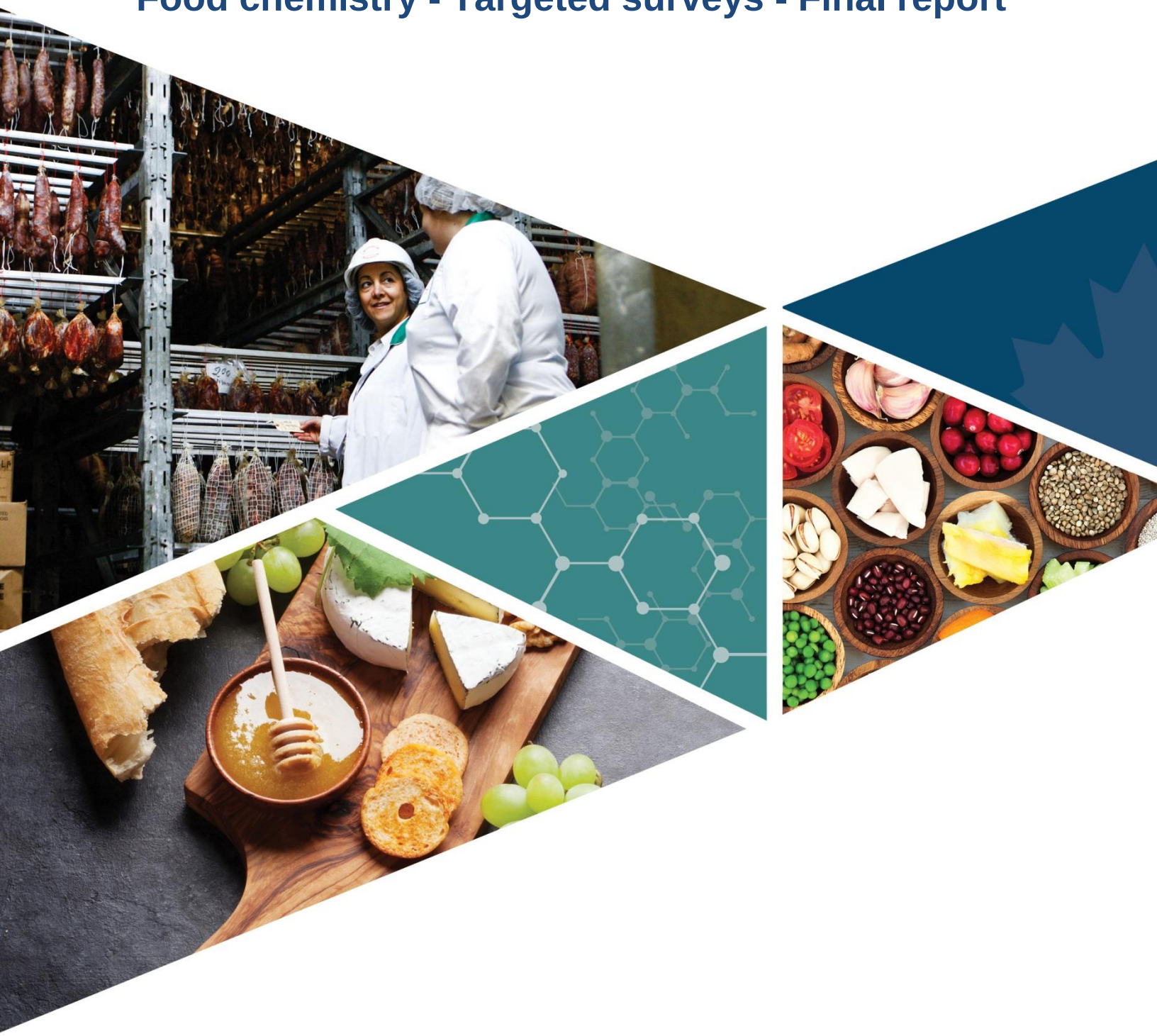
Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments

Toxic Metals in Botanical Powders, Frozen Fruits and Vegetables - April 1, 2020 to March 31, 2021

Food chemistry - Targeted surveys - Final report



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Summary

Targeted surveys provide information on potential food hazards and enhance the Canadian Food Inspection Agency's (CFIA's) routine monitoring programs. These surveys provide evidence regarding the safety of the food supply, identify potential emerging hazards, and contribute new information and data to food categories where it may be limited or non-existent. They are often used by the agency to focus surveillance on potential areas of higher risk. Surveys can also help to identify trends and provide information about how industry complies with Canadian regulations.

Chemical hazards in foods can come from a variety of sources. Metals are naturally-occurring elements that may be present in very low amounts in rock, water, soil, or air. Finding these substances in food products is not unexpected as trace levels generally reflect normal accumulation from the environment. They may be present in finished foods due to their presence in the ingredients used to manufacture those foods, and/or may be unintentionally incorporated along the food production chain. Metals of highest concern to human health include arsenic, cadmium, lead, and mercury and these have been shown to have effects on human health following long term exposure[1].

The main objectives of this targeted survey were to generate additional baseline surveillance data on the level of metals in foods not routinely monitored under other CFIA programs, and to compare, the detection rate of metals in foods in this survey with that of previous targeted surveys.

A total of 993 samples of botanical powders and frozen fruits and vegetables were collected from retail locations in 11 cities across Canada and tested for metals/elements. Only the results of the metals of highest concern (arsenic, cadmium, lead, and mercury) are presented in this report. Mercury and cadmium had the lowest and the highest detection rate, respectively. Most (92%) of the survey samples contained one or more metals, while 12% of the samples contained traces of all four toxic metals. Botanical powders were identified as the commodity with the highest detected content of these metals. It should however be noted that botanical powders were analyzed as sold and not as consumed, therefore the levels of metal found in these samples may not be comparable to ready-to-serve products. The detection rates and the levels of metals reported in this targeted survey were comparable to those previously found in similar product types. There are no regulations in Canada for metal levels in the products tested. Health Canada determined that none of the samples analyzed for metals in this survey posed a concern to human health.

What are targeted surveys

Targeted surveys are used by the CFIA to focus its surveillance activities on areas of highest health risk. The information gained from these surveys provides support for the allocation and prioritization of the agency's activities to areas of greater concern. Originally started as a project under the Food Safety Action Plan (FSAP), targeted surveys have been embedded in our regular surveillance activities since 2013. Targeted surveys are a valuable tool for generating information on certain hazards in foods, identifying and characterizing new and emerging hazards, informing trend analysis, prompting and refining health risk assessments, highlighting potential contamination issues, as well as assessing and promoting compliance with Canadian regulations.

Food safety is a shared responsibility. We work with federal, provincial, territorial and municipal governments and provide regulatory oversight of the food industry to promote safe handling of foods throughout the food production chain. The food industry and retail sectors in Canada are responsible for the food they produce and sell, while individual consumers are responsible for the safe handling of the food they have in their possession.

Why did we conduct this survey

Chemical hazards in foods can come from a variety of sources. Metals are naturally-occurring elements that may be present in very low amounts in rock, water, soil, or air. Finding these substances in food products is not unexpected as trace levels generally reflect normal accumulation from the environment. They may be present in finished foods due to their presence in the ingredients used to manufacture those foods, and/or may be unintentionally incorporated along the food production chain.

Metals of highest concern to human health include arsenic, cadmium, lead, and mercury and these have been shown to have effects on human health following long term exposure. The human health effects depend on the metal, its concentration in the food, and other possible exposure effects/sources[1]. Manufacturers are responsible for measures aimed at reducing accidental introduction of these elements in foods.

The main objectives of this targeted survey were to generate additional baseline surveillance data on the level of metal levels in foods not routinely monitored under other CFIA programs, and to compare the detection rate of metals in foods in this survey with that of previous targeted surveys. Only the results of the metals of highest concern (arsenic, cadmium, lead, and mercury) are presented in this report.

Due to rising consumer demands for natural products, a growing number of botanical powders have appeared on the Canadian market in recent years. Since these products are mostly dried commodities and the drying process in know to concentrate metal residues, they were included in this report to ensure their safety to the Canadians.

What did we sample

A variety of domestic and imported botanical powders and frozen fruits and vegetables were sampled between April 1, 2020 and March 21, 2021. Samples of products were collected from local/regional retail locations located in 11 major cities across Canada. These cities encompassed 4 Canadian geographical areas:

- Atlantic (Halifax and Moncton)
- Quebec (Montreal and Quebec City)
- Ontario (Toronto and Ottawa)
- West (Calgary, Saskatoon, Vancouver, Victoria and Winnipeg)

The number of samples collected from these cities was in proportion to the relative population of the respective areas. The shelf life, storage conditions, and the cost of food on the open market were not considered in this survey.

Table 1. Distribution of samples based on product type and origin

Product type	Number of domestic samples	Number of imported samples	Number of samples of unspecified[a] origin	Total number of samples
Botanical powders	28	246	23	297
Frozen fruits and vegetables	143	431	122	696
Grand total	**171**	**677**	**145**	**993**

[a] Unspecified refers to those samples for which the country of origin could not be assigned from the product label or available sample information

How were samples analyzed and assessed

Samples were analyzed by an ISO/IEC 17025 accredited food testing laboratory under contract with the Government of Canada. The results are based on the food products as sold and not necessarily as they would be consumed, whether the product sampled is considered ingredient or requires preparation prior to consumption (for example, mixing with liquid or other ingredients).

Contaminants and other adulterating substances in foods have regulatory maximum levels. In 2014, Health Canada updated regulatory tolerances for arsenic and lead in a variety of ready-to-serve beverages, and infant formula when ready-to-serve[2]. In the absence of a specific maximum level, the levels of arsenic, cadmium, mercury and lead may be assessed by Health Canada on a case-by-case basis using the most current scientific data available.

What were the survey results

A total of 993 samples of botanical powders and frozen fruits and vegetables were analysed for arsenic, cadmium, lead and mercury. Most (92%) of the survey samples contained one or more metals, while 12% of the samples contained traces of all four toxic metals.

Table 2. Detected levels of metals in selected foods

Product type	Number of samples	% positive for arsenic	Average level (maximum) of arsenic (ppm)	%positive for cadmium	Average level (maximum) of cadmium (ppm)	%positive for lead	Average level (maximum) of lead (ppm)	%positive for mercury	Average level (maximum) of mercury (ppm)
Botanical powders	297	92	0.196 (2.20)	73	0.157 (1.11)	92	0.353 (6.54)	45	0.0099 (0.186)
Frozen fruits and vegetables	696	12	0.024 (0.102)	20	0.029 (0.140)	7	0.016 (0.050)	6	0.0019 (0.0052)
Frozen fruits[b]	351	13	0.022 (0.079)	12	0.021 (0.070)	4	0.016 (0.050)	4	0.0014 (0.0031)
Frozen vegetables - Leafy greens[b]	41	39	0.038 (0.102)	71	0.065 (0.140)	32	0.022 (0.050)	39	0.0017 (0.0035)
Frozen vegetables - Other[b]	304	6	0.018 (0.070)	23	0.018 (0.100)	8	0.013 (0.034)	4	0.0030 (0.0052)

ppm = parts per million

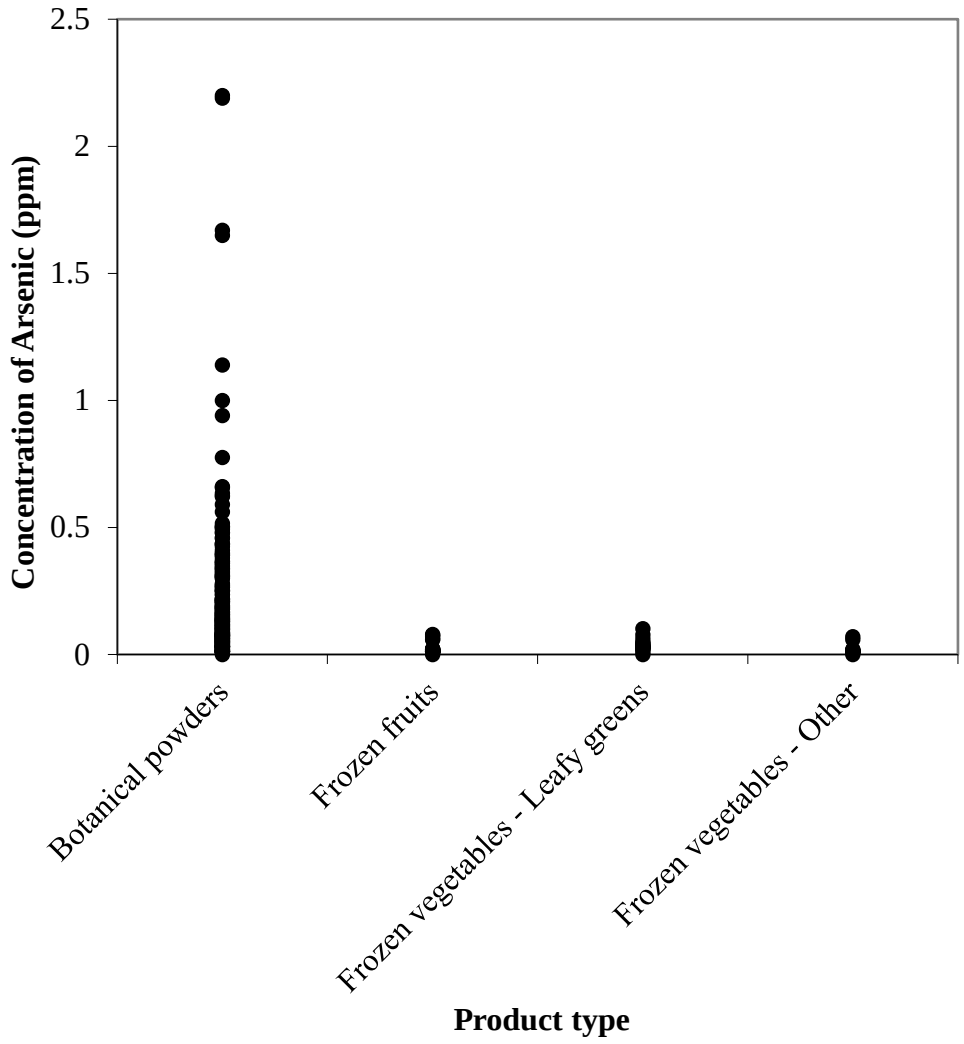
Note: Average values were calculated using only results for samples with quantifiable metal levels

[b] Subcategory of 'Frozen fruits and vegetables'

Arsenic

Arsenic was detected in 36% of samples tested in this targeted survey. Frozen vegetables had the lowest (10%) and botanical powders had the highest (92%) percentage of samples with detectable levels of arsenic. Figure 1 illustrates the range of arsenic levels by product type. Botanical powders were associated with the highest maximum levels and average arsenic levels. The highest levels of arsenic (2.19 and 2.20 ppm) were detected in 2 samples of botanical powder (bhringaraj and barley grass powder). Leafy greens (specifically kale) had higher levels of arsenic than other frozen fruits and vegetables tested. This is not unexpected, leafy vegetables are known to have higher arsenic uptake due above ground tissues exposure to the soil particles and due to large surface area in relation to mass[3].

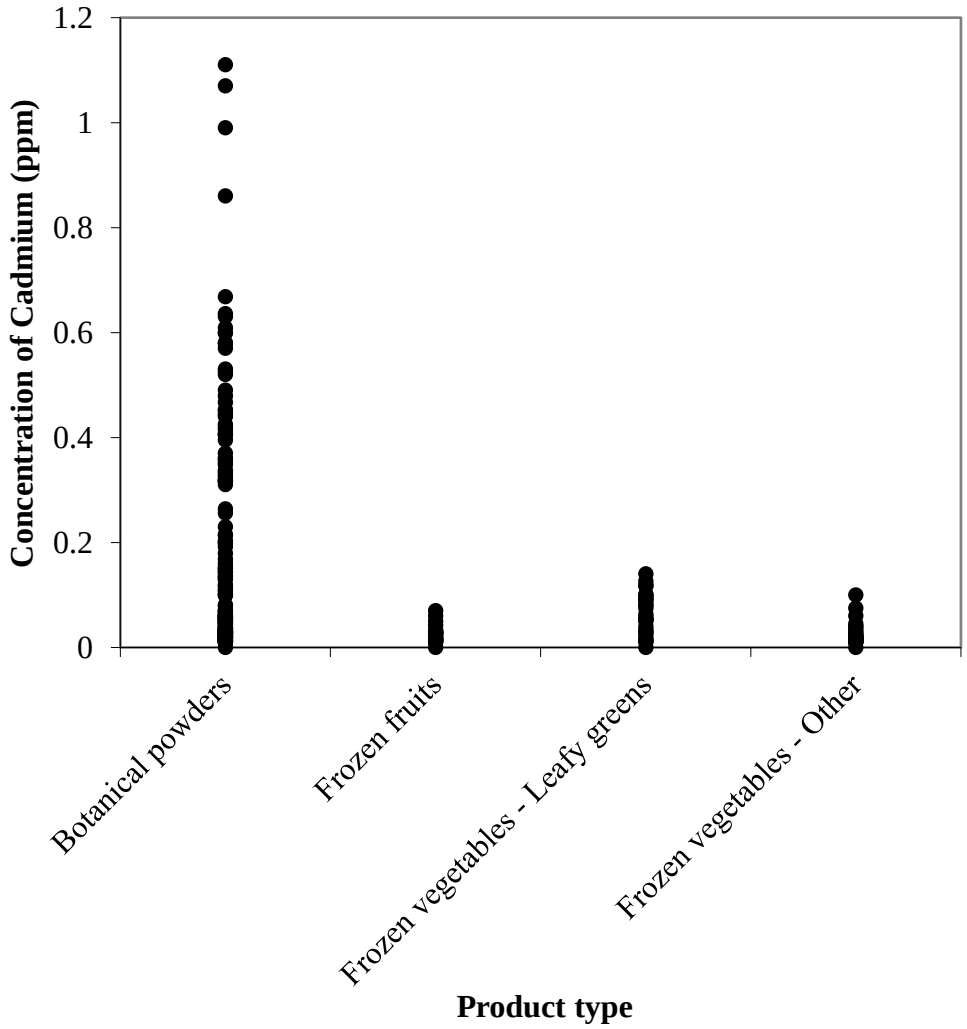
Figure 1. Distribution of arsenic levels by product type



Cadmium

Cadmium had the highest overall detection rate; it was detected in 359 (36%) samples. Cadmium levels in this survey ranged from 0 ppm to 1.11 ppm. Figure 2 illustrates the range of cadmium levels by product type. Botanical powders were associated with the highest detection rate and cadmium levels. Frozen fruits had the lowest cadmium levels. Leafy greens had higher levels of cadmium than other frozen fruits and vegetables tested.

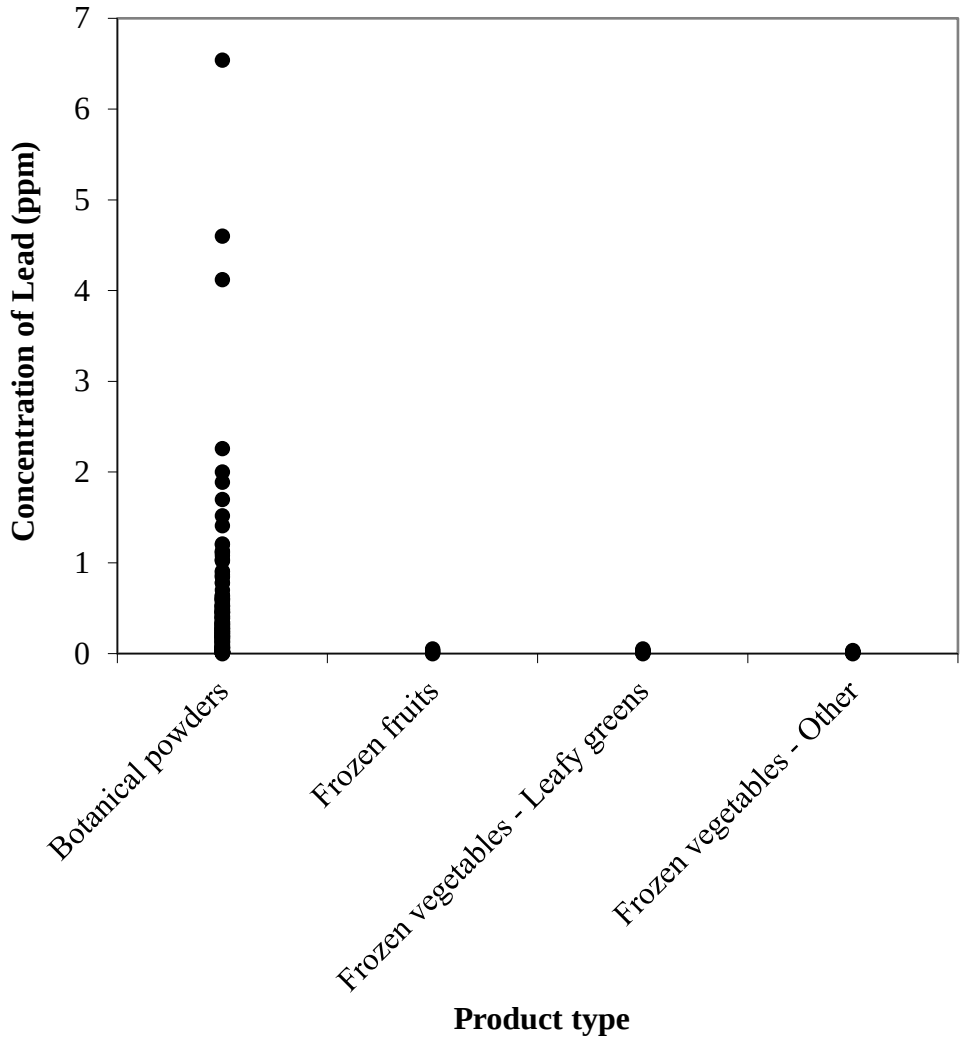
Figure 2. Distribution of cadmium levels by product type



Lead

Lead was detected in 33% of samples tested in this targeted survey. The detection rate was highest for botanical products (92%) and relatively low in frozen fruits and vegetables (7%). Figure 3 illustrates the range of lead levels detected by product type. Botanical powders had a much wider range of lead levels detected than other product types. The highest levels of lead (4.12, 4.60, 6.54 ppm) were detected in 3 samples of bhringaraj powder. These 3 samples were the same product with different lot numbers sampled in different provinces.

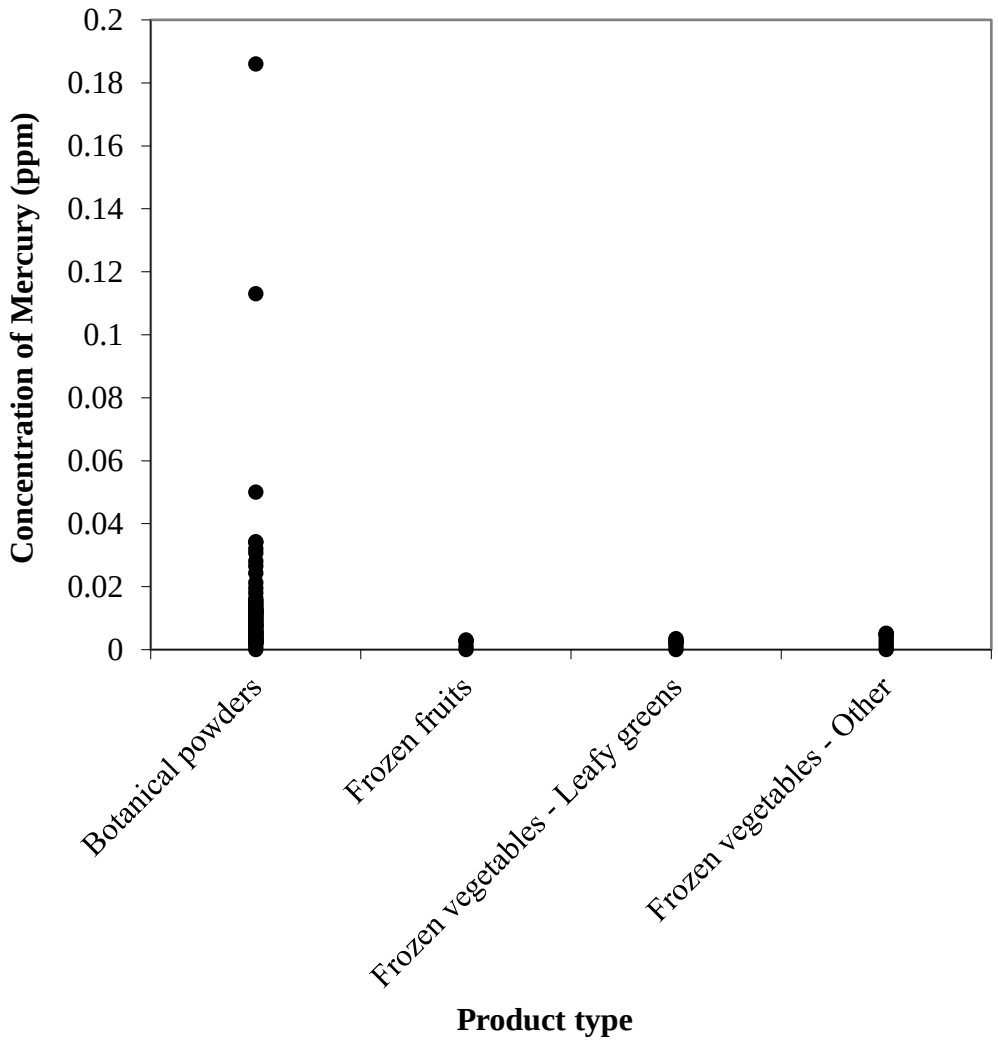
Figure 3. Distribution of lead levels by product type



Mercury

Mercury had the lowest overall detection rate; it was detected in 18% of samples tested in this survey. Only 6% of frozen fruits and vegetables contained a detectable level of mercury. Figure 4 illustrates the range of mercury levels detected by product type. Frozen fruits and vegetables contained very low levels of mercury. The mercury levels in those products ranged from 0 ppm to 0.0052 ppm. Botanical powders were associated with the highest mercury levels (up to 0.186 ppm) detected in this survey.

Figure 4. Distribution of mercury levels by product type



What do the survey results mean

The detection rates and the levels of metals reported in this targeted survey were comparable to those previously found in these product types[4,5]. Some differences observed may be due to the sample size and the specific type of product tested. The large difference in the detection rates for arsenic and lead between the two surveys years were associated with a difference in the method sensitivity. High levels of metals in botanical powders were consistent with the fact that the drying process is known to concentrate metal residues. It should also be noted that botanical powders were analyzed as sold and not as consumed, therefore the levels of metal found in these samples may not be comparable to ready-to-serve products. Higher average mercury levels in frozen vegetable (other than leafy greens) samples in this year's surveys was

due to a larger selection of samples from geographical areas with higher mercury concentrations. As previously observed in the 2017 CFIA survey, leafy greens were more likely to contain toxic metals than other frozen fruits and vegetables.

Table 3. Metal testing results from various survey years

Product type	Year	Number of samples	% pos for arsenic	Average level (maximum) of arsenic (ppm)	% pos for cadmium	Average level (maximum) of cadmium (ppm)	% pos for lead	Average level (maximum) of lead (ppm)	% pos for mercury	Average level (maximum) of mercury (ppm)
Botanical powders	2020	297	92	0.196 (2.20)	73	0.157 (1.11)	92	0.353 (6.54)	45	0.0099 (0.186)
Botanical powders	2018	187	68	0.180 (5.03)	85	0.204 (1.19)	73	0.330 (3.42)	53	0.0020 (0.031)
Frozen fruits and vegetables	2020	696	12	0.024 (0.102)	20	0.029 (0.140)	7	0.016 (0.050)	6	0.0019 (0.0052)
Frozen fruits and vegetables	2017	980	0.3	0.032 (0.048)	21	0.030 (0.281)	2	0.027 (0.063)	6	0.0007 (0.0021)
Frozen fruits[c]	2020	351	13	0.022 (0.079)	12	0.021 (0.070)	4	0.016 (0.050)	4	0.0014 (0.0031)
Frozen fruits[c]	2017	490	0.2	0.023 (0.023)	9	0.020 (0.050)	0.4	0.021 (0.022)	3	0.0002 (0.0008)
Frozen vegetables - Leafy greens[c]	2020	41	39	0.038 (0.102)	71	0.065 (0.140)	32	0.022 (0.050)	39	0.0017 (0.0035)
Frozen vegetables - Leafy greens[c]	2017	26	4	0.048 (0.048)	92	0.123 (0.281)	27	0.028 (0.047)	92	0.0013 (0.0021)
Frozen vegetables - Other[c]	2020	304	6	0.018 (0.070)	23	0.018 (0.100)	8	0.013 (0.034)	4	0.0030 (0.0052)
Frozen vegetables - Other[c]	2017	464	0.2	0.025 (0.025)	30	0.017 (0.096)	2	0.029 (0.063)	4	0.0003 (0.0016)

Note: Average values were calculated using only results for samples with quantifiable metal levels

[c] Subcategory of 'Frozen fruits and vegetables'

All survey results were forwarded to Health Canada for health risk assessment and determined to pose no concern to human health.

References

1. Hutton, M. Human Health Concerns of Lead, Mercury, Cadmium and Arsenic. In Lead, Mercury, Cadmium and Arsenic in the Environment. (1987). John Wiley & Sons Ltd., pp. 53-68.
2. List of Contaminants and other Adulterating Substances in Foods. (2018). Canada. Health Canada.
3. Norton, G., Deacon, C., Mestrot, A., Feldmann, J., Jenkins, P., Baskaran, C. Arsenic speciation and localization in horticultural produce grown in a Historically impacted mining region. (2013). Environ. Sci. Technol., 47(12), pp. 6164-6172.
4. 2017-2018 Pesticides and Metals in Selected Foods. Canada. Canadian Food Inspection Agency. [unpublished results]
5. 2018-2019 Toxic metals in Selected Foods. Canada. Canadian Food Inspection Agency. [unpublished results]

Appendix A

Figure 1
Distribution of arsenic levels by product type
Product type: Botanical powders (concentration of Arsenic [ppm])

- 0
- 0.01
- 0.0108
- 0.011
- 0.0115
- 0.012
- 0.0123
- 0.0124
- 0.0126
- 0.0129
- 0.0132
- 0.0143
- 0.0144
- 0.0189
- 0.0192
- 0.0194
- 0.02
- 0.0253
- 0.0261
- 0.0262
- 0.03
- 0.0301
- 0.0306
- 0.0308
- 0.0313
- 0.0319
- 0.032
- 0.0327
- 0.0329
- 0.0334
- 0.0336
- 0.0373
- 0.0387
- 0.04
- 0.043

- 0.0431
- 0.0452
- 0.0463
- 0.0469
- 0.0496
- 0.05
- 0.0501
- 0.0504
- 0.0526
- 0.0547
- 0.0551
- 0.0556
- 0.0576
- 0.0589
- 0.06
- 0.063
- 0.0631
- 0.0636
- 0.0639
- 0.0646
- 0.0656
- 0.0689
- 0.07
- 0.0706
- 0.0716
- 0.0734
- 0.0739
- 0.0741
- 0.0742
- 0.0754
- 0.0765
- 0.0767
- 0.0768
- 0.0781
- 0.0782
- 0.08
- 0.0815
- 0.0816
- 0.0825
- 0.0832

- 0.085
- 0.086
- 0.0881
- 0.0883
- 0.09
- 0.0951
- 0.0971
- 0.0988
- 0.1
- 0.101
- 0.102
- 0.104
- 0.107
- 0.108
- 0.111
- 0.112
- 0.114
- 0.116
- 0.117
- 0.119
- 0.12
- 0.121
- 0.127
- 0.128
- 0.129
- 0.13
- 0.131
- 0.133
- 0.134
- 0.136
- 0.138
- 0.139
- 0.14
- 0.142
- 0.144
- 0.145
- 0.149
- 0.15
- 0.154
- 0.155

- 0.158
- 0.159
- 0.16
- 0.165
- 0.166
- 0.169
- 0.17
- 0.177
- 0.179
- 0.18
- 0.184
- 0.185
- 0.187
- 0.19
- 0.192
- 0.194
- 0.2
- 0.205
- 0.207
- 0.209
- 0.21
- 0.212
- 0.217
- 0.218
- 0.219
- 0.22
- 0.235
- 0.237
- 0.249
- 0.25
- 0.251
- 0.254
- 0.264
- 0.266
- 0.271
- 0.274
- 0.279
- 0.3
- 0.302
- 0.307

- 0.309
- 0.31
- 0.314
- 0.321
- 0.326
- 0.333
- 0.339
- 0.34
- 0.346
- 0.351
- 0.359
- 0.36
- 0.366
- 0.367
- 0.38
- 0.39
- 0.392
- 0.396
- 0.4
- 0.41
- 0.425
- 0.433
- 0.436
- 0.437
- 0.458
- 0.46
- 0.479
- 0.48
- 0.494
- 0.5
- 0.504
- 0.505
- 0.516
- 0.561
- 0.59
- 0.622
- 0.626
- 0.634
- 0.657
- 0.661

- 0.775
- 0.94
- 1
- 1.14
- 1.65
- 1.67
- 2.19
- 2.2

Product type: Frozen fruits (concentration of Arsenic [ppm])

- 0
- 0.01
- 0.0105
- 0.0109
- 0.0113
- 0.0114
- 0.0126
- 0.0131
- 0.0133
- 0.0134
- 0.0137
- 0.0142
- 0.0159
- 0.0173
- 0.0192
- 0.0195
- 0.02
- 0.0213
- 0.0226
- 0.0584
- 0.0607
- 0.07
- 0.0762
- 0.0789

Product type: Frozen vegetables – Leafy greens (concentration of Arsenic [ppm])

- 0
- 0.01
- 0.02
- 0.023

- 0.0265
- 0.0276
- 0.03
- 0.031
- 0.0313
- 0.0332
- 0.0403
- 0.0449
- 0.0474
- 0.0612
- 0.0772
- 0.102

Product type: Frozen vegetables – Other (concentration of Arsenic [ppm])

- 0
- 0.01
- 0.0101
- 0.0106
- 0.0115
- 0.0126
- 0.013
- 0.0132
- 0.0149
- 0.0183
- 0.02
- 0.0587
- 0.0697

Figure 2
Distribution of cadmium levels by product type
Product type: Botanical powders (concentration of Cadmium [ppm])

- 0
- 0.01
- 0.0102
- 0.0104
- 0.0113
- 0.0114
- 0.0115
- 0.0126
- 0.0127

- 0.0129
- 0.0146
- 0.0149
- 0.0155
- 0.0157
- 0.0178
- 0.0179
- 0.018
- 0.0181
- 0.0191
- 0.0195
- 0.0197
- 0.0199
- 0.02
- 0.0203
- 0.0207
- 0.021
- 0.022
- 0.0226
- 0.0229
- 0.0232
- 0.0236
- 0.0244
- 0.0245
- 0.0247
- 0.0248
- 0.0257
- 0.0264
- 0.0267
- 0.027
- 0.0274
- 0.0276
- 0.0279
- 0.0283
- 0.0285
- 0.0289
- 0.0291
- 0.0292
- 0.0293
- 0.03

- 0.0301
- 0.0302
- 0.0304
- 0.0308
- 0.0318
- 0.0325
- 0.0327
- 0.0329
- 0.0338
- 0.0355
- 0.0358
- 0.0359
- 0.0362
- 0.0374
- 0.0375
- 0.04
- 0.0419
- 0.0432
- 0.0435
- 0.0467
- 0.0471
- 0.0473
- 0.0479
- 0.05
- 0.0511
- 0.0513
- 0.0528
- 0.0539
- 0.0542
- 0.0559
- 0.0563
- 0.057
- 0.0576
- 0.0579
- 0.0581
- 0.0593
- 0.06
- 0.0609
- 0.0627
- 0.0636

- 0.0655
- 0.0688
- 0.07
- 0.0707
- 0.0794
- 0.081
- 0.099
- 0.1
- 0.102
- 0.108
- 0.109
- 0.116
- 0.119
- 0.13
- 0.131
- 0.135
- 0.136
- 0.143
- 0.144
- 0.149
- 0.15
- 0.153
- 0.16
- 0.168
- 0.179
- 0.192
- 0.198
- 0.2
- 0.203
- 0.213
- 0.215
- 0.23
- 0.256
- 0.264
- 0.31
- 0.316
- 0.317
- 0.318
- 0.319
- 0.324

- 0.329
- 0.334
- 0.337
- 0.348
- 0.352
- 0.358
- 0.36
- 0.37
- 0.395
- 0.404
- 0.406
- 0.407
- 0.415
- 0.42
- 0.425
- 0.44
- 0.444
- 0.451
- 0.453
- 0.467
- 0.479
- 0.49
- 0.52
- 0.526
- 0.53
- 0.57
- 0.579
- 0.58
- 0.599
- 0.6
- 0.609
- 0.63
- 0.636
- 0.668
- 0.86
- 0.99
- 1.07
- 1.11

Product type: Frozen fruits (concentration of Cadmium [ppm])

- 0
- 0.01
- 0.0113
- 0.0117
- 0.0127
- 0.0145
- 0.015
- 0.0164
- 0.0172
- 0.02
- 0.0213
- 0.0245
- 0.0264
- 0.0282
- 0.0286
- 0.0295
- 0.03
- 0.0326
- 0.0417
- 0.05
- 0.06
- 0.07

Product type: Frozen vegetables – Leafy greens (concentration of Cadmium [ppm])

- 0
- 0.011
- 0.0118
- 0.0125
- 0.0164
- 0.0222
- 0.0276
- 0.03
- 0.0341
- 0.04
- 0.05
- 0.0528
- 0.053
- 0.0544
- 0.0581
- 0.0633

- 0.0742
- 0.08
- 0.0822
- 0.0897
- 0.09
- 0.094
- 0.0966
- 0.1
- 0.101
- 0.117
- 0.118
- 0.126
- 0.14

Product type: Frozen vegetables – Other (concentration of Cadmium [ppm])

- 0
- 0.01
- 0.0106
- 0.0109
- 0.0111
- 0.0115
- 0.0128
- 0.0129
- 0.013
- 0.0131
- 0.0144
- 0.0145
- 0.0146
- 0.0147
- 0.0148
- 0.0149
- 0.0157
- 0.016
- 0.0169
- 0.0176
- 0.0181
- 0.0185
- 0.0186
- 0.0187
- 0.0191

- 0.02
- 0.0221
- 0.0234
- 0.0257
- 0.03
- 0.0323
- 0.0378
- 0.04
- 0.0447
- 0.06
- 0.0751
- 0.1

Figure 3
Distribution of lead levels by product type
Product type: Botanical powders (concentration of Lead [ppm])

- 0
- 0.01
- 0.0104
- 0.0105
- 0.011
- 0.0111
- 0.0113
- 0.013
- 0.0131
- 0.0135
- 0.0137
- 0.0139
- 0.0142
- 0.0145
- 0.0146
- 0.0152
- 0.0156
- 0.0159
- 0.016
- 0.0162
- 0.0166
- 0.0185
- 0.019
- 0.0192

- 0.0196
- 0.0198
- 0.02
- 0.0202
- 0.0203
- 0.0204
- 0.0206
- 0.021
- 0.0218
- 0.0222
- 0.0223
- 0.0228
- 0.023
- 0.0238
- 0.0284
- 0.0287
- 0.0289
- 0.03
- 0.0318
- 0.0341
- 0.0362
- 0.04
- 0.0432
- 0.0533
- 0.0548
- 0.0588
- 0.0595
- 0.06
- 0.0647
- 0.0672
- 0.0675
- 0.0694
- 0.07
- 0.0704
- 0.0717
- 0.08
- 0.0802
- 0.081
- 0.09
- 0.0911

- 0.0977
- 0.1
- 0.11
- 0.12
- 0.122
- 0.125
- 0.126
- 0.128
- 0.135
- 0.136
- 0.14
- 0.144
- 0.145
- 0.159
- 0.16
- 0.161
- 0.166
- 0.17
- 0.171
- 0.174
- 0.178
- 0.18
- 0.185
- 0.187
- 0.189
- 0.19
- 0.192
- 0.193
- 0.198
- 0.199
- 0.202
- 0.206
- 0.207
- 0.216
- 0.218
- 0.22
- 0.223
- 0.225
- 0.228
- 0.231

- 0.236
- 0.239
- 0.24
- 0.244
- 0.245
- 0.246
- 0.25
- 0.253
- 0.26
- 0.262
- 0.267
- 0.27
- 0.273
- 0.276
- 0.278
- 0.28
- 0.281
- 0.282
- 0.29
- 0.294
- 0.3
- 0.301
- 0.31
- 0.312
- 0.319
- 0.32
- 0.321
- 0.326
- 0.329
- 0.331
- 0.333
- 0.34
- 0.348
- 0.349
- 0.351
- 0.352
- 0.382
- 0.383
- 0.386
- 0.391

- 0.4
- 0.401
- 0.404
- 0.41
- 0.414
- 0.419
- 0.435
- 0.445
- 0.45
- 0.451
- 0.452
- 0.457
- 0.458
- 0.459
- 0.464
- 0.467
- 0.47
- 0.483
- 0.488
- 0.49
- 0.5
- 0.515
- 0.516
- 0.523
- 0.524
- 0.526
- 0.532
- 0.54
- 0.555
- 0.58
- 0.584
- 0.599
- 0.6
- 0.603
- 0.605
- 0.609
- 0.623
- 0.63
- 0.64
- 0.643

- 0.7
- 0.779
- 0.78
- 0.841
- 0.851
- 0.869
- 0.9
- 0.909
- 1.02
- 1.03
- 1.04
- 1.08
- 1.11
- 1.12
- 1.13
- 1.2
- 1.21
- 1.41
- 1.52
- 1.7
- 1.89
- 2
- 2.26
- 4.12
- 4.6
- 6.54

Product type: Frozen fruits (concentration of Lead [ppm])

- 0
- 0.01
- 0.0145
- 0.0291
- 0.0366
- 0.05

Product type: Frozen vegetables – Leafy greens (concentration of Lead [ppm])

- 0
- 0.01
- 0.0107
- 0.0116

- 0.0136
- 0.0159
- 0.0243
- 0.0293
- 0.0303
- 0.0325
- 0.037
- 0.0501

Product type: Frozen vegetables – Other (concentration of Lead [ppm])

- 0
- 0.01
- 0.0111
- 0.0114
- 0.0124
- 0.014
- 0.0176
- 0.019
- 0.02
- 0.0253
- 0.0342

Figure 4
Distribution of mercury levels by product type
Product type: Botanical powders (concentration of Mercury [ppm])

- 0
- 0.001
- 0.002
- 0.0021
- 0.0022
- 0.0023
- 0.0024
- 0.0025
- 0.0026
- 0.0027
- 0.0028
- 0.0029
- 0.003
- 0.0034
- 0.0036

- 0.0039
- 0.0043
- 0.0044
- 0.0047
- 0.005
- 0.0051
- 0.0052
- 0.0053
- 0.0057
- 0.0059
- 0.006
- 0.0068
- 0.007
- 0.0074
- 0.0077
- 0.0078
- 0.008
- 0.0081
- 0.0089
- 0.009
- 0.0095
- 0.01
- 0.0101
- 0.0105
- 0.011
- 0.0113
- 0.0114
- 0.0118
- 0.012
- 0.0121
- 0.0123
- 0.0125
- 0.0126
- 0.0127
- 0.013
- 0.0138
- 0.014
- 0.0147
- 0.0153
- 0.0154

- 0.0163
- 0.018
- 0.0195
- 0.0212
- 0.0243
- 0.0265
- 0.028
- 0.0307
- 0.032
- 0.034
- 0.0342
- 0.05
- 0.113
- 0.186

Product type: Frozen fruits (concentration of Mercury [ppm])

- 0
- 0.001
- 0.0025
- 0.0027
- 0.0031

Product type: Frozen vegetables – Leafy greens (concentration of Mercury [ppm])

- 0
- 0.001
- 0.002
- 0.0022
- 0.0024
- 0.0025
- 0.0031
- 0.0035

Product type: Frozen vegetables – Other (concentration en mercure [ppm])

- 0
- 0.001
- 0.002
- 0.003
- 0.0043
- 0.0047
- 0.0049

- 0.005
- 0.0052