Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Children's Food Project

2011-2012 Report on Sampling

Foods intended for children aged 2 – 15 years

Canada

Table of Contents

Executive Summary

The main objectives of the 2011 – 2012 Children's Food Project (CFP) were to:

- assess the compliance status for pesticide residues in foods consumed by children aged 2 – 15 years;
- focus on foods marketed for school lunches; and
- provide data to Health Canada that can be used for health risk assessment of foods consumed by children.

In the 2011 – 2012 CFP, a total of 710 processed and manufactured food samples were purchased in the Ottawa – Gatineau area. Samples included a variety of cookies/crackers/cakes, dried fruit, cereal-, dairy-, fruit- and vegetable based products targeted to and consumed by children aged 2 to 15 years. Samples were analysed for pesticide residues and metals. A total of 2 310 analytical tests were performed, corresponding to over 286 000 results.

Of the 710 samples tested for pesticide residues, 491 (69%) contained no detected pesticide residues. The remaining 219 samples (31%) had detected levels of pesticide residues, with 68 samples (10%) containing three or more pesticide analytes. Of the 219 samples with detectable levels of pesticide residues, two exceeded established maximum residue limits (MRLs). The overall compliance rate of the 2011 – 2012 CFP was 99.7%. The violations were assessed to determine the appropriate follow-up action.

There are very few Canadian maximum levels established for metals in food. Heavy metals that may pose the greatest inherent risk to human health at low levels include arsenic, cadmium, lead and mercury. Consistent with previous years' results, the highest arsenic levels were observed in rice-based products. The majority of the metal levels detected were within the range of typical background concentrations observed in similar foods.

Data obtained from studies like the Children's Food Project are instrumental in the assessment of the dietary exposure of Canadian children to pesticide residues and metals. The 2011 – 2012 Children's Food Project represents a typical overview of the nature of pesticide residues and metals in the Canadian food supply.

1 The Children's Food Project

1.1 Project purpose

As part of the 'Building Public Confidence in Pesticide Regulation and Improving Access to Pest Management Products' initiative the Canadian Food Inspection Agency (CFIA) received funding to undertake limited monitoring of pesticides in foods consumed by children. In January 2003, the CFIA initiated the 'Young Children's Food Chemical Residues Project' (later renamed the 'Children's Food Project' (CFP)) to test children's foods for pesticide residues. The overall objective of the CFP is to ensure continued compliance of pesticide residues in children's foods, with specific aims to:

- gather data to determine the prevalence of pesticide residues in imported and domestically produced children's foods;
- identify foods that represent a potential health risk from illegal or inappropriate uses of pesticides; and
- determine compliance with pesticide and metal MRLs specified under the *Pest Control Products Act* (*PCPA*) and maximum levels for metals specified in the *Food and Drug Regulations* (*FDR*).

1.2 Rationale

On an annual basis, the CFIA conducts a number of different monitoring programs and targeted surveys. For example, the National Chemical Residue Monitoring Program (NCRMP) targets federally-registered food commodities, such as meat, eggs, honey, dairy products, maple products, processed products, and fresh fruits and vegetables. Alternatively, the CFP collects information on chemical residues in manufactured and imported foods frequently consumed by and targeted to children (e.g., fruit snacks, cereal-based products, fruit juices and beverages, etc.). These manufactured and imported foods are also the focus of targeted surveys, deliverables of the Food and Consumer Safety Action Plan. However, targeted surveys conducted as part of the Food and Consumer Safety Action Plan do not focus on the level of pesticide residues in foods targeted to children as does the CFP. Together, the data from these programs help health authorities assess potential exposure to pesticide residues and metals in a number of foods consumed by Canadian children. The results from these on-going activities can be found at the following CFIA web address:
http://www.inspection.gc.ca/english/fssa/microchem/resid/reside.shtml

1.3 Acts and Regulations Relating to Pesticide Residues and Metals

The *Canadian Food Inspection Agency Act* stipulates that the CFIA is responsible for enforcing restrictions on the production, sale, composition and content of foods and food products as outlined in the *Food and Drugs Act* (FDA) and the corresponding *Food and Drug Regulations* (FDR).

Health Canada establishes Maximum Residue Limits (MRLs) for pesticide residues in food. The MRL is the maximum amount of residues that are expected to remain in or on food products when a pesticide is used according to label directions and is regulated under the *Pest Control Products Act* (PCPA). In the absence of a MRL, pesticide residues must comply with the General MRL (GMRL) of 0.1 ppm as stated in section B.15.002(1) of the *Food and Drug Regulations*. The process for establishing a MRL is initiated through the publication of a Proposed Maximum Residue Limit (PMRL) on Health Canada's website. Established MRLs appear in Health Canada's MRL Database. The CFIA recognizes the scientific validity of the safety evaluation carried out by Health Canada prior to publishing PMRLs and establishing MRLs. The results obtained in the CFP are compared to the applicable standards accordingly.

Maximum levels for chemical contaminants in foods may be expressed as either regulatory tolerances or standards. Regulatory tolerances are listed in the FDR whereas standards can be viewed on Health Canada's website. A limited number of tolerances and standards are established for metals in food. There are, at present, metal tolerances established in the *FDR* (Section B.15.001-TABLE I) for arsenic, lead and tin in specific commodities. It should be noted that the regulatory tolerances in Table I of Division 15 are under review by Health Canada. There are two standards established for mercury in different types of retail fish. There is also one MRL established for copper in fresh fruits and vegetables under the PCPA as a result of its use as an antifungal agent.

All chemical residues or contaminants detected in food products are evaluated to determine if there has been a violation of applicable Canadian MRLs or maximum levels. Residues detected at or below established levels are in compliance and do not require enforcement or follow-up action. When a violation is identified or if no MRL or maximum level has been established, the result is assessed to determine the appropriate follow-up action. These actions can include notification of the producer or importer, follow-up inspections, further directed sampling, or recall of products if Health Canada determines that the product could pose a health risk to consumers or certain segments of the population. Follow-up actions vary according to the magnitude of the health risk, with the objective of preventing any repeat occurrence or further distribution of items still in the marketplace.

1.4 Limitations of CFP

The CFP is designed to be a case study. It is not designed to gather statistically valid information on the type and levels of chemical residues and metals in children's foods. This would require more samples and substantially increase project costs.

The sampled foods are chosen based on the market availability of manufactured foods frequently consumed and marketed towards children and do not necessarily correspond to the relative importance of this type of food in their diets. No statistical methods are used to determine the types and numbers of samples selected. When possible, the samples selected for testing were purchased in duplicate at two different times during the year. For example, each sample was purchased twice with the only difference being the product lot code or expiry date of the sample when no product lot code was available.

2 2011 – 2012 Children's Food Project Design

2.1 Sample selection

The CFP was designed to provide a snapshot of the levels of pesticide residues and metals found in foods commonly consumed by and targeted to children. The multitude of food available and targeted at children, as well as the different consumption patterns of children of different age groups, makes it impractical for the CFIA to test all of these on an annual basis. To address this challenge, different foods for different age groups are sampled each year.

In 2010 – 2011, baby and toddler foods (0 – 24 months) were targeted. In 2011 – 2012, foods for children aged 2 to 15 years were sampled. Foods collected for this age group have been previously targeted in a number of years. Please consult Appendix A for a list and web links to previous Children's Food Project reports.

The samples in the CFP include both randomly selected domestic and imported manufactured foods with a focus on foods that may be consumed more frequently in school lunches (e.g., apple sauce, granola bars, dried fruit, etc.). The samples were packaged in a variety of packaging formats: glass and plastic bottles, cans, boxes, cartons and bags. Samples included products with both short and long shelf-lives (e.g., refrigerated, non-perishable, frozen). Samples were purchased from several national grocery chains, drugstores, and at smaller local markets in the Ottawa-Gatineau area. The number of samples purchased from each grocery store was related to the availability of products and/or brands and does not reflect the relative demographic composition of or the relative amounts of food consumed by Canadian children.

2.1.1 Sample breakdown

A total of 710 samples were included in the CFP. The products sampled were further subdivided into 17 different categories based on ingredient similarities between products. The larger categories include cookies/crackers/cakes (12%), drink/juices (10%) and fruit- or vegetable-based products (12%). Table 1 provides a summary of the different categories used.

Table 1 Breakdown of sampled products in the 2011 – 2012 CFP

Product Type	Count of Sample Number	Percent of Total
Apple sauce	31	4%
Breakfast cereals	35	5%
Candy	24	3%
Canned meats	6	1%
Cheese	22	3%
Cookies/crackers/cakes	83	12%
Dried fruits	37	5%
Drinks/juices	73	10%
Fruit- or vegetable-based products	87	12%
Milk-based drinks	25	4%
Nut-based products	38	5%
Other	29	4%
Pasta (canned/dry)	44	6%
Rice-based products	58	8%
Snack food	67	9%
Tomato-based products	38	5%
Yogurt	13	2%
Total	**710**	**100%**

2.2 Analysis

Analytical testing is performed using multi-residue methods (MRMs) and single-residue methods (SRMs). MRMs are capable of detecting large numbers of pesticide residues and metals and are generally more cost-efficient. Samples in the CFP were analyzed by accredited third party laboratories. The CFIA has established requirements for the acceptance of analytical results from third party laboratories. These laboratories must have analytical methods that meet or surpass the equivalent CFIA method performance parameters.

2.2.1 Pesticide analysis

Pesticides and other agricultural chemicals are commonly used in large scale agricultural systems. These chemicals help to protect crops from damage by pests, increase yields and expand the geographical location in which crops can be grown. A consequence of using agricultural chemicals during food production is that foods can sometimes retain chemical residues which may be of concern to Canadian consumers.

Foods are tested for pesticide residues using a variety of analytical methods. The CFIA multi-residue and single residue methods listed in Table 2 were used as references by

third party laboratories in the analysis of the children's food samples. The analytical scope is provided Appendix B, Tables B-1 to B-4. Please note that in the 2011 – 2012 CFP, benomyl (carbendazim), formetanate and thiabendazole were included as analytes of the LC/ESI-MS-MS MRM, therefore, these SRMs are no longer needed to quantitate the aforementioned analytes.

Table 2. List of CFIA multi-residue and single residue methods

Sample Type	CFIA Reference Method[1]	Method Detection Limit (MDL)
Processed fruit and vegetable based foods	'Determination of Pesticides in Infant Foods using Liquid Chromatography Electrospray Ionization Mass Spectrometry (LC/ESI-MS/MS)'	Ranged from 0.00014 ppm to 0.01 ppm
Processed products (meat-, cereal-, fruit- and vegetable-based)	'Determination of Pesticides in Honey, Fruit Juice and Wine (With Solid Phase Extraction Clean-Up and GC/MSD and HPLC Fluorescence Detection)'	Ranged from 0.001 ppm to 0.025 ppm
Dairy-based products	'The Determination of Organochlorine Pesticides and Polychlorinated Biphenyls PCB's in Dairy, Raw Milk, Egg and Egg Products by GC/ECD'	Ranged from 0.0003 ppm to 0.009 ppm
Dairy-based products	'Carbamates in Tissues'	0.005 ppm
Processed products (meat-, cereal-, fruit- and vegetable-based)	'Determination of Amitraz in Pears by GC/ECD'	0.009 ppm
Processed products (meat-, cereal-, fruit- and vegetable-based)	'Determination of 2-Imidazolidinethione in Fruits and Vegetables by GC/MSD'	0.01 ppm

[1] The contract laboratories are not required to use CFIA methods. The analytical method used must have third party accredited Standard Operating Procedures (SOPs) and meet the minimum limits of detection (LOD), limits of quantitation (LOQ) and reporting limits set out by the CFIA.

2.2.2 Metals analysis

Although many metals occur in food naturally, they may also be present in food as a result of the use of agricultural chemicals, environmental contamination or processing. While some metals are essential nutrients, exposure to others may be harmful to human health (e.g., arsenic, cadmium, mercury, lead). Some pesticides contain metals such as copper and aluminum, which may result in elevated levels of these metals in food crops. Arsenic has been used in the past as a component of pesticides but has been discontinued in many countries. Cadmium is a common contaminant of chemical fertilizers, and may accumulate in certain types of plants. Processed foods may contain elevated levels of certain metals that are approved as food additives (aluminum, titanium), in packaging materials (tin), or for fortification with essential minerals such as iron, selenium,

chromium, and zinc. Food that has been processed using lead-containing equipment may have elevated levels of lead.

The multi-metal analytical method used in the CFP analyzes for 20 different metals including: aluminum, antimony, arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, tin, titanium and zinc. For metals analyses performed at the contract laboratories, the CFIA does not specify a reference method, but only specifies that the method used must be third party accredited and meet minimum limits of detection.

3 Results

3.1 Pesticides

A total of 1600 tests for pesticide residues were carried out on 710 samples yielding over 270 000 results. Of these, 491 samples (69%) contained no detected pesticide residues. There were 219 samples (31%) with detected pesticide residues, two of which resulted in pesticide residue violations. The violations were in an imported organic corn pasta product and a domestic taboule-parsley salad product. The corn pasta contained metolachlor residues at 0.16 ppm exceeding the established MRL in corn of 0.1 ppm and the parsley salad contained 0.106 ppm of diniconazole exceeding the General MRL of 0.1 ppm. All violations were assessed and appropriate follow-up actions reflecting the magnitude of the health risk were taken. As well, any results for samples labeled as organic containing detected pesticide residues or violations were forwarded to CFIA's Canada Organic Office. The overall sample compliance rate is 99.7%. Figure 1 illustrates the distribution of samples.

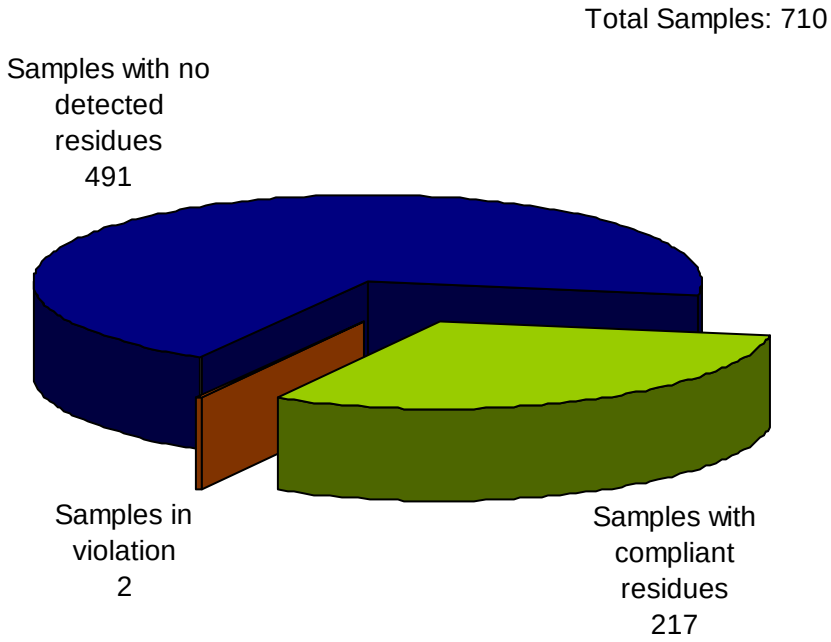

Figure 1. Distribution of sample pesticide residue results

The CFP tested samples from 28 countries including Canada (Table 3). Of the 28 countries sampled, 18 had samples with detected pesticide residues. The majority of the samples tested in the CFP originated from Canada and the United States with approximately 35% and 26% of the samples having detectable pesticide residues, respectively.

Table 3. Percentage of samples with detected pesticide residues listed by country of origin

Country of Origin	Number of Samples	Number of Positive Samples	% Positive Samples	Product Types (containing detectable pesticide residues)
Belgium	8	1	13%	Nut-based products
Canada	290	102	35%	Apple sauce, Cookies/crackers/cakes, Dried fruits, Drinks/juices, Fruit- or vegetable-based products, Milk-based drinks, Nut-based products, Other, Pasta (canned/dry), Rice-based products, Snack food, Tomato-based products
China	21	5	24%	Fruit- or vegetable-based products
Croatia	1	0	0%	
Finland	1	0	0%	
France	6	5	83%	Fruit- or vegetable-based products
Hong Kong	6	2	33%	Drinks/juices
Indonesia	1	0	0%	
Israel	2	0	0%	
Italy	27	8	30%	Candy, Cookies/crackers/cakes, Drinks/juices, Pasta (canned/dry), Tomato-based products
Jamaica	2	0	0%	
Japan	8	0	0%	
Korea	6	0	0%	
Malaysia	7	0	0%	
Netherlands	4	1	25%	Cookies/crackers/cakes
Philippines	12	2	17%	Cookies/crackers/cakes, Pasta (canned/dry)
Poland	1	1	100%	Canned meats
Slovenia	1	1	100%	Drinks/juices
South Africa	2	0	0%	
Spain	2	1	50%	Rice-based products
Switzerland	2	1	50%	Other
Taiwan	16	3	19%	Cookies/crackers/cakes, Drinks/juices, Rice-based products
Thailand	16	6	38%	Dried fruits, Fruit- or vegetable-based products, Other, Pasta (canned/dry)
Turkey	1	0	0%	
United Kingdom	3	3	100%	Breakfast cereals, Dried fruits
Unknown	98	35	36%	Apple sauce, Breakfast cereals, Candy,

Country of Origin	Number of Samples	Number of Positive Samples	% Positive Samples	Product Types (containing detectable pesticide residues)
				Cookies/crackers/cakes, Drinks/juices, Fruit- or vegetable-based, Other, Snack food, Tomato-based products
United States	156	40	26%	Apple sauce, Breakfast cereals, Candy, Cookies/crackers/cakes, Dried fruits, Drinks/juices, Nut-based products, Pasta (canned/dry), Tomato-based products
Vietnam	10	2	20%	Dried fruits

The percentage of samples containing compliant pesticide residues and violations observed in the different product types is presented in Figure 2. Fifteen of the seventeen product types sampled contained detectable levels of pesticide residues. Cheese and yogurt were the only product types where no pesticide residues were detected. More than 60% of the apple sauce (29 out of 31 samples), dried fruits (24 out of 37 samples) and tomato-based product (35 out of 38 samples) samples had detectable residues. Although greater than 60% of these had detected pesticide residues, no violations were observed. Comparisons of the pesticide residues found in apple sauce, dried fruit and tomato-based product types to either the 0.1 ppm GMRL or applicable MRLs are presented in Appendix C. Drinks/juices and fruit- or vegetable-based products are other product types that had detected pesticide residues in nearly 40% of samples. The results from those product types for which there are a very small number of total samples (i.e., <30) should be interpreted cautiously.

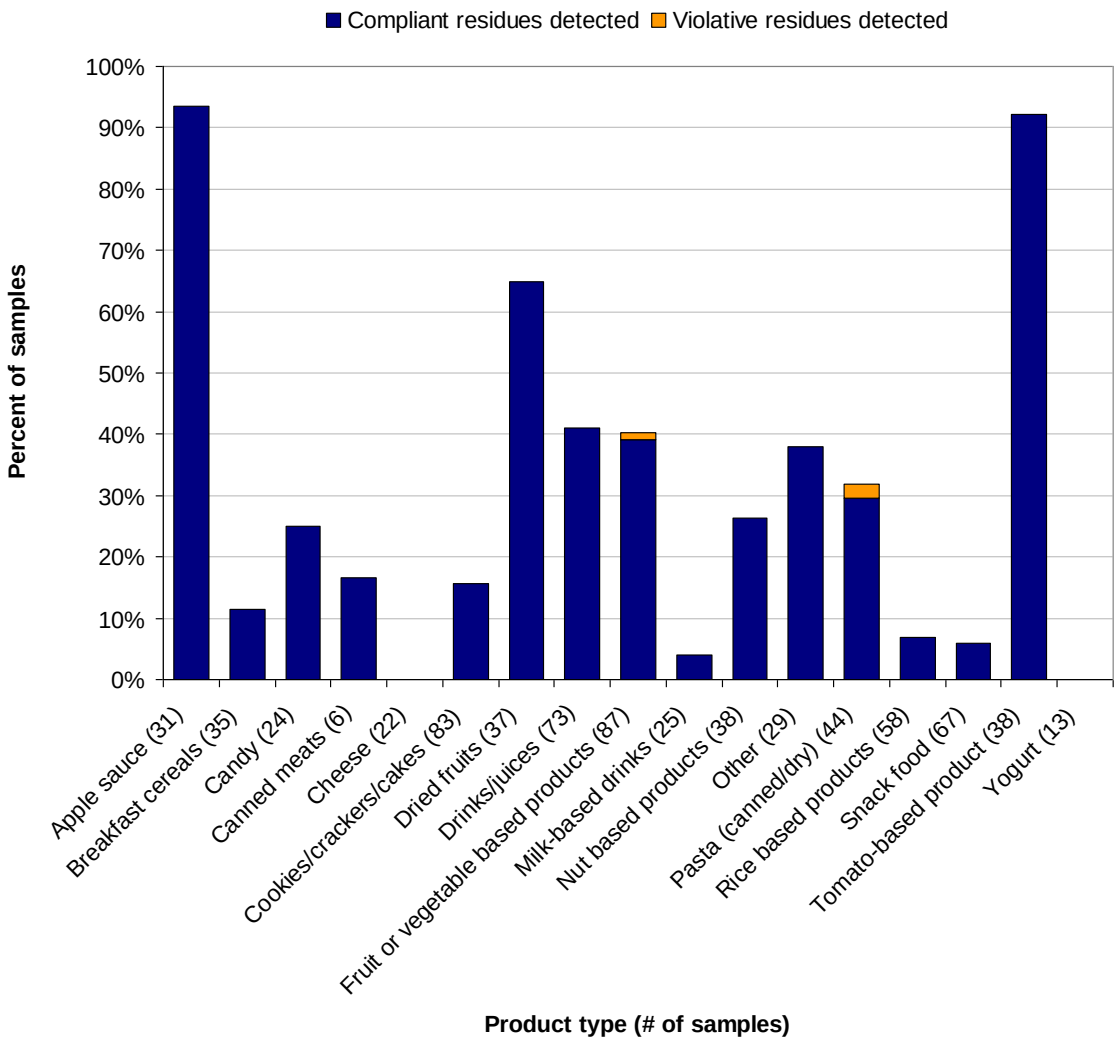

Figure 2. Percentage of samples with compliant and violative pesticide residues by product type

The prevalence of pesticide residues was examined in the CFP samples as well. Pesticide residue prevalence was calculated as the number of times a residue was detected as a percentage of the total number of samples tested for that residue. In total there were 58 different pesticide residues detected. Figure 3 below illustrates the ten most prevalent pesticide residues detected. The top ten pesticide residues detected were 100% compliant with the exception of diniconazole (1 violation, 99.8% compliant).

Imidacloprid was the most prevalent pesticide detected (12.3%). It is an insecticide used to control a wide variety of insects on cereals, fruit and vegetables. Many of the samples that contained detectable levels of imidacloprid were fruit- or vegetable-based, reflecting the high rate of usage in fruit and vegetable production. Carbendazim, detected 6% of the

time, is a fungicide registered for use on a variety of cereals, fruits and vegetables. The majority of the samples that contained detectable levels of carbendazim were fruit- or vegetable-based. Thiabendazole is a fungicide used on bananas, apples, pears, and potatoes. It was detected in 5.5% of samples mainly containing apple- and pear-based ingredients. Diphenylamine is registered for use in the post-harvest treatment of apple and pear. It was detected in 4.8% of samples, the majority of which contained apple- or pear-based ingredients. Captan, a fungicide used on small fruits and berries, was detected at a level of 4.5% mostly on apple-based products.

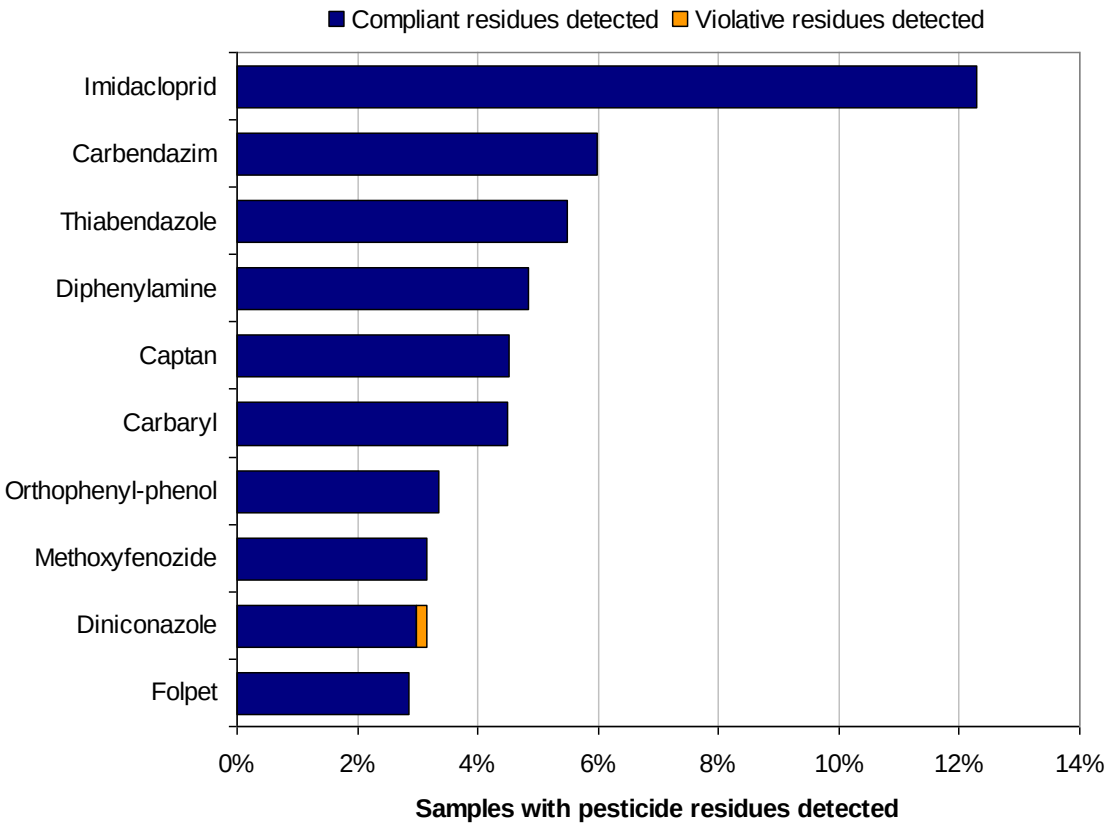

Figure 3. Pesticide residue prevalence in samples where pesticide residues were detected

Figure 4 below illustrates the distribution of CFP samples containing no detected residues (ND), one or multiple pesticide residues (2 – 12). Approximately 69% of all samples tested contained no detected pesticide residues. Of the 219 samples with detected pesticide residues, 99 samples (14%) had one pesticide residue, 52 samples (7%) had two pesticide residues and 68 samples (10%) had three to twelve residues per sample.

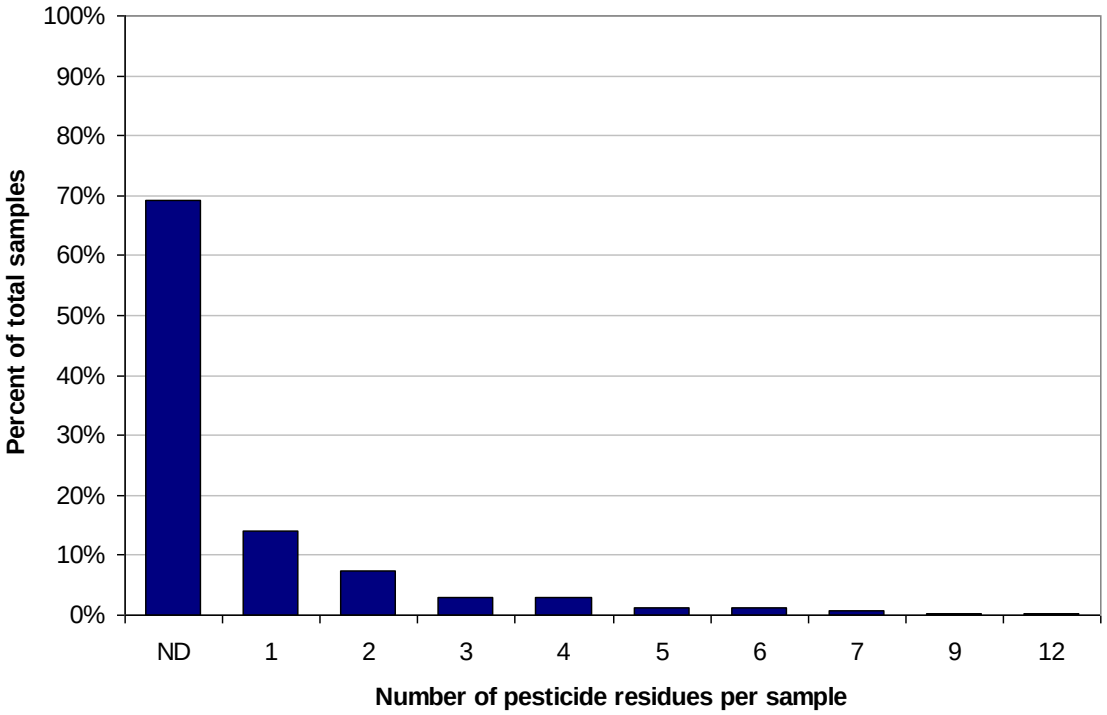

Figure 4. Pesticide residue frequency in CFP 2011 – 2012 samples

3.1.1 Comparison of results with 2009 – 2010 CFP results

The food products sampled in the 2011– 2012 CFP were similar to those sampled in the 2009 – 2010 CFP as the targeted age groups were identical for both project years. Table 5 summarizes the main project parameters for both sampling years.

Table 5 Summary of the 2009 – 2010 and 2011 – 2012 CFP

2009 – 2010	**CFP sampling year**	**2011 – 2012**
821	Number samples	710
375	Number domestic samples	290
446	Number import samples	420
2 – 15 years	Age group targeted	2 – 15 years
98.6%	Overall compliance rate	**99.7%**
20%	% Positive samples	31%
47	Number pesticide residues detected	58
11	Number of violations	2

Both years the overall compliance rate was very high, at 99.7% for 2011 – 2012 and 98.6% for 2009 – 2010. The percentage of samples containing detectable pesticide residues was higher in 2011 – 2012 at 31% compared to 20% in 2009 – 2010. The difference between sampling years is attributed to the type and quantity of samples analysed. In 2011 – 2012 more samples of apple sauce, dried fruit and tomato-based products were analysed than in 2009 – 2010. The percentage of samples containing detectable residues in each of these categories exceeded 60% and in the case of apple sauce and tomato-based products it was over 90%. Captan and carbendazim were some of the most prevalent pesticide residues in 2011 – 2012 as well as in 2009 – 2010.

3.2 Metals

Appendix D contains a detailed summary of the levels of metals observed in the product types sampled. All samples had detected levels of metals. As mentioned in section 2.2, metals are anticipated in most food products. The results presented in Appendix D are a measure of total metal concentration present in food and does not distinguish between organic and inorganic forms, or ionic species. The CFIA continues to develop and validate methods to enable quantitation of metal species to complement the current approach.

The following discussion focuses on copper due to its use as fungicide in agriculture and the four detected metals that pose the greatest inherent risk to human health (arsenic, cadmium, mercury and lead). These inherently toxic metals are typically not present in food at elevated levels.

Copper

Copper and copper compounds are used as natural fungicides. An MRL of 50 ppm is specified under the PCPA for fruit and vegetable products. No results of concern were identified in the 2011 – 2012 study. Figure 5 illustrates the distribution of copper levels detected in the 17 product types tested. Approximately 96% of samples contained some level of copper. Figure 5 illustrates that nut-based products contained the highest levels of copper. Copper was detected in 100% of nut-based products and ranged from 2.7 ppm to 23.5 ppm. The levels observed in all samples were well below the 50 ppm MRL for copper.

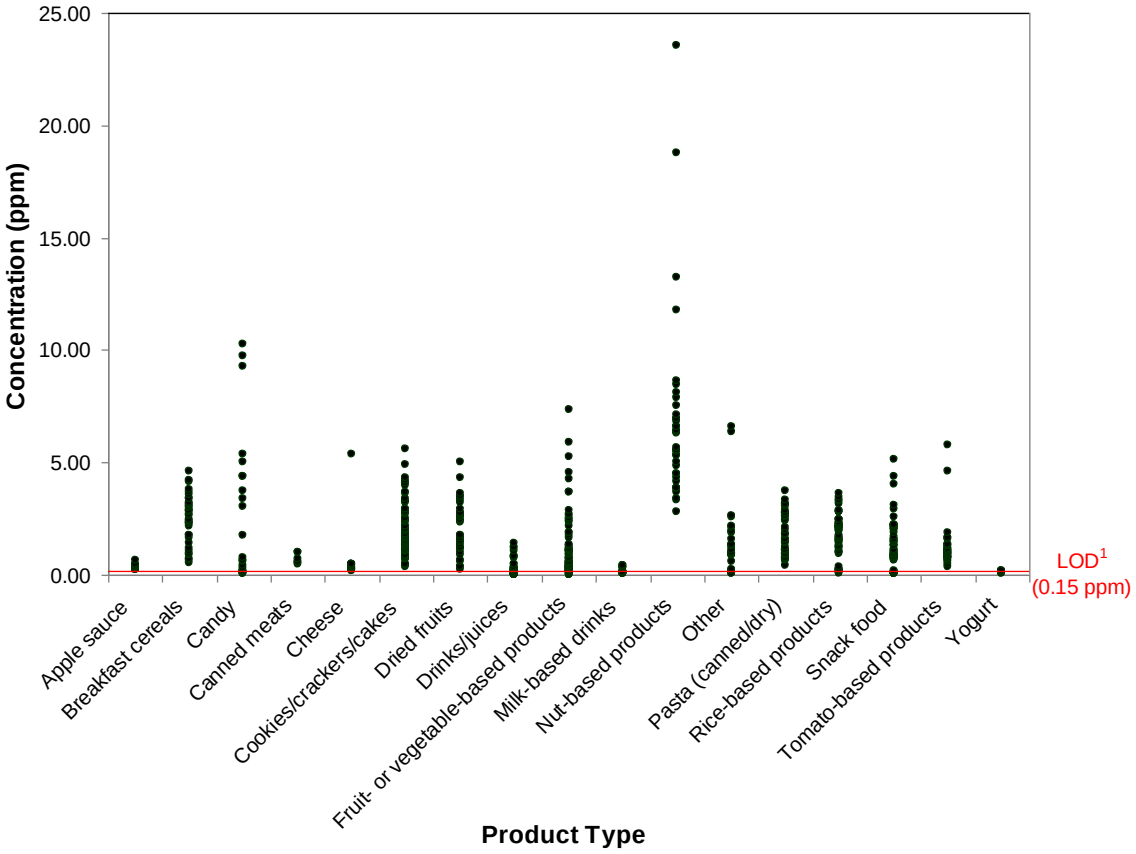

Figure 5. Distribution of copper levels detected by product type

[1] The highest reported limit of detection (LOD) is listed for all metals. Multiple LODs can occur when multiple laboratories complete the same analytical testing.

Arsenic

Arsenic can be found at low levels in foods such as fish and seafood, cereals, apples and pears.[5] There is an established arsenic tolerance in fruit juice, fruit nectar, beverages when ready-to-serve and water in sealed containers other than spring or mineral water specified in Table I of Division 15 of the *FDR*. Health Canada has informed industry and the CFIA that the current limits listed in the *FDR* are outdated and under review.[1] In addition, there is an established arsenic tolerance for food colours (Division 6 of the *FDR*). There are no Canadian arsenic standards or tolerances established for any of the other foods tested. It should be noted that the results discussed below are reported as total arsenic only. Figure 6 illustrates the distribution of arsenic levels detected in the 17 product types tested. Total arsenic was detected in approximately 44% of the samples with a large concentration of data points below 0.05 ppm. Rice-based products had the highest average concentration of arsenic at 0.120 ppm (ranging from 0.004 – 0.435 ppm). A breakfast cereal sample containing 0.422 ppm arsenic and a vegetable-based product containing 0.148 ppm arsenic were considerably higher when compared to the levels found in their respective product types. In Figure 6, the distribution of data points for the cookies/crackers/cakes, dried fruits and snack food product types illustrate a small number of samples with arsenic levels greater than 0.05 ppm. The arsenic tolerances were not exceeded in any of the fruit juice, nectar products, ready-to-serve beverages and water. As well, Health Canada did not consider that any of the samples represented a concern to human health with respect to to the arsenic levels observed.

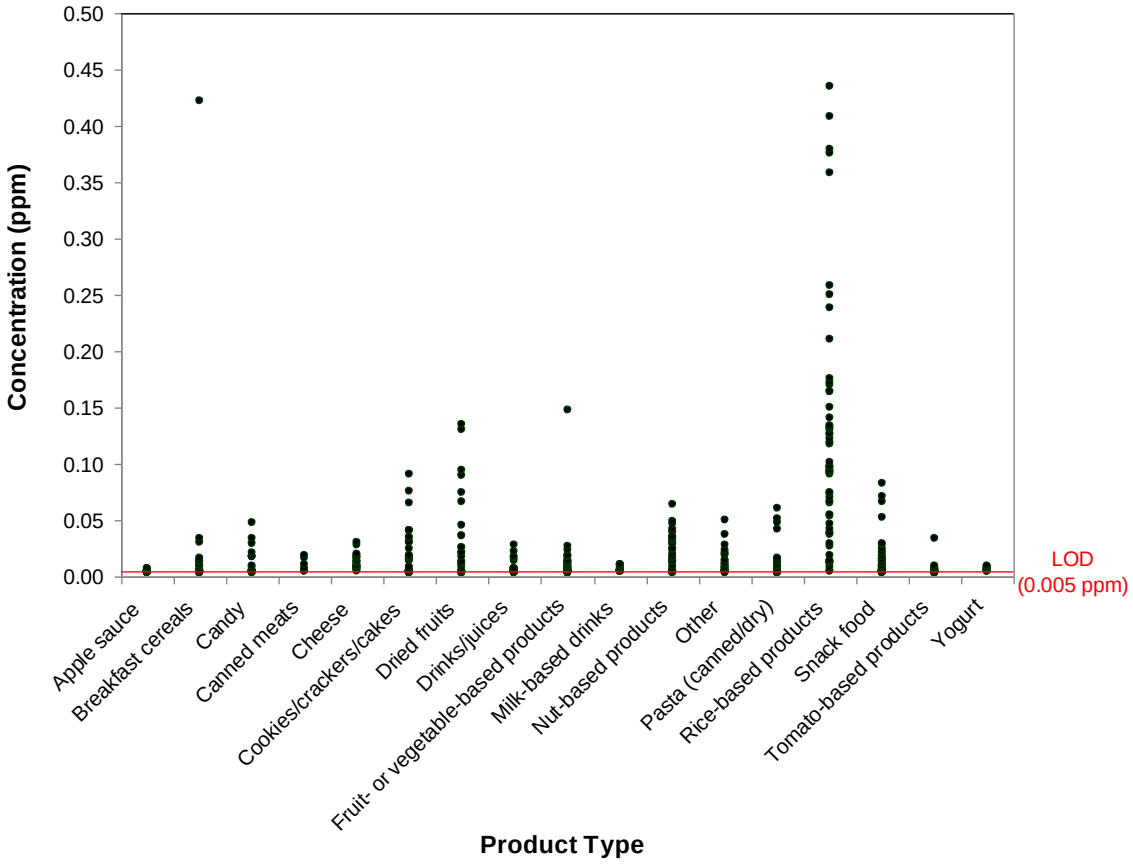

Figure 6. Distribution of arsenic levels detected by product type

Cadmium

There are no Canadian tolerances or standards established for cadmium levels in food. Cadmium can be present in water and soils. Soil may become contaminated with cadmium by the use of phosphate fertilizers or sewage sludge. Food grown in cadmium-contaminated soils is the primary source of cadmium exposure in the general population.[2] Figure 7 illustrates the distribution of cadmium levels detected in the 17 product types tested. Approximately 57% of the samples contained a detectable level of cadmium. Cadmium was not detected in apple sauce, canned meats, cheese, milk-based drinks and yogurt. The highest level of cadmium was detected in breakfast cereal at 0.284 ppm. Ninety-seven percent of the nut-based products contained cadmium resulting in the highest average, 0.053 ppm (ranging from 0.002-0.210 ppm). Health Canada did not consider that any of the samples represented a concern to human health with respect to the cadmium levels observed.

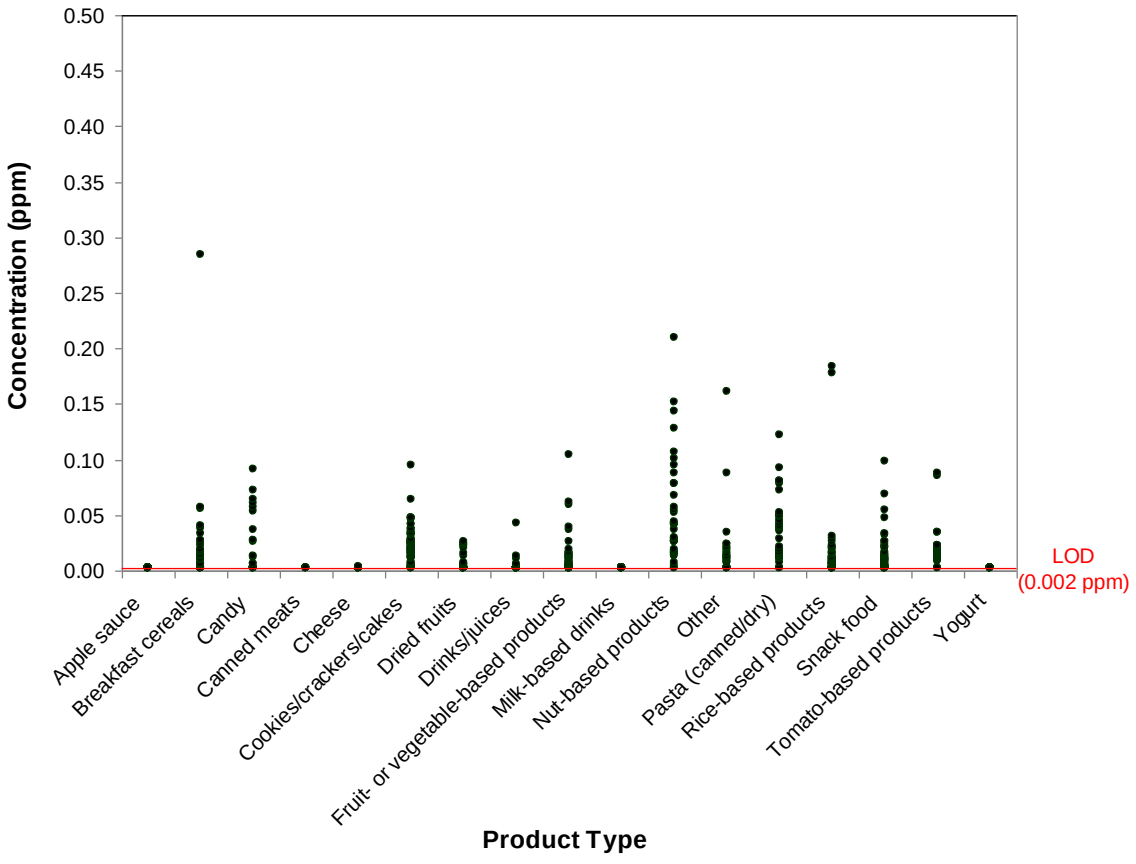

Figure 7. Distribution of cadmium levels detected by product type

Lead

Lead exposure may occur from a number of environmental and food sources. There are several tolerances for lead in food that are specified in Division 15 of the *FDR* including tomato paste, tomato sauce, fruit juice, fruit nectar, beverages when ready-to-serve and water in sealed containers other than spring or mineral water. None of these tolerances were exceeded in any of the similar product types tested. As part of Health Canada's risk management strategies for lead, the lead tolerances in Table I of Division 15 are being updated.[3] Figure 8 illustrates the distribution of lead levels detected in the 17 product types tested. Approximately 66% of the samples tested for lead contained detectable levels. The majority of the lead levels for the different products are comparable as much of their distribution falls below 0.05 ppm. Data points that were considerably higher than others from the same product type were found in dried fruits (0.002-0.151 ppm), other (0.002-0.140 ppm), rice-based (0.002-0.129 ppm) and tomato-based products (0.001-0.081 ppm). Health Canada did not consider that any of the samples represented a concern to human health with respect to the lead levels observed.

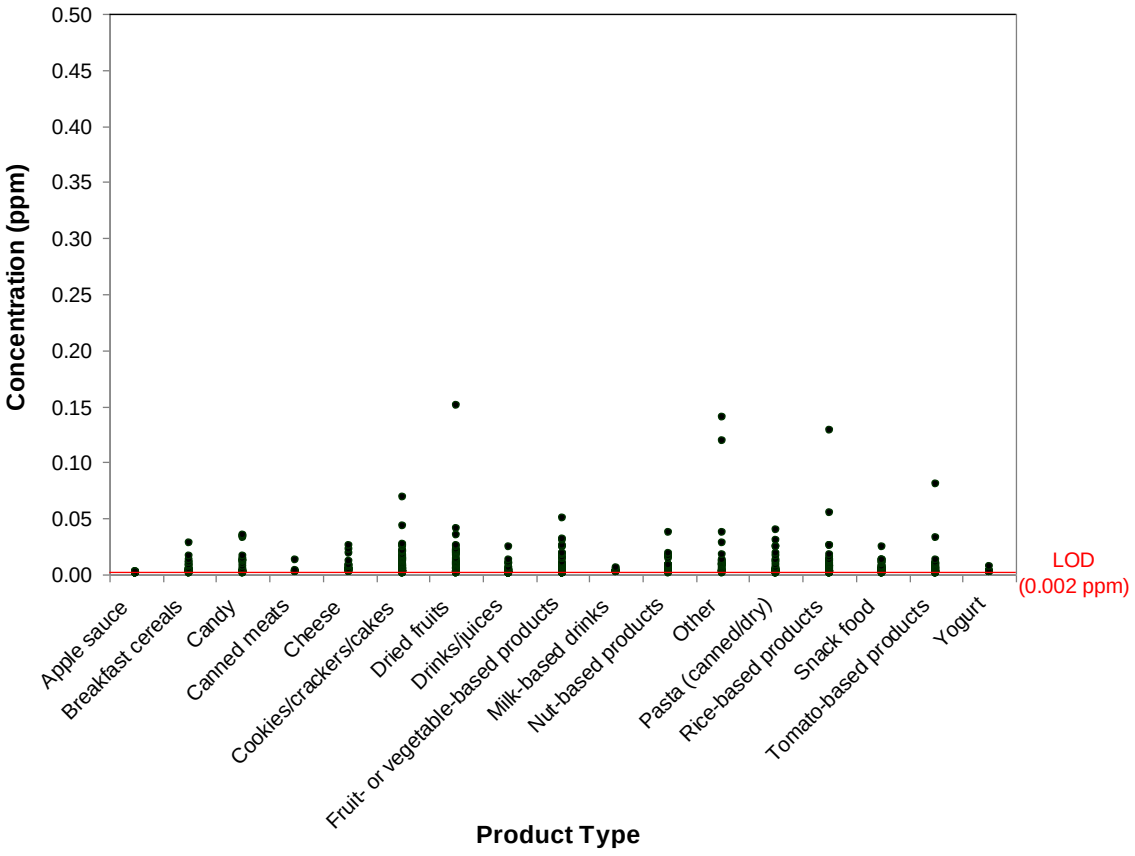

Figure 8. Distribution of lead levels detected by product type

Mercury

Health Canada has established a maximum level of 1 ppm total mercury in the edible portion of escolar, orange roughy, marlin, fresh and frozen tuna, shark, and swordfish. The maximum level of mercury permitted in all other types of retail fish is 0.5 ppm. There were no fish-based children foods included in the survey and there are no other mercury standards established for any other type of food tested in this survey. Figure 9 illustrates the distribution of mercury levels detected in the 17 product types tested. Mercury was detected in approximately 15% of the samples ranging from 0.0001 ppm to 0.033 ppm. Product types with detected levels included breakfast cereals, candy, dried fruits, drinks/juice, nut-based products, pasta (canned/dry) and rice-based products. The highest level was found in raisins at 0.033 ppm. The average levels of mercury in the product types tested ranged from 0.0001 ppm to 0.013 ppm mercury. Health Canada did not consider that any of the samples represented a concern to human health with respect to the mercury levels observed.

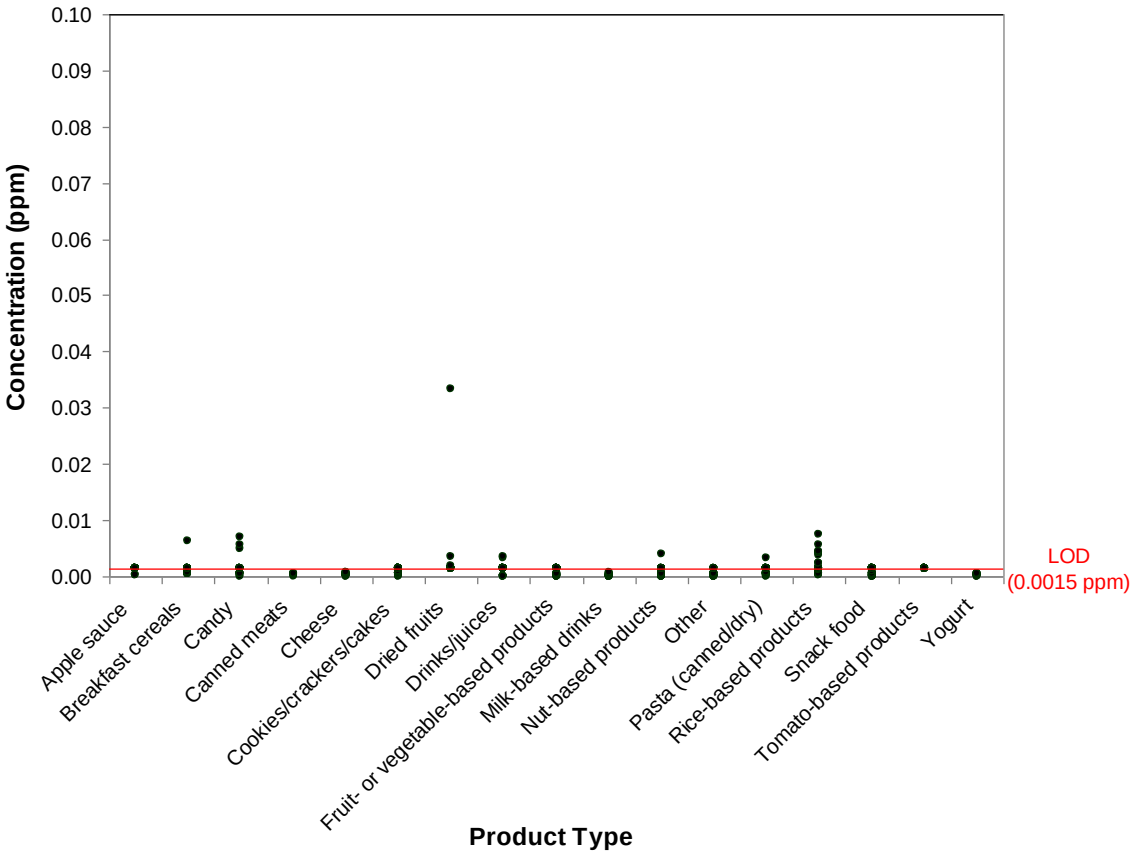

Figure 9. Distribution of mercury levels detected by product type

4 Discussion

In the 2011 – 2012 CFP, over 2 300 tests for pesticide residues and metals were performed on domestically produced and imported foods consumed by and targeted to children aged 2 to 15 years. The results observed were consistent with those in previous years with an overall compliance rate of 99.7%. Similar results were observed for domestic and imported products, and there was no clear relationship between compliance rate and country of origin. The compliance rate is similar to the compliance rates of previous CFPs and also to those determined for the much larger number and scope of samples tested under the NCRMP.

Pesticides and other agricultural chemicals are commonly used in conventional agricultural systems. These are an important tool in food production because pests such as insects, bacteria, fungi, and other organisms can have devastating effects on the quantity and quality of the food. In total there were 710 samples tested for pesticide residues. The overall compliance rate was 99.7%.The samples tested originated from 28 countries including Canada. Samples from 18 of the countries contained detectable pesticide residues with the majority originating from Canada (41%) and the United States (22%). Approximately 35% of the samples originating from Canada and 26% of the samples originating from the United States had detectable residues.

Approximately 31% (219 samples) of total samples contained detectable pesticide residues. Two samples contained pesticide residues in violation: 0.16 ppm metolachlor in corn pasta and 0.106 ppm diniconazole in parsley salad (taboule). The cheese and yogurt samples were the only product types that did not contain any detectable levels of pesticide residues. Although the percentage of samples with pesticide residues detected was upwards of 90% for apple sauce and tomato based products and greater than 60% for dried fruits, no violations were observed in any of these product types. There was a total of 58 different pesticide residues detected. The two most prevalent residues were imidacloprid at 12.3% followed by carbendazim at 6.0%; these pesticide residues were found primarily in fruit and vegetable containing foods. This is comparable with past NCRMP and CFP results; imidacloprid and carbendazim are pesticides often used in fruit and vegetable production. Other prevalent pesticide residues detected in the 2011 – 2012 CFP that were common to past NCRMP and CFP results included thiabendazole, diphenylamine, and captan[4, 6, 7].

It is not uncommon to find products that contain more than one detectable pesticide residue. Approximately 69% of all samples tested contained no detectable pesticide residues, 14% contained one residue, 7% had two residues and 10% had three or more residues. Many of the samples that contained three or more pesticide residues per sample

were fruit-based. These fruit types were the same types of fresh fruit sampled under the NCRMP that have been found to contain one or more detected pesticide residue.

All samples were analysed for up to 20 different metals. There were no violations of the specific metals tolerances, standards or MRLs. The levels of metals observed are comparable to CFP and NCRMP results seen in the past.

Total arsenic was detected in approximately 44% of samples with values ranging from 0.004 ppm to 0.435 ppm. The maximum level of 0.435 ppm was observed in a Chinese-style fried rice product and was not considered to be a human health concern. Similar levels of total arsenic in rice-based products were observed in the CFIA 2011 – 2012 Arsenic Speciation in Selected Foods Food Safety Action Plan (FSAP) Targeted Survey (unpublished). In the rice-based products tested under the arsenic speciation survey, total arsenic levels ranged from 0.002 ppm in rice noodles to 1.14 ppm in rice bran. Other products tested within the survey were seaweed, fruit products (e.g., leathers, juices, snacks) and mineral waters. A study conducted by the European Food Safety Authority (EFSA) in 2009 identified fish and seafood and cereal products as having the highest levels of total arsenic.[5] In the study, ranges were between 0.0024 ppm in juices, soft drinks and bottled water and 9.2088 ppm in miscellaneous/special dietary products (i.e., spices, salt, additives, food colours, algae as food and food supplements which can be derived from algae).[5] The average concentrations of arsenic in rice grains and rice-based products reported in the EFSA study were 0.1362 ppm (1.18 ppm maximum) and 0.1422 ppm (1.98 ppm maximum), respectively. In the CFP, most of the highest levels of arsenic (> 0.200 ppm) were detected in rice products. Total arsenic levels detected in the CFP were all within the ranges observed in the FSAP Targeted Survey and EFSA study for similar products.

The presence of cadmium in foods is not unexpected. Cadmium was detected in 57% of samples. Levels of cadmium detected ranged from 0.002 ppm to 0.284 ppm. Nut-based products had the highest average levels of cadmium at 0.053 ppm. The highest level was found in whole grain organic breakfast cereal at 0.284 ppm. Cadmium levels in breakfast cereals tested under the 2011 – 2012 Cadmium in Selected Foods FSAP Targeted Survey ranged from <0.002 ppm to 0.066 ppm (unpublished). Cereal-based products tested in previous CFPs ranged from <0.002 ppm to 0.126 ppm[6, 7]. Although the 0.284 ppm cadmium was considerably higher, Health Canada indicated the levels observed in the whole grain organic breakfast cereal were not considered to be a human health concern. From 2003 to 2007 the European Commission (EC) assessed the presence of cadmium in foodstuffs.[8] It found that the highest levels of cadmium were observed in seaweed, fish and seafood, chocolate, and foods for special dietary uses. However, food groups that contributed to the major part of the dietary cadmium exposure, primarily because of high

consumption, were cereals and cereal products, vegetables, nuts and pulses, starchy roots or potatoes, and meat and meat products.[8] The cadmium levels observed in the CFP were consistent with typical levels found in similar types of foods.

Lead occurs naturally in the environment and has many industrial uses, such as in mining, smelting and battery manufacturing.[9] After the implementation of measures to reduce exposures to lead through the inhalation route (e.g., use of unleaded gasoline), oral exposure from food and water along with ingestion of house dust and soil contaminated with lead are the greatest sources of a child's environmental exposure to lead.[9] An EFSA scientific opinion on lead in food reported that the highest contributors to lead in the diet were cereals and cereal products, vegetables, nuts and pulses, meat and meat products and foods for special uses (e.g., herbs and spices).[10] Lead was detected in approximately 66% of the samples tested for the CFP. Levels detected ranged from 0.001 ppm to 0.151 ppm with dried fruits having the highest average level at 0.018 ppm. The highest level, 0.151 ppm, was detected in dried apple slices and not considered to be a human health concern. Lead levels in dried fruit snacks tested under the 2011 – 2012 Arsenic Speciation in Selected Foods FSAP Targeted Survey ranged from not detected (<0.001 ppm) to 0.045 ppm and from <0.002 ppm to 0.185 ppm under the 2009 – 2010 CFP.[6] Lead levels observed in the 2011 – 2012 CFP are comparable to amounts observed in similar product types.

Although mercury is released naturally from rocks, soils and volcanoes, industrial activities have increased the amount of mercury in the environment. Mercury was detected in 15% of samples and ranged from 0.0001 ppm to 0.033 ppm with the highest found in raisins. Dried fruits had the highest average mercury level at 0.013 ppm. All mercury data was sent to Health Canada and was not considered to be a human health concern.

5 Conclusion

The results of the 2011 – 2012 Children's Food Project indicate that the majority of samples analyzed for pesticide residues (69% of 710 samples) contained no detected pesticide residues. There were 219 (31%) samples with detected pesticide residues, two of which exceeded Canadian pesticide regulations. The overall compliance rate for pesticide residues was 99.7%. This sample compliance rate is similar to the compliance rates of previous CFPs and also to those determined for the much larger number and scope of samples tested under the NCRMP.

There were no violations of established metal tolerances, standards or MRLs. Consistent with previous years' results, higher levels of arsenic were found in some rice-based products. The levels of metals detected in samples from the 2011 – 2012 CFP were comparable to typical concentrations of metals observed in similar foods.

Due to the limited scope and number of samples collected in the project, no clear relationships can be made between product type and country of origin. The data obtained from studies like the Children's Food Project are, however, instrumental in the assessment of the dietary exposure to pesticide residues and metals in foods consumed by Canadian children.

References

[1] Health Canada. Factsheet: Streamlining Food Regulations in Canada. April 2012. Web. 3 July 2012. http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/_2012/2012-58fs-eng.php

[2] Damodaran, Srinivasan, Kirk L. Parkin, and Owen R. Fennema. eds. *Fennema's Food Chemistry Fourth Edition.* Boca Raton FL.: CRC Press, 2008. Print.

[3] Health Canada. Food Directorate Updated Approach for Managing Dietary Exposure to Lead. October 2011. Web. 3 July 2012. http://www.hc-sc.gc.ca/fn-an/securit/chem-chim/environ/lead_strat_plomb_strat-eng.php

[4] Canadian Food Inspection Agency. National Chemical Residue Monitoring Program Annual Report. 2010-2011. Web. 30 November 2012. http://www.inspection.gc.ca/food/chemical-residues-microbiology/chemical-residues/national-chemical-residue-monitoring-program/eng/1349814013684/1349814138195

[5] European Food Safety Authority. Scientific Opinion on Arsenic in Food. 2009. Web. 15 December 2010. http://www.efsa.europa.eu/en/scdocs/scdoc/1351.htm

[6] Canadian Food Inspection Agency. Children's Food Project. 2009-2010. Web. 30 Novemeber 2012. http://www.inspection.gc.ca/food/chemical-residues-microbiology/chemical-residues/children-s-food-project/eng/1348240784372/1348241294879

[7] Canadian Food Inspection Agency. Children's Food Project. 2010-2011. Web. 30 November 2012. http://www.inspection.gc.ca/food/chemical-residues-microbiology/chemical-residues/children-s-food-project/eng/1349808202107/1349808325353

[8] European Food Safety Authority. Cadmium in food – Scientific opinion of the Panel on Contaminants in the Food Chain. Adopted 30 January 2009. Web. 13 December 2010. http://www.efsa.europa.eu/EFSA/efsa_locale-1178620753812_1211902396126.htm

[9] Health Canada. Final Human Health State of the Science Report on Lead. 2012. Web. 23 May 2013. http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/dhhssrl-rpecscepsh/index-eng.php

[10] European Food Safety Authority. Lead in food – Scientific opinion of the Panel on Contaminants in the Food Chain. Adopted 18 March 2010. Web. 4 January 2012. http://www.efsa.europa.eu/en/efsajournal/pub/1570.htm

Appendix A

Table A.1. Summary of pesticide results obtained in previous Children's Food Projects

Age Group Targeted	Remarks and pesticide residue results	Sampling Year	Sample Size
0 – 18 months	• Overall compliance rate of 99.76%	*2002 - 2003*	412
2 – 10 years	• Scope expansion to include some veterinary drug residues and metals • Overall compliance rate of 100%	*2003 - 2004*	594
0.5 – 15 years	• Overall compliance rate of 98.8%	*2004 - 2006*	1523
0.5 – 15 years	• Overall compliance rate of 100%	*2006 - 2007*	350
3 – 15 years	• Overall compliance rate of 98.6%	*2007 - 2008*	836
0 – 24 months	• Pesticide residue scope expansion from 300 to 400 residues • Overall compliance rate of 99.7%	*2008 – 2009*	382
2 – 15 years	• Overall compliance rate of 98.6%	*2009 – 2010*	821
0 – 24 months	• Overall compliance rate of 100%	*2010 – 2011*	879

Appendix B

Table B-1 List of analytes (142) included in CFIA LC/ESI-MS-MS pesticide method (PMR-006-V1.0)

3-Hydroxycarbofuran	Diniconazole	Isocarbamide	Pyrifenox
Acetochlor	Dioxacarb	Isoprocarb	Pyrimethanil
Aclonifen	Dipropetryn	Isoxathion	Pyriproxyfen
Aldicarb	Diuron	Mepanipyrim	Quinoxyfen
Aldicarb sulfone	Dodemorph	Mephosfolan	Quizalofop
Aldicarb sulfoxide	Emamectin	Methabenzthiazuron	Quizalofop-ethyl
Azaconazole	Epoxiconazole	Methiocarb	Schradan
Benomyl	Ethiofencarb	Methiocarb sulfone	Spinosad
Benoxacor	Ethiofencarb sulfone	Methiocarb sulfoxyde	Spirodiclofen
Bitertanol	Ethiofencarb sulfoxyde	Methomyl	Spiromesifen
Bromuconazole	Ethirimol	Methoxyfenozide	Spiroxamine
Butafenacil	Ethoprop	Metolcarb	Sulfentrazone
Butocarboxim sulfoxide	Etofenprox	Metoxuron	Tebufenozide
Cadusafos	Etoxazole	Molinate	Tebufenpyrad
Carbaryl	Fenamidone	Napropamide	Tebupirimfos
Carbendazim	Fenazaquin	Naptalam	Tepraloxydim
Carbofuran	Fenhexamid	Neburon	Tetraconazole
Carbosulfan	Fenoxanil	Ofurace	Thiabendazole
Carfentrazone-ethyl	Fenpropidine	Oxamyl	Thiacloprid
Chlorimuron-ethyl	Fenpropimorph	Oxamyl oxime	Thiamethoxam
Chloroxuron	Fenpyroximate	Paclobutrazol	Thiazopyr
Chlortoluron	Fentrazamide	Pencycuron	Thiodicarb
Clodinafop-propargyl	Fluazifop-butyl	Penoxsulam	Thiofanox
Cloquintocet-mexyl	Flucarbazone-sodium	Picolinafen	Thiofanox sulfone
Clothianidin	Flutolanil	Picoxystrobin	Thiofanox sulfoxyde
Cyanofenphos	Flutriafol	Piperophos	Thiophanate methyl
Cycloxydim	Forchlorfenuron	Pretilachlor	Tralkoxydim
Cycluron	Formetanate	Primisulfuron-methyl	Trichlorfon
Demeton-s-methyl sulfone	Fosthiazate	Prodiamine	Trietazine
Demeton-s-methyl sulfoxyde	Fuberidazole	Propoxur	Trifloxysulfuron
Desmedipham	Furathiocarb	Pymetrozine	Triforine
Diclocymet	Haloxyfop	Pyraclostrobin	Trimethacarb
Diethofencarb	Imazamethabenz-methyl	Pyraflufen-ethyl	Zinophos
Difenoconazole	Imidacloprid	Pyridalyl	Zoxamide
Dimethametryn	Indoxacarb	Pyridaphenthion	
Dimethomorph	Iprovalicarb	Pyridate	

Table B-2 List of analytes (299) included in third party lab method for pesticide analysis in processed products (GC-MS)

2-phenylphenol	Cyfluthrin	Flucythrinate	Parathion-methyl
3-hydroxyCarbofuran	Lambda-cyfluthrin	Fludioxinil	Pebulate
Acephate	Cypermethrin	Flumetralin	Penconazole
Acibenzolar-s-methyl	Cyprazine	Fluorochloridone	Pendimethalin
Alachlor	Cyproconazole	Fluorodifen	Pentachloroaniline
Aldicarb	Cyprodinil	Flusilazole	Cis-Permethrin 1
Aldicarb Sulfone	Cyromazine	Fluvalinate	Trans-Permethrin 2
Aldicarb Sulfoxyde	Dacthal (chlorthal-dimethyl)	Folpet	Phenthoate
Aldrin	Delta HCH	Fonofos	Phorate
Allidochlor	Deltamethrin	Heptachlor	Phorate sulfone
Ametryn	delta-trans-allethrin	Heptachlor epoxide endo	Phosalone
Aminocarb	Demeton-O	Heptanophos	Phosmet
Aramite	Demeton-S	Hexachlorobenzene	Phosphamidon
Aspon	Demeton-S-methyl	Hexaconazole	Piperonyl butoxide
Atrazine	Des-ethyl Atrazine	Hexazinone	Pirimicarb
Azinphos-ethyl	Desmetryn	Imazalil	Pirimiphos-ethyl
Azinphos-methyl	Di-allate	Iodofenphos	Pirimiphos-methyl
Azoxystrobin	Dialofos	Iprobenfos	Prochloraz
Benalaxyl	Diazinon	Iprodione	Procymidone
Bendiocarb	Diazinon o analogue	Iprodione metabolite	Prodiamine
Benfluralin	Dichlobenil	Isazophos	Profenophos
Benodanil	Dichlofluanid	Isofenphos	Profluralin
Benzoylprop-ethyl	Dichloran	Isopropalin	Prometon
ALPHA-BHC	Dichlormid	Isoprothiolane	Prometryne
BETA-BHC	Dichlorovos	Kresoxim-methyl	Pronamide
Bifenox	Diclobutrazole	Leptophos	Propachlor
Bifenthrin	Diclofenthion	Lindane	Propanil
Biphenyl	Diclofop-methyl	Linuron	Propargite
Bromacil	Dicofol	Malaoxon	Propazine
Bromophos	Dicrotophos	Malathion	Propetamphos
Bromophos-ethyl	Dieldrin	Mecarbam	Propham
Bromopropylate	Diethatyl-ethyl	Metalaxyl	Propiconazole
Bufencarb	Dimethachlor	Metazachlor	Propoxur
Bupirimate	Dimethoate	Methamidophos	Prothiophos
Buprofezin	Dinitramine	Methidathion	Pyracarbolid
Butachlor	Dioxacarb	Methiocarb	Pyrazophos
Butralin	Dioxathion	Methiocarb Sulfoxyde	Pyridaben
Butylate	Diphenamid	Methomyl	Quinalphos
Captafol	Diphenylamine	Methoprotryne	Quinomethionate
Captan	Disulfoton	Methoxychlor	Quintozene
CAPmet	Disulfoton sulfone	Methyl - trithion	Schradan

Carbaryl	Edifenphos	Methyl Pentachlorophenyl sulphide	Secbumeton
Carbetamide	Alpha-Endosulfan	Metobromuron	Simazine
Carbofenthion	Beta-Endosulfan	Metolachlor	Simetryn
Carbofuran	Endosulfan sulphate	Metribuzin	Sulfallate
Carboxin	Endrin	c-Mevinophos	Sulfotep
Chlorbenside	EPN	t-Mevinophos	Sulprophos
Chlorbenzilate	EPTC	Mexacarbate	TCMTB
Chlorbromuron	Erbon	Mirex	Tebuconazole
Chlorbufam	Esfenvalerate	Monocrotophos	Tecnazene
Cis Chlordane	Etaconazole	Monolinuron	Terbacil
Trans Chlordane	Ethalfluralin	Myclobutanil	Terbufos
Chlordimeform	Ethion	Naled	Terbumeton
Chlorfenson	Ethofumesate	Nitralin	Terbutryne
Chlorfenvinphos	Ethoprophos	Nitrapyrin	Terbutylazine
Chlorflurenol-methyl	Ethylan	Nitrofen	Tetrachlorvinphos
Chloridazon	Etridiazole	Nitrothal-isopropyl	Tetradifon
Chlormephos	Etrimfos	Norflurazon	Tetraiodoethylene
Chloroneb	Fenamiphos	Nuarimol	Tetramethrin
Chloropropylate	Fenamiphos sulfone	o,p-DDD	Tetrasul
Chlorothalonil	Fenamiphos Sulfoxyde	o,p-DDE	Thiobencarb
Chlorpropham	Fenarimol	o,p-DDT	Tolclofos-methyl
Chlorpyrifos	Fenbuconazole	Octhilinone	Tolyfluanid
Chlorpyrifos-methyl	Fenchlorophos	Omethoate	Triadimefon
Chlorthiamid	Fenfuram	Oxadiazon	Triadimenol
Chlorthion	Fenitrothion	Oxadixyl	Tri-allate
Chlorthiophos	Fenpropathrin	Oxamyl	Triazophos
Chlozolinate	Fenpropimorph	Oxycarboxin	Tribufos
Clomazone	Fenson	Oxychlordane	Tricyclazole
Coumaphos	Fensulfothion	Oxyfluorfen	Trifloxystrobin
Crotoxyphos	Fenthion	p,p-DDD	Triflumizole
Crufomate	Fenvalerate	p,p-DDE	Trifluralin
Cyanazine	Flamprop-isopropyl	p,p-DDT	Vernolate
Cyanophos	Flamprop-methyl	Paraoxon	Vinclozolin
Cycloate	Fluchloralin	Parathion	

Table B-3 List of analytes (32) included in third party method for pesticide analysis in dairy products

Alachlor	Beta-Endosulfan	o,p-DDE
Aldrin	Endosulfan sulphate	o,p-DDT
Alpha-BHC	Endrin	Oxychlordane
Beta-BHC	Fenchlorophos	p,p-DDD
Cis Chlordane	Heptachlor	p,p-DDE
Trans Chlordane	Heptachlor epoxide endo	p,p-DDT
Chlorpyrifos	Hexachlorobenzene	Cis-Permethrin 1
Cyfluthrin	Lindane	Trans-Permethrin 2
Dicofol	Methoxychlor	Quizalofop-ethyl
Dieldrin	Mirex	Tefluthrin
Alpha-Endosulfan	o,p-DDD	

Table B-4 Analytes (16) included in method entitled, "Carbamates in tissue"

aldicarb	oxamyl
aldicarb sulfone	methiocarb
aldicarb sulfoxide	carbofuran
dioxacarb	carbaryl
isoprocarb	bufencarb
propoxur	bendiocarb
promecarb	methiocarb sulfoxide
methomyl	3-hydroxycarbofuran

Appendix C

Table C-1 Comparison of detected pesticide residues to established Maximum Residue Limits for those product types with greater than 60% detected pesticide residues (all compliant).

Product Type[1]	Pesticide Residue	Number of Times Detected	Minimum (ppm)	Maximum (ppm)	Average (ppm)	Maximum Residue Limit (MRL)
Apple sauce (main ingredient is apples therefore compared to apple MRLs if specified)	Diphenylamine	23	0.0003	0.0847	0.0114	5.0 ppm
	Captan	21	0.0168	0.2904	0.0725	5.0 ppm
	Carbendazim	14	0.0008	0.0158	0.0049	5.0 ppm
	Folpet	11	0.0013	0.0113	0.0059	25 ppm
	Thiabendazole	10	0.0025	0.0678	0.0179	10 ppm
	Spinosyn A	6	0.0001	0.0004	0.0002	0.1 ppm, MRL for Spinosad (Spinosyn A + Spinosyn D)
	Spinosyn D	3	0.0001	0.0004	0.0002	0.1 ppm, MRL for Spinosad (Spinosyn A + Spinosyn D)
	Imidacloprid	5	0.0002	0.0037	0.0011	0.5 ppm
	Carbaryl	4	0.0005	0.0093	0.0030	5.0 ppm
	Formetanate	3	0.0027	0.0121	0.0060	3.0 ppm
	Thiophanate-methyl	2	0.0024	0.0051	0.0038	5.0 ppm
	Thiacloprid	2	0.0012	0.0026	0.0019	0.3 ppm
	Phosalone	2	0.0036	0.0047	0.0042	5.0 ppm
	Cyprodinil	2	0.0009	0.0018	0.0014	0.1 ppm
	Pyrimethanil	1	0.0020	0.0020	0.0020	14 ppm
	Pyraclostrobin	1	0.0007	0.0007	0.0007	1.5 ppm
	Methoxyfenozide	1	0.0001	0.0001	0.0001	1.5 ppm
	Fenpyroximate	1	0.0008	0.0008	0.0008	0.1 GMRL
	Fenhexamid	1	0.0019	0.0019	0.0019	0.1 GMRL
	Endosulfan Total	1	0.0012	0.0012	0.0012	0.1 GMRL
	Difenoconazole	1	0.0002	0.0002	0.0002	1 ppm
Dried fruits (main ingredients are apple or pear puree with other fruits for flavour)	Imidacloprid	14	0.0003	0.0153	0.0033	0.5 ppm for apples 1.0 ppm for blueberries 1.5 ppm for grapes 2.5 ppm for raspberries
	Carbaryl	12	0.0004	0.0476	0.0093	5.0 ppm for apples, pears, strawberries 10 ppm for cranberries and raspberries
	Thiabendazole	9	0.1244	0.9452	0.6186	10 ppm for apples and pears
	Pyrimethanil	8	0.0101	0.3933	0.1021	8.0 ppm for raisins 10 ppm for oranges 14 ppm for apples and pears
	Carbendazim	5	0.0024	0.0227	0.0075	5 ppm for apples, pears, strawberries
	Formetanate	4	0.0068	0.0179	0.0132	3.0 ppm for apples 0.1 ppm GMRL

Product Type[1]	Pesticide Residue	Number of Times Detected	Minimum (ppm)	Maximum (ppm)	Average (ppm)	Maximum Residue Limit (MRL)
	Methoxyfenozide	4	0.0014	0.0690	0.0199	1.5 ppm for apples and pears 0.1 ppm GMRL
	Pyraclostrobin	4	0.0016	0.0439	0.0197	1.5 ppm for apples and pears 3.5 ppm for blueberries 7.0 ppm for raisins
	Quinoxyfen	2	0.0024	0.0064	0.0044	0.5 ppm for grapes
	Thiacloprid	2	0.0010	0.0120	0.0065	0.3 ppm for apples and pears
	Clothianidin	1	0.0064	0.0064	0.0064	0.6 ppm for grapes
	Fenhexamid	1	0.0059	0.0059	0.0059	3.0 ppm for strawberries
	Fenpyroximate	1	0.0082	0.0082	0.0082	0.1 ppm GMRL
	Indoxacarb	1	0.0018	0.0018	0.0018	0.1 ppm GMRL
	Phosalone	1	0.0640	0.0640	0.0640	6.0 ppm for cherries
	Spinosyn A	1	0.0114	0.0128	0.0114	0.1 ppm, MRL for Spinosad (Spinosyn A + Spinosyn D)
	Spinosyn D	1	0.0128	0.0128	0.0128	0.1 ppm, MRL for Spinosad (Spinosyn A + Spinosyn D)
Tomato-based product (main ingredient is tomatoes therefore compared to tomato MRLs if established)	Imidacloprid	25	0.0005	0.0042	0.0019	1.0 ppm for tomatoes 6.0 ppm for tomato paste
	Difenoconazole	12	0.0003	0.0045	0.0022	0.6 ppm
	Methoxyfenozide	7	0.0001	0.0072	0.0017	0.1 ppm GMRL
	Azoxystrobin	5	0.0040	0.0152	0.0086	0.2 ppm
	Bifenthrin	5	0.0022	0.0107	0.0053	0.1 ppm GMRL
	Dimethomorph	4	0.0004	0.0074	0.0045	0.1 ppm GMRL
	Indoxacarb	3	0.0002	0.0004	0.0003	0.1 ppm GMRL
	Pyraclostrobin	3	0.0001	0.0004	0.0002	1.0 ppm
	Clothianidin	2	0.0008	0.0017	0.0013	0.1 ppm GMRL
	Oxamyl-oxime	2	0.0002	0.0008	0.0005	0.1 ppm GMRL
	Permethrin (Total)	2	0.0046	0.0087	0.0067	0.5 ppm
	Thiabendazole	2	0.0162	0.0631	0.0397	0.1 ppm GMRL
	Thiamethoxam	2	0.0009	0.0009	0.0009	0.02 ppm
	Carbaryl	1	0.0108	0.0108	0.0108	5.0 ppm
	Chlorpropham	1	0.0209	0.0209	0.0209	0.1 ppm GMRL
	Chlorpyrifos	1	0.0014	0.0014	0.0014	0.01 ppm
	Fenamidone	1	0.0086	0.0086	0.0086	1.0 ppm
	Iprodione	1	0.0102	0.0102	0.0102	0.5 ppm
	Iprovalicarb	1	0.0030	0.0030	0.0030	0.1 ppm GMRL
	Metalaxyl	1	0.0027	0.0027	0.0027	1.0 ppm
	Myclobutanil	1	0.0065	0.0065	0.0065	1.0 ppm
	Orthophenyl-phenol	1	0.0045	0.0045	0.0045	10 ppm
	Piperonyl butoxide	1	0.1477	0.1477	0.1477	8.0 ppm
	Spinosyn A	1	0.0004	0.0004	0.0004	0.2 ppm, MRL for Spinosad (Spinosyn A + Spinosyn D)
	Tebufenozide	1	0.0001	0.0001	0.0001	2.0 ppm

[1] An MRL applies to the identified raw agricultural food commodity as well as to any processed food product that contains it. Where a processed product may require a higher MRL than that specified for its raw agricultural commodity, separate MRLs are specified. (http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/food-nourriture/mrl-lmr-eng.php)

Appendix D

Table D-1 Levels of metals observed in the product types tested.

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Aluminum	Apple sauce	31	3	28	0.096	0.834	0.274
	Breakfast cereals	35		35	0.387	120.200	12.332
	Candy	24	1	23	0.244	39.656	9.358
	Canned meats	6		6	0.229	1.315	0.708
	Cheese	22		22	0.061	4.753	0.547
	Cookies/crackers/cakes	83	2	81	0.700	195.200	13.430
	Dried fruits	37	2	35	0.384	329.818	18.018
	Drinks/juices	73	24	49	0.090	4.881	0.820
	Fruit- or vegetable-based products	87	12	75	0.091	79.748	2.748
	Milk-based drinks	25	1	24	0.036	1.454	0.329
	Other	29		29	0.342	614.500	54.858
	Pasta (canned/dry)	44	1	43	0.299	156.500	10.463
	Rice-based products	58	4	54	0.104	163.220	12.890
	Tomato-based product	38		38	0.294	73.585	4.568
	Yogurt	13		13	0.034	0.443	0.222
	Snackfood	67		67	0.091	51.907	3.502
	Nut-based products	38		38	0.362	24.340	7.488
Antimony	Apple sauce	31	31		-	-	-
	Breakfast cereals	35	34	1	0.007	0.007	0.007
	Candy	24	23	1	0.072	0.072	0.072
	Canned meats	6	6		-	-	-
	Cheese	22	22		-	-	-
	Cookies/crackers/cakes	83	83		-	-	-
	Dried fruits	37	34	3	0.007	0.176	0.066
	Drinks/juices	73	70	3	0.003	0.038	0.017
	Fruit- or vegetable-based products	87	78	9	0.005	0.046	0.018
	Milk-based drinks	25	25		-	-	-
	Other	29	28	1	0.011	0.011	0.011
	Pasta (canned/dry)	44	43	1	0.010	0.010	0.010
	Rice-based products	58	57	1	0.009	0.009	0.009
	Tomato-based product	38	37	1	0.004	0.004	0.004
	Yogurt	13	13		-	-	-
	Snackfood	67	67		-	-	-
	Nut-based products	38	37	1	0.009	0.009	0.009

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Arsenic	Apple sauce	31	25	6	0.005	0.007	0.006
	Breakfast cereals	35	25	10	0.009	0.422	0.057
	Candy	24	14	10	0.005	0.048	0.021
	Canned meats	6	2	4	0.007	0.019	0.013
	Cheese	22	1	21	0.006	0.030	0.013
	Cookies/crackers/cakes	83	62	21	0.009	0.091	0.032
	Dried fruits	37	18	19	0.009	0.134	0.046
	Drinks/juices	73	55	18	0.004	0.028	0.009
	Fruit- or vegetable-based products	87	59	28	0.004	0.148	0.016
	Milk-based drinks	25	14	11	0.005	0.011	0.007
	Other	29	12	17	0.005	0.050	0.017
	Pasta (canned/dry)	44	31	13	0.006	0.061	0.024
	Rice-based products	58	1	57	0.004	0.435	0.120
	Tomato-based product	38	24	14	0.004	0.034	0.008
	Yogurt	13	4	9	0.005	0.009	0.007
	Snackfood	67	40	27	0.005	0.082	0.022
	Nut-based products	38	10	28	0.008	0.064	0.028
Beryllium	Apple sauce	31	31		-	-	-
	Breakfast cereals	35	30	5	0.002	0.005	0.004
	Candy	24	21	3	0.001	0.003	0.002
	Canned meats	6	6		-	-	-
	Cheese	22	22		-	-	-
	Cookies/crackers/cakes	83	76	7	0.002	0.004	0.003
	Dried fruits	37	35	2	0.002	0.003	0.002
	Drinks/juices	73	67	6	0.001	0.002	0.001
	Fruit- or vegetable-based products	87	80	7	0.002	0.004	0.003
	Milk-based drinks	25	25		-	-	-
	Other	29	29		-	-	-
	Pasta (canned/dry)	44	38	6	0.001	0.005	0.003
	Rice-based products	58	50	8	0.001	0.006	0.002
	Tomato-based product	38	38		-	-	-
	Yogurt	13	13		-	-	-
	Snackfood	67	60	7	0.002	0.004	0.003
	Nut-based products	38	33	5	0.002	0.003	0.002

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Boron	Apple sauce	31		31	1.906	4.244	2.979
	Breakfast cereals	35		35	0.367	25.897	2.351
	Candy	24	1	23	0.073	9.207	2.662
	Canned meats	6		6	0.077	0.341	0.209
	Cheese	22		22	0.068	1.776	0.450
	Cookies/crackers/cakes	83	1	82	0.167	3.186	1.090
	Dried fruits	37		37	0.739	24.426	11.353
	Drinks/juices	73	4	69	0.022	6.645	1.179
	Fruit- or vegetable-based products	87	1	86	0.118	19.308	1.997
	Milk-based drinks	25	4	21	0.066	7.904	0.624
	Other	29	1	28	0.079	3.812	1.043
	Pasta (canned/dry)	44		44	0.357	6.237	0.845
	Rice-based products	58	1	57	0.183	3.216	1.078
	Tomato-based product	38		38	0.703	10.765	2.004
	Yogurt	13		13	0.176	0.441	0.253
	Snackfood	67	2	65	0.097	5.097	1.022
	Nut-based products	38		38	2.461	39.986	14.634
Cadmium	Apple sauce	31	30	1	0.002	0.002	0.002
	Breakfast cereals	35	10	25	0.005	0.284	0.030
	Candy	24	11	13	0.007	0.091	0.040
	Canned meats	6	6		-	-	-
	Cheese	22	19	3	0.002	0.004	0.003
	Cookies/crackers/cakes	83	7	76	0.004	0.095	0.024
	Dried fruits	37	22	15	0.002	0.026	0.013
	Drinks/juices	73	63	10	0.002	0.042	0.009
	Fruit- or vegetable-based products	87	44	43	0.002	0.104	0.014
	Milk-based drinks	25	24	1	0.002	0.002	0.002
	Other	29	7	22	0.003	0.161	0.025
	Pasta (canned/dry)	44	3	41	0.008	0.122	0.034
	Rice-based products	58	21	37	0.004	0.184	0.022
	Tomato-based product	38	2	36	0.009	0.088	0.021
	Yogurt	13	13		-	-	-
	Snackfood	67	24	43	0.003	0.098	0.017
	Nut-based products	38	1	37	0.002	0.210	0.053

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Chromium	Apple sauce	31	24	7	0.010	0.031	0.022
	Breakfast cereals	35	5	30	0.043	0.467	0.104
	Candy	24	8	16	0.035	0.484	0.187
	Canned meats	6	1	5	0.013	0.073	0.035
	Cheese	22	1	21	0.014	0.104	0.038
	Cookies/crackers/cakes	83	18	65	0.017	0.568	0.139
	Dried fruits	37	4	33	0.037	0.779	0.121
	Drinks/juices	73	59	14	0.021	0.081	0.031
	Fruit- or vegetable-based products	87	34	53	0.011	2.721	0.167
	Milk-based drinks	25	15	10	0.013	0.171	0.046
	Other	29	3	26	0.015	0.625	0.120
	Pasta (canned/dry)	44	13	31	0.011	92.140	3.034
	Rice-based products	58	10	48	0.014	0.333	0.106
	Tomato-based product	38	5	33	0.024	0.202	0.059
	Yogurt	13	11	2	0.010	0.011	0.011
	Snackfood	67	18	49	0.010	0.437	0.112
	Nut-based products	38	2	36	0.014	0.456	0.126
Cobalt	Apple sauce	29	20	9	0.001	0.002	0.001
	Breakfast cereals	26	1	25	0.002	0.104	0.025
	Candy	16	6	10	0.002	0.365	0.114
	Cookies/crackers/cakes	52	4	48	0.002	0.126	0.026
	Dried fruits	36	2	34	0.002	0.151	0.026
	Drinks/juices	68	33	35	0.001	0.024	0.004
	Fruit- or vegetable-based products	69	12	57	0.001	0.096	0.012
	Other	7	1	6	0.004	0.062	0.022
	Pasta (canned/dry)	27	2	25	0.002	0.020	0.006
	Rice-based products	42		42	0.001	0.115	0.019
	Tomato-based product	38		38	0.003	0.091	0.012
	Snackfood	41	7	34	0.001	0.073	0.014
	Nut-based products	14		14	0.015	0.184	0.066

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Copper	Apple sauce	31		31	0.218	0.667	0.316
	Breakfast cereals	35		35	0.540	4.581	2.464
	Candy	24		24	0.072	10.248	2.657
	Canned meats	6		6	0.464	1.001	0.702
	Cheese	22		22	0.171	5.372	0.551
	Cookies/crackers/cakes	83		83	0.354	5.566	1.851
	Dried fruits	37		37	0.237	5.025	2.066
	Drinks/juices	73	20	53	0.023	1.427	0.260
	Fruit- or vegetable-based products	87	2	85	0.025	7.360	1.129
	Milk-based drinks	25	5	20	0.048	0.430	0.166
	Other	29		29	0.045	6.565	1.472
	Pasta (canned/dry)	44		44	0.412	3.755	1.824
	Rice-based products	58		58	0.084	3.612	1.728
	Tomato-based product	38		38	0.326	5.771	1.224
	Yogurt	13		13	0.051	0.176	0.116
	Snackfood	67	2	65	0.032	5.135	1.260
	Nut-based products	38		38	2.769	23.550	6.812
Iron	Apple sauce	31		31	0.451	1.523	0.785
	Breakfast cereals	35		35	5.975	268.500	89.812
	Candy	24	2	22	0.641	99.124	23.233
	Canned meats	6		6	5.720	18.350	10.474
	Cheese	22		22	0.903	1.937	1.380
	Cookies/crackers/cakes	83		83	2.628	128.860	30.399
	Dried fruits	37		37	0.955	59.946	9.854
	Drinks/juices	73	32	41	0.310	6.865	2.246
	Fruit- or vegetable-based products	87	6	81	0.348	65.979	7.264
	Milk-based drinks	25	13	12	0.322	8.888	2.308
	Other	29	2	27	0.752	51.980	19.643
	Pasta (canned/dry)	44		44	2.747	51.441	16.678
	Rice-based products	58	1	57	0.325	269.900	32.670
	Tomato-based product	38		38	1.585	83.304	9.341
	Yogurt	13	1	12	0.307	0.847	0.495
	Snackfood	67	6	61	0.324	68.870	15.361
	Nut-based products	38		38	12.840	60.525	28.171

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Lead	Apple sauce	31	25	6	0.001	0.002	0.001
	Breakfast cereals	35	11	24	0.002	0.028	0.006
	Candy	24	7	17	0.002	0.035	0.014
	Canned meats	6	2	4	0.002	0.012	0.005
	Cheese	22		22	0.002	0.026	0.007
	Cookies/crackers/cakes	83	22	61	0.002	0.069	0.012
	Dried fruits	37	5	32	0.002	0.151	0.018
	Drinks/juices	73	38	35	0.001	0.025	0.004
	Fruit- or vegetable-based products	87	20	67	0.001	0.051	0.008
	Milk-based drinks	25	18	7	0.002	0.006	0.003
	Other	29	8	21	0.003	0.140	0.022
	Pasta (canned/dry)	44	18	26	0.001	0.039	0.009
	Rice-based products	58	22	36	0.003	0.129	0.014
	Tomato-based product	38	2	36	0.001	0.081	0.007
	Yogurt	13	12	1	0.008	0.008	0.008
	Snackfood	67	23	44	0.002	0.024	0.006
	Nut-based products	38	7	31	0.002	0.038	0.009
Magnesium	Apple sauce	31		31	24.836	40.356	32.037
	Breakfast cereals	35		35	145.200	1351.000	691.558
	Candy	24		24	1.802	1488.936	453.122
	Canned meats	6		6	132.600	185.700	154.117
	Cheese	22		22	66.220	347.600	256.955
	Cookies/crackers/cakes	83		83	64.519	961.800	314.300
	Dried fruits	37		37	11.982	762.070	365.789
	Drinks/juices	73		73	0.045	178.800	46.719
	Fruit- or vegetable-based products	87		87	3.885	1023.566	186.172
	Milk-based drinks	25		25	10.590	146.600	77.837
	Other	29		29	5.323	857.400	253.557
	Pasta (canned/dry)	44		44	101.776	1050.419	367.562
	Rice-based products	58		58	25.085	1199.069	467.616
	Tomato-based product	38		38	78.947	1107.364	213.020
	Yogurt	13		13	107.200	160.600	127.031
	Snackfood	67		67	4.972	1320.000	393.269
	Nut-based products	38		38	455.465	2930.000	1534.592

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Manganese	Apple sauce	31		31	0.179	0.840	0.328
	Breakfast cereals	35		35	0.998	36.110	15.253
	Candy	24	6	18	0.040	13.462	5.102
	Canned meats	6		6	0.076	0.553	0.242
	Cheese	22		22	0.094	0.241	0.166
	Cookies/crackers/cakes	83		83	0.151	26.775	5.919
	Dried fruits	37		37	0.339	76.653	8.893
	Drinks/juices	73	17	56	0.021	5.395	0.682
	Fruit- or vegetable-based products	87	3	84	0.030	27.786	3.358
	Milk-based drinks	25	5	20	0.024	0.438	0.167
	Other	29	2	27	0.028	8.789	3.556
	Pasta (canned/dry)	44		44	0.549	12.945	5.884
	Rice-based products	58		58	0.142	38.564	11.188
	Tomato-based product	38		38	0.473	10.122	1.573
	Yogurt	13		13	0.029	0.679	0.145
	Snackfood	67	4	63	0.025	19.018	4.957
	Nut-based products	38		38	4.307	81.680	19.303
Mercury	Apple sauce	31	29	2	0.0001	0.0001	0.0001
	Breakfast cereals	35	33	2	0.0008	0.0063	0.0035
	Candy	24	21	3	0.0049	0.0069	0.0058
	Canned meats	6	3	3	0.0002	0.0004	0.0002
	Cheese	22	3	19	0.0002	0.0008	0.0003
	Cookies/crackers/cakes	83	74	9	0.0001	0.0010	0.0005
	Dried fruits	37	34	3	0.0020	0.0333	0.0129
	Drinks/juices	73	71	2	0.0033	0.0035	0.0034
	Fruit- or vegetable-based products	87	78	9	0.0001	0.0015	0.0004
	Milk-based drinks	25	16	9	0.0002	0.0006	0.0004
	Other	29	28	1	0.0003	0.0003	0.0003
	Pasta (canned/dry)	44	38	6	0.0002	0.0032	0.0008
	Rice-based products	58	43	15	0.0001	0.0074	0.0026
	Tomato-based product	38	38		0.0002	0.0005	0.0003
	Yogurt	13	4	9	0.0001	0.0009	0.0003
	Snackfood	67	60	7	0.0001	0.0039	0.0006
	Nut-based products	38	27	11	0.0001	0.0001	0.0001

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Molybdenum	Apple sauce	31	2	29	0.003	0.010	0.006
	Breakfast cereals	35	1	34	0.092	1.615	0.601
	Candy	24	7	17	0.005	1.606	0.196
	Canned meats	6	4	2	0.034	0.109	0.072
	Cheese	22		22	0.036	0.351	0.142
	Cookies/crackers/cakes	83	8	75	0.020	0.639	0.272
	Dried fruits	37	2	35	0.007	0.154	0.052
	Drinks/juices	73	26	47	0.002	0.505	0.054
	Fruit- or vegetable-based products	87	9	78	0.002	3.201	0.177
	Milk-based drinks	25	8	17	0.023	0.055	0.044
	Other	29	5	24	0.007	0.264	0.125
	Pasta (canned/dry)	44	1	43	0.058	0.860	0.331
	Rice-based products	58		58	0.032	2.072	0.452
	Tomato-based product	38		38	0.032	0.314	0.080
	Yogurt	13		13	0.053	0.100	0.067
	Snackfood	67	8	59	0.003	0.943	0.219
	Nut-based products	38		38	0.034	2.945	0.547
Nickel	Apple sauce	31	12	19	0.006	0.016	0.009
	Breakfast cereals	35		35	0.090	1.908	0.680
	Candy	24	5	19	0.011	3.111	0.838
	Canned meats	6	4	2	0.010	0.066	0.038
	Cheese	22	2	20	0.013	0.178	0.047
	Cookies/crackers/cakes	83	3	80	0.015	1.329	0.314
	Dried fruits	37		37	0.012	1.360	0.221
	Drinks/juices	73	26	47	0.005	0.599	0.063
	Fruit- or vegetable-based products	87	5	82	0.007	1.471	0.163
	Milk-based drinks	25	15	10	0.010	0.118	0.060
	Other	29	2	27	0.023	1.545	0.304
	Pasta (canned/dry)	44		44	0.028	0.498	0.104
	Rice-based products	58		58	0.017	0.909	0.244
	Tomato-based product	38		38	0.028	0.480	0.112
	Yogurt	13	12	1	0.017	0.017	0.017
	Snackfood	67	8	59	0.006	1.177	0.241
	Nut-based products	38		38	0.349	11.190	1.935

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Selenium	Apple sauce	31	23	8	0.004	0.029	0.009
	Breakfast cereals	35	7	28	0.010	0.822	0.149
	Candy	24	8	16	0.009	0.392	0.060
	Canned meats	6		6	0.111	0.237	0.181
	Cheese	22		22	0.023	0.293	0.167
	Cookies/crackers/cakes	83	20	63	0.008	0.362	0.090
	Dried fruits	37	6	31	0.006	0.043	0.015
	Drinks/juices	73	52	21	0.004	0.044	0.010
	Fruit- or vegetable-based products	87	34	53	0.003	0.934	0.069
	Milk-based drinks	25	14	11	0.022	0.035	0.028
	Other	29	7	22	0.008	0.315	0.094
	Pasta (canned/dry)	44	2	42	0.011	1.302	0.343
	Rice-based products	58	9	49	0.003	0.276	0.094
	Tomato-based product	38	1	37	0.003	0.054	0.015
	Yogurt	13		13	0.025	0.090	0.041
	Snackfood	67	22	45	0.003	0.369	0.087
	Nut-based products	38	7	31	0.019	0.525	0.100
Tin	Apple sauce	31	31		-	-	-
	Breakfast cereals	35	35		-	-	-
	Candy	24	23	1	0.235	0.235	0.235
	Canned meats	6	3	3	0.035	0.294	0.157
	Cheese	22	19	3	0.037	0.161	0.095
	Cookies/crackers/cakes	83	81	2	0.063	0.116	0.090
	Dried fruits	37	37		-	-	-
	Drinks/juices	73	71	2	0.114	2.553	1.333
	Fruit- or vegetable-based products	87	66	21	0.022	89.553	19.846
	Milk-based drinks	25	25		-	-	-
	Other	29	28	1	0.021	0.021	0.021
	Pasta (canned/dry)	44	36	8	0.046	0.256	0.132
	Rice-based products	58	58		-	-	-
	Tomato-based product	38	26	12	0.129	23.490	2.676
	Yogurt	13	13		-	-	-
	Snackfood	67	63	4	0.029	0.252	0.163
	Nut-based products	38	34	4	0.023	0.251	0.081

Metal Analyte	Product Type	Total # of samples	Total # negative	Total # positive	Min (ppm)	Max (ppm)	Mean (ppm)
Titanium	Apple sauce	31	2	29	0.031	0.121	0.061
	Breakfast cereals	35	4	31	0.319	2.212	1.119
	Candy	24	2	22	0.032	4.313	0.668
	Canned meats	6	1	5	0.091	0.187	0.160
	Cheese	22		22	0.154	1.030	0.539
	Cookies/crackers/cakes	83	15	68	0.171	39.970	1.383
	Dried fruits	37		37	0.033	1.366	0.556
	Drinks/juices	73	7	66	0.014	0.308	0.094
	Fruit- or vegetable-based products	87	10	77	0.025	2.178	0.362
	Milk-based drinks	25	9	16	0.051	0.112	0.074
	Other	29	2	27	0.082	8.490	1.063
	Pasta (canned/dry)	44	12	32	0.066	2.392	0.808
	Rice-based products	58	10	48	0.083	1.999	0.888
	Tomato-based product	38		38	0.118	2.956	0.367
	Yogurt	13		13	0.054	0.144	0.104
	Snackfood	67	9	58	0.051	6.830	1.274
	Nut-based products	38		38	0.197	4.272	1.248
Zinc	Apple sauce	31	3	28	0.095	0.372	0.152
	Breakfast cereals	35		35	3.211	53.870	20.303
	Candy	24	5	19	0.126	25.370	8.986
	Canned meats	6		6	8.762	17.390	12.575
	Cheese	22		22	3.092	36.440	21.811
	Cookies/crackers/cakes	83		83	0.746	23.210	6.945
	Dried fruits	37	2	35	0.397	10.114	3.502
	Drinks/juices	73	35	38	0.096	6.437	1.131
	Fruit- or vegetable-based products	87	10	77	0.118	30.173	3.729
	Milk-based drinks	25		25	0.333	7.247	2.657
	Other	29	3	26	0.332	17.960	7.356
	Pasta (canned/dry)	44		44	2.308	331.100	15.973
	Rice-based products	58		58	0.470	43.236	10.800
	Tomato-based product	38		38	0.812	12.930	2.269
	Yogurt	13		13	3.095	7.214	4.113
	Snackfood	67	2	65	0.103	25.040	8.164
	Nut-based products	38		38	6.425	57.050	23.153