



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Children's Food Project - Annual report

2018 to 2019



Summary

The Canadian Food Inspection Agency (CFIA) uses a number of different monitoring programs for chemical residues and contaminants in food to ensure that the food supply is safe and compliant with Canadian standards. The Children's Food Project (CFP) complements these activities by specifically collecting information on chemical residues and contaminants in manufactured foods frequently consumed by, and targeted to, infants and children. Because of their smaller body weight, their development and growth, and their consumption patterns this group may be at higher risk from exposure to these chemicals.

The main objectives of the 2018 to 2019 CFP were to:

- Collect data and assess the compliance of infant foods to Canadian standards for residues of veterinary drugs, pesticides and metals
- Collect baseline data on the levels of aflatoxin M1 in infant foods and formula containing milk

In the 2018 to 2019 CFP, a total of 143 samples of infant and toddler foods were purchased in the Ottawa, Ontario and Gatineau, Quebec areas. These samples included dairy and soy infant formula, pasta, baby/toddler meals containing meat, baby/toddler meals containing dairy and pureed infant food containing meat. Samples were analyzed for pesticide residues, veterinary drug residues, metals and aflatoxin M1 (in dairy-based samples).

The overall regulatory compliance rate of the infant and toddler food samples tested for pesticide and veterinary drug residues was 100%. Over 64% of the 143 samples tested did not contain any detectable pesticide residues. Veterinary drug residues were not detected in approximately 93% of the 99 samples of infant formula or infant food containing meat.

All samples were tested for metals and over 59% of samples did not contain detectable levels of metals of concern (arsenic, cadmium, lead and mercury). The levels of metals found in the remaining samples were reviewed by HC and were not considered a health risk.

A total of 52 dairy infant formula samples were tested for aflatoxin M1. Aflatoxin M1 was not detected in 81% of the samples. All of the samples with detectable levels were below the Codex Alimentarius maximum level (ML) of 0.5 parts per billion (ppb). The levels of aflatoxin M1 found in infant formula were assessed by Health Canada (HC) and were not considered to be of concern to infant health.

Data obtained from surveillance programs like the CFP are useful in the assessment of the dietary exposure of Canadian children to pesticide residues, veterinary drug residues, metals and aflatoxin M1 in infant foods. All data was reviewed by HC and no health risk was identified to Canadian infants and toddlers.

What is the children's food project

The CFP began in 2003 to look at levels of pesticide residues and metals, in foods for infants and children. Because of their smaller body weight, their development and growth, and their consumption patterns, this group may be at higher risk from exposure to these chemicals.

The CFIA uses a number of different monitoring programs to ensure that the food supply is safe and compliant with Canadian standards. The CFP complements these activities by specifically collecting information on domestically produced and imported manufactured foods frequently consumed by and targeting children (for example, infant formula, cereal-based products, fruit juices and beverages). Together, the data from these programs help health authorities assess potential exposure to chemical residues and contaminants in a number of foods consumed by Canadian children.

The main objectives of the 2018 to 2019 CFP were to:

- Collect data and assess the compliance of infant foods to Canadian standards for residues of veterinary drugs, pesticides and metals
- Collect baseline data on the levels of aflatoxin M1 in infant foods and formula containing milk

What did we sample

In total, 143 domestic and imported infant foods were sampled for this survey. Of the 143 samples, 28 were labelled as organic. Both imported and domestically-produced foods were sampled with 6 products manufactured in Canada, 106 imported from other countries and 31 products from an unknown country of origin.

Table 1. Breakdown of products sampled in 2018 to 2019

Infant food	Number of samples
Purees containing meat (for example, beef, lamb, veal, meat with mixed vegetables)	38
Dairy-based infant formula (for example, milk-based, nutritional supplements)	52
Soy-based infant formula	7
Toddler/baby meals (for example, ready-to-eat meals)	11
Pasta (dried and canned)	35
Total	143

Sampling limitations

Due to the limited number of samples and products analyzed, care must be taken when interpreting these results. Regional differences, impact of product shelf-life, storage conditions, or cost of the commodity on the open market were not examined in this survey. Samples were tested as sold, which means the product was tested as is and not prepared according to package instructions.

How were samples analyzed and assessed

Analytical testing for the various types of analytes was performed by ISO/IEC 17025 accredited food testing laboratories under contract with the Government of Canada.

Pesticide analysis

Samples were tested for residues such as phenoxy herbicides (2,4-D, MCPA, florasulam, metsulfuron-methyl, thien carbazon methyl, bromoxynil, bentazone, fluroxypyr, clopyralid), glyphosate, diquat and paraquat which are commonly used in farming to control weeds.

Veterinary drug analysis

Samples containing meat and milk were analyzed for veterinary drug residues, which can be administered to food-producing animals to prevent or treat disease or to promote growth. The veterinary drugs analyzed are listed in Tables A-1 and A-2 of [Appendix A](#).

Metals analysis

Many metals are present in food due to their natural presence in the environment, but they could also be present due to the use of pesticides, agricultural chemicals, environmental contamination or processing. All samples were tested for metals. The focus of this report will be on metals of primary concern, which are arsenic, cadmium, lead and mercury which can be harmful to human health.

Aflatoxin M1 analysis

Aflatoxins are natural chemicals released by moulds which can thrive in hot, humid climates but are not typically detected in Canadian crops. Aflatoxin B1, which has been classified by the International Agency for Research on Cancer (IARC) as causing cancer in humans¹, is metabolized to aflatoxin M1, which is excreted in milk when contaminated feeds are consumed by milk-producing food animals. Animal studies have shown that aflatoxin M1 causes cancer in the same way as aflatoxin B1^{1,2}. For this reason, all samples of dairy-based infant formula were analyzed for aflatoxin M1.

Assessment of results

The pesticide and veterinary drug residue results from samples tested in the project were evaluated against Canadian MRLs established by HC. For pesticides, the MRL is the maximum amount of residues that is expected to remain in or on food products when a pesticide is used according to product label directions. For veterinary drug residues, the MRL is a level of residue that could safely remain in the tissue or food product derived from a food-producing animal that has been treated with a veterinary drug.

Canadian pesticide MRLs are listed in the [MRL Database](#)³ published on the HC website. In the absence of an 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*.

Canadian MRLs for veterinary drug residues in foods are published in the [List of MRLs for Veterinary Drugs in Food](#)⁴ on HC's website. In the absence of an MRL or proposed MRL for a veterinary drug, the CFIA deems any food product containing a residue at or above the limit of quantitation (LOQ) to be non-compliant.

A list of banned drugs is published on HC's [website](#)⁵. Any detected levels of banned substances are not permitted under the *Food and Drug Regulations* as seen on the Government of Canada [website](#).

Maximum levels for contaminants in food are found in the [List of Contaminants and other Adulterating Substances in Foods](#) or the [List of Maximum Levels for Various Chemical Contaminants in Foods](#). HC

has not established regulatory maximum levels for arsenic, cadmium, mercury or aflatoxins for any of the products in this survey. The maximum level for lead in infant formula was recently revised to 0.01 ppm and applies to all infant formula as consumed. The results for chemical contaminants from this survey were assessed by HC and were not considered to be of concern to children or infants.

What were the results

Pesticides

A total of 429 tests for pesticide residues were carried out on 143 samples. Glyphosate, phenoxy herbicides, diquat and paraquat residues were analysed. There were no detected levels of phenoxy herbicides, diquat and paraquat residues in any of the samples. No detectable levels of glyphosate residues were found in 64.3% of the infant foods tested (92 samples). The results from the remaining 51 samples had levels of glyphosate ranging from 0.0056 to 0.974 ppm. All samples were compliant to Canadian regulations.

In this study, 28 of the 143 samples were labelled as “organic”. There were no pesticide residues detected in 89.3% of organic products tested. Three samples (10.7%) had levels of glyphosate ranging from 0.0077 to 0.0317 ppm which is well below Canadian MRLs.

Veterinary drugs

A total of 1884 tests for veterinary drug residues were carried out on 99 samples of infant foods (38 infant purees containing meat, 9 baby/toddler meals containing meat and 52 milk-based infant formula). No residues were detected in 92.9% of the samples. There were 7 veterinary drug residues detected: thiabendazole, nicarbazin, testosterone, ractopamine, florfenicol and sulfamethazine. All levels were below Canadian MRLs and compliant with regulations.

Metals

All 143 samples were tested for metals and 59% did not have detected levels for arsenic, cadmium, lead and mercury. A summary of metals results can be found in Table B-1 of [Appendix B](#). All metals results were sent to HC’s Bureau of Chemical Safety (BCS) for review and samples were considered safe for children and infants.

Arsenic

Arsenic is an element that naturally occurs in the earth’s crust and can be found in 2 chemical forms: organic (contains carbon atoms) and inorganic. In general, inorganic arsenic is more toxic to humans than organic arsenic. Long-term exposure to high levels of inorganic arsenic is known to contribute to the risk of human cancer and can affect the gastrointestinal tract, kidneys, liver, lungs and skin.⁶ For most Canadians, the primary source of exposure to arsenic is food, followed by drinking water, soil and air.⁷

A total of 4.2% of samples had detected levels of total arsenic (includes organic and inorganic forms). Five samples of infant puree and 1 sample of dairy-based infant formula contained levels of arsenic between 0.02 to 0.064 ppm.

Cadmium

There are no Canadian regulatory limits for cadmium levels in food and are assessed on a case-by-case basis. Cadmium can be present in water and soil through the use of phosphate fertilizers or sewage sludge. Food grown in cadmium containing soils is the primary source of cadmium exposure in the general population⁸. Kidneys and bones are affected by cadmium toxicity⁸.

Cadmium levels were found in 45 samples (31.5%). Pasta had the highest level of cadmium ranging from 0.011 to 0.074 ppm in 94.3% of samples. There were no detected levels of cadmium in dairy-based infant formula samples.

Lead

Lead exposure may occur from a number of environmental and food sources. Chronic exposure to low levels of lead can be harmful to human health. Lead occurs naturally in the environment and has many industrial uses, such as in mining, smelting and battery manufacturing.⁹ The greatest sources of a child's environmental exposure to lead are oral exposure from food and water along with ingestion of house dust and soil contaminated with lead.⁹

Three of the 59 infant formula samples contained levels of lead ranging from 0.016 to 0.019 ppm. One sample of dried pasta contained a level of 0.03 ppm of lead. Although the levels found in infant formula samples were above the 0.01 ppm limit, the samples were not tested as consumed, meaning they were tested in powder form. This would lead to a higher concentration than if it was tested as normally consumed.

Mercury

Although mercury is released naturally from rocks, soils and volcanoes, industrial activities have increased the amount of mercury in the environment.¹⁰ Mercury contamination is a concern because it is toxic, persists in the environment, and can bioaccumulate in the food chain. The health effects of mercury depend on its chemical form (elemental, inorganic, organic), the route and level of exposure. Methyl mercury is the more toxic organic form and is easily absorbed and can cross the blood-brain barrier. Children and the developing fetus are particularly susceptible to the harmful effects of methyl mercury.

Five samples of infant purees containing meat and 3 baby/toddler meals contained levels of mercury ranging from 0.00052 to 0.00079 ppm.

Aflatoxin M1

A total of 52 dairy-based infant formula samples were tested for aflatoxin M1. As Canada does not have an established maximum level for aflatoxin M1 in milk or milk-based products, compliance was not assessed. The aflatoxin levels detected were compared to the Codex Alimentarius (an international standard setting body) ML of 0.5 ppb for aflatoxin M1 in milk. Aflatoxin M1 was detected in 10 of the 52 samples of infant formula at levels well below the Codex ML. Levels ranged from 0.01 ppb to 0.086 ppb which are well below the ML of 0.5 ppb. All results were sent to HC's BCS for review and samples were considered safe for children and infants.

Conclusion

The results of the CFP were shared with HC and they determined that none of the samples tested posed a health risk to Canadian infants. There were no product actions or recalls resulting from this sampling and testing on the basis of health risk. The infant foods tested in this survey, whether domestically produced or imported, are safe for consumption.

CFIA is committed to ensuring a safe food supply for all Canadians, including the vulnerable populations such as infants and young children. In the coming year, pesticide residues, toxic metals (arsenic, cadmium, mercury and lead) and melamine will be examined in pureed infant food, infant cereal, infant snacks, dairy-based infant formula and yogurt samples.

References

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2. Aflatoxin M1. (2001). JECFA Food Additives Series, 47.
3. [Maximum Residue Limits for Pesticides](#). (2012). Canada. Health Canada.
4. [List of Maximum Residue Limits \(MRLs\) for Veterinary Drugs in Foods](#). (2018). Canada. Health Canada.
5. [List of Banned Drugs](#). (2005). Canada. Health Canada.
6. [Arsenic](#). 2008. Canada. Health Canada. 2008
7. [Arsenic in Drinking Water](#). 2006. Canada. Health Canada.
8. Scientific Opinion of the Panel on Contaminants in the Food Chain on a Request from the European Commission on Cadmium in Food. (2009). The EFSA Journal, 980, pp. 1-139.
9. [Final Human Health State of Science Report on Lead](#). 2013. Canada. Health Canada.
10. [Mercury and Human Health](#). 2008. Canada. Health Canada.

Appendix A

Table A-1 Antibiotics multi-residue method

Amoxicillin	Enrofloxacin	Sulfadiazine
Ampicillin	Erythromycin	Sulfadimethoxine
Cefazolin	Florfenicol	Sulfadoxine
Cephalexin	Nafcillin	Sulfaethoxypyridazine
Chloramphenicol	Neospiramycin	Sulfamethazine
Chlortetracycline	Oleandomycin	Sulfamethoxypyridazine
Ciprofloxacin	Oxacillin	Sulfaquinoxaline
Cloxacillin	Oxytetracycline	Sulfathiazole
Danofloxacin	Penicillin G	Tetracycline
Desacetyl Cephapirin	Sarafloxacin	Thiamphenicol
Dicloxacillin	Spiramycin	Tilmicosin
Doxycycline	Sulfachloropyridazine	Tylosin

Table A-2 Other veterinary drug analytes (134)

19-Nortestosterone	Diclofenac	Maduramicin	Ronidazole
2,3,4,5-tetrachlorophenol	Difloxacin	Marbofloxacin	Salinomycin
2,3,4,6-tetrachlorophenol	Dihydrostreptomycin	Mebendazole	Sisomicin
2,3,5,6-tetrachlorophenol	Dimetridazole	Mefenamic Acid	Sparfloxacin
20-Dihydroprednisolone	Dinitolmide	Megestrol Acetate	Spectinomycin
20-Dihydroprednisone	Doramectin	Melengestrol Acetate	Streptomycin
2-Aminosulfone Albendazole	Enamectin	Meloxicam	Sulfabenzamide
5-Hydroxythiabendazole	Enoxacin	Methylprednisolone	Sulfacetamide
Abamectin	Epi-19-Nortestosterone	Metronidazole	Sulfaguandine
Albendazole	Epi-Testosterone	Monensin	Sulfamerazine
Albendazole Sulfone	Eprinomectin	Moxidectin	Sulfameter
Albendazole Sulfoxide	Etodolac	Nalidixic Acid	Sulfamethizole
Alpha-Trenbolone	Fenbendazole	Naproxen	Sulfamethoxazole
Amikacin	Fenbendazole Sulfone	Narasin	Sulfamonomethoxine
Amprolium	Flubendazole	Neomycin	Sulfamoxole
Apramycin	Flumequine	Nicarbazin	Sulfanilamide
Beclomethasone	Flumethasone	Niflumic Acid	Sulfaphenazole
Betamethasone	Flunixin	Nitrofurantoin	Sulfapyridine
Beta-Trenbolone	Furaltadone	Nitrofurazone	Sulfisomidine
Boldenone	Furazolidone	Norfloxacin	Sulfisoxazole
Buquinolate	Gamithromycin	Ofloxacin	Testosterone
Cambendazole	Gentamicin	Orbifloxacin	Thiabendazole
Carbendazim	Halofuginone	Ormetoprim	Tildipirosin
Carprofen	Hygromycin	Oxfendazole	Tinidazole
Ceftiofur	Ipronidazole	Oxibendazole	Tobramycin
Chlormadinone Acetate	Ivermectin	Oxolinic Acid	Tolfenamic Acid
Clindamycin	Josamycin	Paromomycin	Toltrazuril Sulfone
Clopidol	Kanamycin A	Penicillin V	Triamcinolone Acetonide
Dapsone	Kanamycin B	Pentachlorophenol	Trimethoprim
Decoquinat	Ketoprofen	Pipemedic Acid	Tulathromycin
Desmycosin	Lasalocid	Pirlimycin	Tylvalosin
Dexamethasone	Levamisole Hydrochloride	Prednisolone	Vedaprofen
Dianabol	Lincomycin	Prednisone	
Diclazuril	Lomefloxacin	Robenidine	

Appendix B

Table B-1 Metals results found in infant foods and formula

Metal analyte	Product type	Total number of samples	Total number negative	Total number positive	Minimum (ppm)	Maximum (ppm)	Mean (ppm) ¹
Aluminum	Infant food - puree	38	10	20	0	2.99	1.17
	Infant formula - dairy	52	15	37	0	4.06	1.64
	Infant formula - soy	7	0	7	1.04	5.96	3.05
	Meal - toddler/baby	11	2	9	0	8.48	2.26
	Pasta	35	0	35	0.62	120	5.88
Antimony	Infant food - puree	38	38	0	0	0	0
	Infant formula - dairy	52	52	0	0	0	0
	Infant formula - soy	7	7	0	0	0	0
	Meal - toddler/baby	11	11	0	0	0	0
	Pasta	35	35	0	0	0	0
Arsenic	Infant food - puree	38	33	5	0	0.064	0.038
	Infant formula - dairy	52	51	1	0	0.02	0.02
	Infant formula - soy	7	7	0	0	0	0
	Meal - toddler/baby	11	11	0	0	0	0
	Pasta	35	35	0	0	0	0
Beryllium	Infant food - puree	38	38	0	0	0	0
	Infant formula - dairy	52	52	0	0	0	0
	Infant formula - soy	7	7	0	0	0	0
	Meal - toddler/baby	11	11	0	0	0	0
	Pasta	35	35	0	0	0	0
Boron	Infant food - puree	38	8	30	0	2.15	0.93
	Infant formula - dairy	52	4	34	0	2.35	0.80
	Infant formula - soy	7	0	7	0.8	1.43	1.11
	Meal - toddler/baby	11	0	11	0.29	1.91	0.81

	Pasta	35	0	35	0.34	1.57	0.61
Cadmium	Infant food - puree	38	34	4	0	0.016	0.01
	Infant formula - dairy	52	52	0	0	0	0
	Infant formula - soy	7	5	2	0	0.012	0.011
	Meal - toddler/baby	11	5	6	0	0.02	0.013
	Pasta	35	2	33	0	0.074	0.02
Chromium	Infant food - puree	38	30	8	0	0.79	0.28
	Infant formula - dairy	52	50	2	0	0.14	0.13
	Infant formula - soy	7	6	1	0	0.12	0.12
	Meal - toddler/baby	11	10	1	0	0.14	0.14
	Pasta	35	34	1	0	0.13	0.13
Copper	Infant food - puree	38	33	5	0	1.1	1.04
	Infant formula - dairy	52	0	52	0	10.9	5.28
	Infant formula - soy	7	0	7	3.7	6	5.24
	Meal - toddler/baby	11	10	1	4.2	1	1
	Pasta	35	16	19	0	4.4	2.5
Iron	Infant food - puree	38	0	38	3	14.8	7.32
	Infant formula - dairy	52	0	52	71.6	123	100.38
	Infant formula - soy	7	0	7	66.5	135	115.64
	Meal - toddler/baby	11	0	11	2	10.2	5.69
	Pasta	35	0	35	7.1	67.4	23.90
Lead	Infant food - puree	38	38	0	0	0	0
	Infant formula - dairy	52	49	3	0	0.019	0.02
	Infant formula - soy	7	7	0	0	0	0
	Meal - toddler/baby	11	11	0	0	0	0
	Pasta	35	34	1	0	0.03	0.03
Magnesium	Infant food - puree	38	0	38	83.3	296	158.47
	Infant formula - dairy	52	0	52	362	1660	616.10

	Infant formula - soy	7	0	7	425	765	628
	Meal - toddler/baby	11	0	11	95.5	171	135.32
	Pasta	35	0	35	101	1080	396.74
Manganese	Infant food - puree	38	6	32	0	3.95	2.11
	Infant formula - dairy	52	0	52	0.4	32.5	4.81
	Infant formula - soy	7	0	7	2.41	5.16	3.81
	Meal - toddler/baby	11	0	11	0.51	1.61	1.21
	Pasta	35	0	35	1.12	27.2	6.38
Mercury	Infant food - puree	38	33	5	0	0.00064	0.00
	Infant formula - dairy	52	52	0	0	0	0
	Infant formula - soy	7	7	0	0	0	0
	Meal - toddler/baby	11	8	3	0	0.00079	0.00
	Pasta	35	35	0	0	0	0
Molybdenum	Infant food - puree	38	24	14	0	0.49	0.26
	Infant formula - dairy	52	21	31	0	0.31	0.21
	Infant formula - soy	7	1	6	0	0.47	0.33
	Meal - toddler/baby	11	11	0	0	0	0
	Pasta	35	16	19	0	1.03	0.46
Nickel	Infant food - puree	38	9	29	0	0.9	0.19
	Infant formula - dairy	52	42	10	0	0.15	0.08
	Infant formula - soy	7	0	7	0.163	0.26	0.20
	Meal - toddler/baby	11	7	4	0	0.082	0.07
	Pasta	35	16	19	0	0.18	0.10
Selenium	Infant food - puree	38	27	11	0	0.17	0.10
	Infant formula - dairy	52	0	52	0.1	0.35	0.25
	Infant formula - soy	7	0	7	0.14	0.25	0.21
	Meal - toddler/baby	11	10	1	0	0.061	0.06
	Pasta	35	3	32	0	0.54	0.19

Tin	Infant food - puree	38	38	0	0	0	0
	Infant formula - dairy	52	52	0	0	0	0
	Infant formula - soy	7	7	0	0	0	0
	Meal - toddler/baby	11	11	0	0	0	0
	Pasta	35	34	1	0	0.75	0.75
Titanium	Infant food - puree	38	38	0	0	0	0
	Infant formula - dairy	52	29	23	0	0.42	0.30
	Infant formula - soy	7	2	5	0	0.54	0.32
	Meal - toddler/baby	11	11	0	0	0	0
	Pasta	35	29	6	0	0.65	0.45
Zinc	Infant food - puree	38	0	38	1.78	39.8	9.02
	Infant formula - dairy	52	0	52	41	78.2	58.21
	Infant formula - soy	7	0	7	44	80.4	64
	Meal - toddler/baby	11	0	11	2.63	5.61	3.74
	Pasta	35	0	35	2.17	27.3	9.59