthly, which represents 2.2% of PTMI, which could generate a total of 3.4% of the samples possibly rejected in the world market. Considering these scenarios with regional data, for LAC, an ML of 3.2 mg/kg could generate 11.36% of possibly rejected samples. The lowest possible ML that could be derived for LAC, which ensures that the rejected samples are under the “cut-off point” of 5% is 4.8 mg/kg, which is a level above the level considered in the CCCF13. For NASWP countries, Africa and Asia using the same scenario of a ML of 3.2 mg/kg could generate a rejection of 0% of the samples.

24. On the other hand, the ML worldwide that ensures a rejection percentage of less than 5% would be 2.4 mg/kg, however, said ML would still represent a rejection percentage for the Latin American and Caribbean Region of 15.8%

25. While analyzing the results for both global, and regional rejection rates, according to Table 5, it can be observed that the ML range from 2.0 mg/kg to 3.0 mg/kg would present 5.5% to 3.65% rejected samples worldwide with an PTMI of 2.2% for both cases, which will mean 17.8% to 12.2% rejection rates for LAC.

APPENDIX III

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