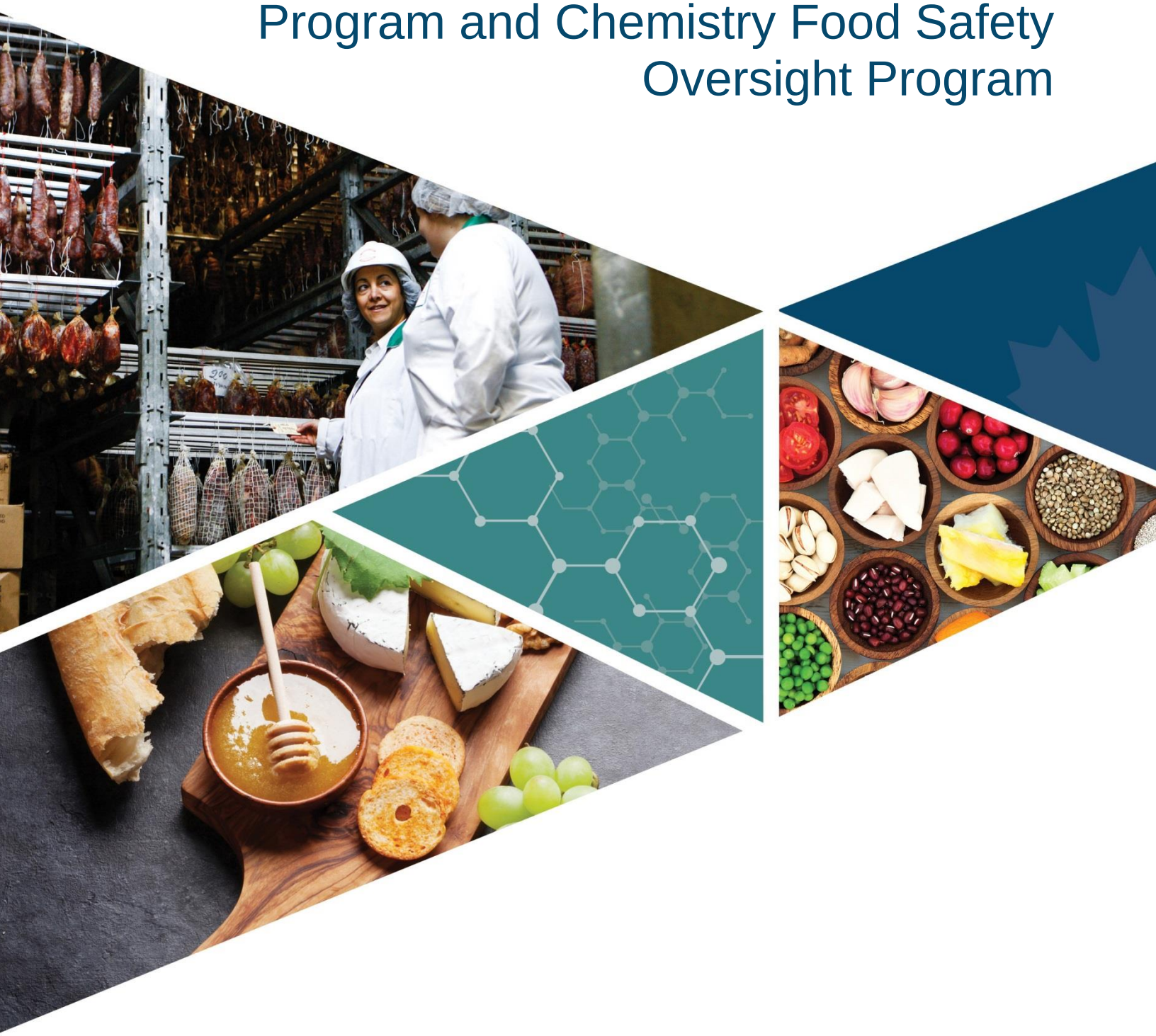
Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments

2020/21 Annual Report

National Chemical Residue Monitoring Program and Chemistry Food Safety Oversight Program



Canada

Table of Contents

Summary

The Canadian Food Inspection Agency (CFIA) is dedicated to safeguarding food, animals and plants, which enhances the health and well-being of Canada's people, environment and economy. The National Chemical Residue Monitoring Program (NCRMP) is an annual CFIA regulatory surveillance program which verifies compliance in certain foods to Canadian standards and guidelines for chemical residues and contaminants. The foods tested come from seven commodity groups, which are meat, fresh fruit & vegetables, dairy, eggs, honey, maple products and processed fruits & vegetables. The data collected from the NCRMP along with other surveillance activities enables the CFIA to identify trends that may warrant additional control strategies to maintain or improve compliance.

The NCRMP is one of several valuable surveillance tools that the CFIA uses to help ensure the very high compliance of foods to Canadian standards year after year. The NCRMP is carried out in accordance with Codex Alimentarius principles and guidelines and is an important part of the CFIA food safety framework that monitors Canadian food for potential chemical hazards. This program provides data to support the Canadian food production system and the integrity of Canada's chemical residue control system. These systems are equivalent to those of our main trading partners like the United States and the European Union.

In 2014 an initiative known as the Food Safety Oversight (FSO) Program was introduced to complement the NCRMP and to increase CFIA's oversight in the non-meat food sectors. In 2016 the CFIA increased sampling and testing of certain fresh fruit and vegetables that were not typically monitored within the program. The increased level of sampling and testing has continued into 2020. Some of these additional FSO program samples were collected at federally registered establishments or importers by inspectors in the same manner as the NCRMP samples. The majority of the FSO samples, however, were collected at retail locations by third party samplers under contract to the CFIA. Sampling of foods at both federally registered establishments and retail locations offers additional information on levels of residues and contaminants present in foods on the Canadian market.

The CFIA communicates non-compliant results from surveillance activities like the NCRMP and the FSO Program to farmers, growers/producers, importers, and retailers to identify areas of concern and to promote the safe use of agricultural chemicals and practices. This ongoing effort ensures that safe and healthy food is continuously available to Canadians.

This report summarizes testing results from both the NCRMP and the fresh fruit and vegetable portion of the FSO Program in food samples collected between April 1, 2020 and March 31, 2021 (hereafter referred to as 2020/21). Over 95,000 tests for residues of veterinary drugs, pesticides, metals, and contaminants were performed on approximately 12,500 NCRMP and FSO monitoring samples and generated millions of results, which are summarized in Annex B of this report. This amount of sampling and testing was lower than the planned amount due to the Covid-19 global pandemic and resource constraints due to emergency response activities at the CFIA. Despite the reduction in chemical residue testing on domestic and imported food products, the CFIA has confidence in the reported results and conclusions provided in this report. The test results from samples taken as part of the NCRMP and FSO Program showed that the overwhelming majority of food on the market meets Canadian standards for chemical residues. The overall compliance rate was determined to be 96.6% which is consistent with past years.

What is the National Chemical Residue Monitoring Program?

Since 1978 a national program to monitor foods for chemical residues, now known as the National Chemical Residue Monitoring Program (NCRMP), has been in place to ensure that strategies for reducing health risks as they relate to chemical residue and contaminant exposure in food are implemented proactively.

While the CFIA verifies food safety in different ways, the NCRMP is central to maintaining the safety of the food supply with respect to chemical residues and contaminants. The NCRMP is a valuable surveillance tool built on Codex Alimentarius principles[1,2] that allows the CFIA to monitor food products in the Canadian marketplace. The data collected is used to assess health risks by identifying all non-compliances which helps the CFIA refine any follow up activity like directed or compliance sampling, or additional testing, and inspection activities. This allows the CFIA to take proactive measures to improve food safety and helps industry comply with Canadian food safety requirements and standards.

What is the Food Safety Oversight Program?

In 2014, the Government of Canada introduced an initiative known as the Food Safety Oversight (FSO) Program to complement existing surveillance programs like the NCRMP by providing additional sampling and testing of commodities to specifically increase oversight on fresh fruit and vegetables, fish and seafood and manufactured products. Since fish and seafood and manufactured food products are currently outside the scope of the NCRMP, these results will be highlighted in different reports by the CFIA. The fresh fruit and vegetable sampling and testing components of the FSO program have been merged into the NCRMP starting with the 2020/21 sampling year. As a result, all data reported below is combined from both the NCRMP and FSO programs.

Why does the CFIA conduct the annual NCRMP and FSO Programs?

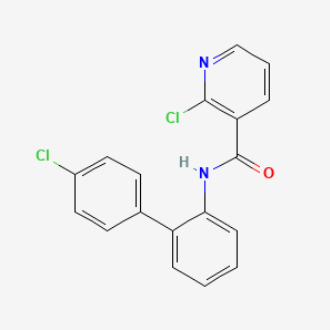
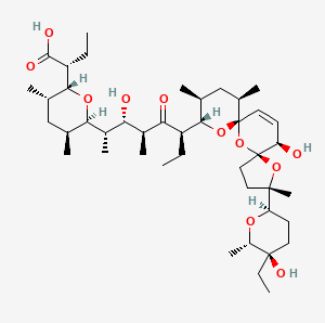
The CFIA is responsible for monitoring the safety of inter-provincially traded and imported food products, as well as domestically produced food destined for the Canadian market and export. Imported products must meet the same Canadian regulatory requirements as domestic products. The NCRMP and FSO Programs provide analytical test results on chemical residues and contaminants in foods to ensure that national standards and guidelines are respected by industry. Results are evaluated by the CFIA and any potential health risks from chemical residues present in foods are assessed by Health Canada. The CFIA determines appropriate follow up actions for all chemical residue results exceeding Canadian standards and guidelines. These combined efforts are able to demonstrate that foods consumed by Canadians meet Canadian standards. In addition, the NCRMP provides data that supports the international recognition of a safe and healthy Canadian food supply and market access.

Why are there chemical residues in food?

Pesticides and other agricultural chemicals are used in conventional agricultural production systems. These chemicals help protect crops from damage by pests, increase yields and expand the geographical location in which crops can be grown. Pesticides must be applied according to label instructions and good agricultural practices, and the resulting residues in food must not exceed established Canadian limits. Food-producing animals may also be exposed to pesticides and other agricultural chemicals. For example, pesticide residues may be present in livestock feed and water, insecticides may be applied directly to animals for the control of ticks or flies, and fumigants may be used to control pests in stored grains and animal houses. While pesticides help protect our food supply, small amounts of pesticide residues may remain in or on our food after they are applied. Establishing science-based maximum residue limits (MRLs) helps ensure that pesticides are being used properly by growers, and provides Canadians with access to a safe food supply[3].

Food-producing animals may be treated with veterinary drugs. Some drugs are administered to individual animals to treat specific disease conditions, while other drugs are administered to groups of animals, usually through medicated feed or water, for the prevention or treatment of disease or for the purpose of growth promotion. Responsible use of veterinary drugs according to a veterinarian's prescription or label directions should not result in residues that exceed established Canadian limits. In addition, judicious use of antibiotics in food producing animals is an important control step in preventing anti-microbial resistance.

Figure 1: Examples of chemicals administered to food and/or food producing animals

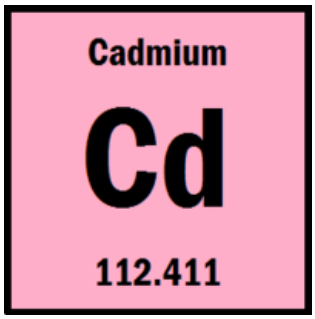
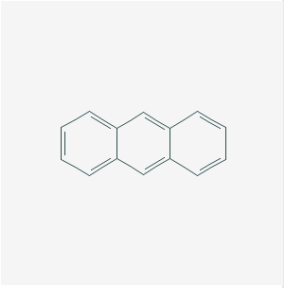
 (Source: PubChem)	Boscalid is a fungicide used to control a broad range of fungal pathogens. It is used on many different fruits and vegetables, as well as a seed treatment for canola and rapeseed. It is often used in a mixture with pyraclostrobin.[4]	 (Source: PubChem)	Narasin is a coccidiostat and ionophore antibiotic that can be added to feed as a medication. It is used for the treatment of coccidiosis in broiler chickens and is also approved for use in swine to improve weight gain and feed efficiency.[5]

What causes chemical contamination of food?

Chemical contamination of food products may result from direct or indirect use of, or exposure to, contaminated soil, water, or air. Contaminants can include natural toxins, industrial pollutants, and metals arising from food storage conditions, food processing or from contact with food packaging materials. These chemicals generally occur in foods at very low levels, but regardless should be monitored to ensure they do not exceed levels deemed safe for human health.

Toxic metals and trace elements (for example lead and arsenic) can occur in food naturally, or may result from the use of pesticides or other agricultural chemicals, from environmental contamination, or from processing.

Figure 2: Examples of chemical contaminants found in food and/or food producing animals

	Metals like cadmium can occur naturally in the environment, but can also be released from human activities such as mining and smelting, fossil fuel consumption, and fertilizer use. It is considered a poisonous metal and classified as a harmful pollutant.	 (Source: PubChem)	Polycyclic aromatic hydrocarbons (PAHs) are toxic substances emitted into the environment from both natural and human activities. They are common airborne pollutants that can contaminate crops. Sources include forest fires, wood heating, aluminum smelters and thermal food processing.

What are the Canadian limits for residues and contaminants in food?

Maximum Residue Limits (MRLs) for Pesticides

Pesticide MRLs are established by Health Canada's Pest Management Regulatory Agency (PMRA) and appear in Health Canada's *MRL Database* http://pr-rp.hc-sc.gc.ca/mrl-lrm/index-eng.php. These MRLs apply to the specified raw agricultural commodity as well as to any processed food product that contains the commodity unless otherwise specified. According to section B.15.002 of the *Food and Drug Regulations* (FDR), when no specific pesticide MRL exists for a food commodity, a general MRL of 0.1 milligrams per kilogram (mg/kg) is used for that particular pesticide in that commodity.

Maximum Residue Limits (MRLs) for Veterinary Drugs

Veterinary drug MRLs are set by Health Canada's Veterinary Drugs Directorate (VDD) and appear in Health Canada's *List of Maximum Residue Limits (MRLs) for Veterinary Drugs in Foods* https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/maximum-residue-limits-mrls/list-maximum-residue-limits-mrls-veterinary-drugs-foods.html. 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) for the analytical method to be non-compliant.

A list of banned drugs in animal-derived foods is specified in section B.01.048 of the *FDR.* Any detected and confirmed level of a banned drug residue in animal-derived foods is considered non-compliant.

Regulatory Maximum Levels (MLs) for Contaminants

Some contaminants and other adulterating substances have regulatory maximum levels in certain foods. These appear on Health Canada's *List of contaminants and other adulterating substances in foods:* https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/contaminants-adulterating-substances-foods.html#fn_t1b1 and List of *Maximum Levels for Chemical Contaminants in Foods:* https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html.

What was sampled?

The NCRMP and FSO Programs generated compliance information on seven basic food commodity groups regularly consumed by Canadians. The food commodity groups included both imported and domestic products (Figures 3 and 4). Table 1 lists some examples of products tested within each of the seven commodity groups. The majority of sampling was conducted in raw meat and fresh fruit and vegetables. These food commodity groups represented the majority of the raw agricultural commodities available on the Canadian market.

Figure 3: Domestic food samples collected by food commodity group

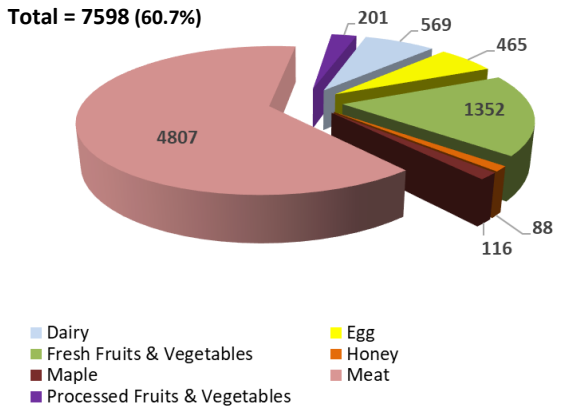


Figure 4: Imported food samples collected by food commodity group

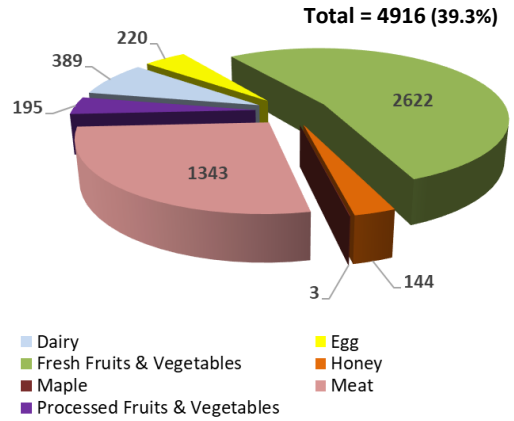


Table 1: Examples of products tested in 2020/21 by food commodity group

Food Commodity Group*	Examples of products tested
Meat	• Domestic raw meat from a slaughtered animal (e.g. muscle, liver, kidney and fat) • Imported processed (raw and cooked) meat products
Fresh Fruit & Vegetables	• Domestic and imported fresh fruit • Domestic and imported fresh vegetables • Domestic and imported seeds, tree nuts, and peanuts
Processed Fruit & Vegetables	• Domestic and imported processed fruit and vegetable products (e.g. juices, canned and frozen products, etc.)
Honey	• Domestic and imported honey (bulk, packaged)
Eggs	• Domestic and imported (USA only) shell eggs
Dairy	• Domestic raw milk collected at dairy farms • Domestic and imported cheeses and yogurts • Non-bovine milk products (e.g. from goat and sheep milk)
Maple	• Domestic and imported maple products (syrup, butter, sugar, candy, spread)

* Includes products labelled organic.

How were foods chosen for testing?

The CFIA's sampling activities were carried out in accordance with internationally accepted principles and guidelines[1,2]. The NCRMP and FSO Program are designed to provide a statistical estimate of the compliance rate of the food production system. For example, if non-compliances for a particular contaminant or residue are not detected in a sample size of about 300, it can be assumed with 95% confidence that the compliance rate for that food is greater than 99%[2].

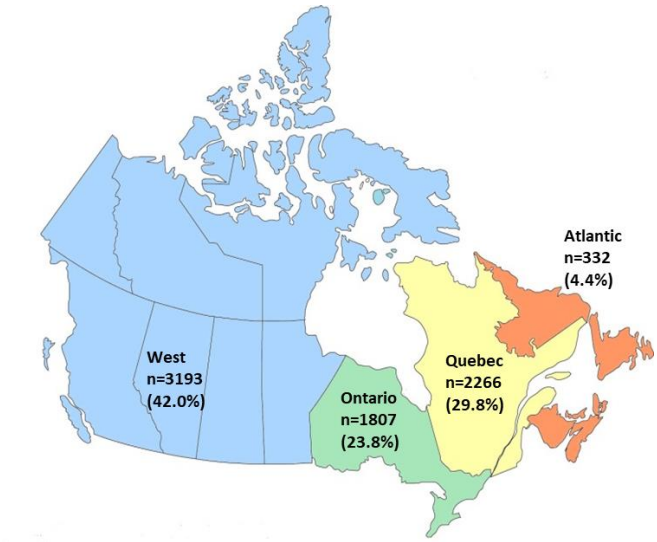
The samples selected were unbiased, random, and collected throughout the fiscal year or when available based on production times or seasonality (e.g. domestic fruit and vegetables and domestic honey). The number of samples collected for the NCRMP was determined by taking into consideration past compliance data, the volume of food produced, import transaction information, consumption information, and changes in import or production locations and practices. Year-to-year variation in the number and the location of individual sample types collected can fluctuate considerably. FSO Program samples were selected by identifying the fresh fruit and vegetable products, seeds, peanuts and tree nuts that historically have limited CFIA-generated chemical residue data.

All food samples were collected using a pre-defined sampling schedule based on an internationally accepted approach[1,2]. All food samples must be of an adequate size to represent the product being sampled and provide the laboratory with enough material to carry out all required tests. Due to the Covid-19 global pandemic, Agency resources were not available to complete all of the sampling for certain commodities. Domestic meat was very well delivered due to the presence of CFIA inspectors at meat establishments through-out the pandemic. Other commodities were more severely impacted, and adjustments to sampling plans were made throughout the year to optimize delivery. The number of domestic samples picked up for testing dropped by about 12% as compared with the previous year while the number of imported samples dropped by 39%. This led to an overall drop of 25% in the number of samples tested for chemical residues as compared with the previous year. Even with this decrease, over 12500 samples were collected and a comprehensive chemical residue monitoring program was maintained.

Where did the NCRMP and FSO sampling occur?

The vast majority of NCRMP samples are collected by CFIA inspectors and are taken from individual lots of domestically-produced and imported foods. FSO samples were primarily collected by third party samplers under contract to the CFIA at retail locations across Canada. When not collected at retail, domestic samples were taken as close as possible to the point of production in the distribution system (e.g., slaughter establishments, fruit and vegetable packing facilities, etc). Figure 5 illustrates the geographical distribution of where domestically-produced, inter-provincially traded NCRMP food samples were collected in Canada.

Figure 5: Number of domestic NCRMP samples collected by operational area in 2020/21



There were 7598 domestic NCRMP and FSO samples collected across the country with the highest percentage, roughly 42.0% (3193 samples), originating from the Western Area. Only a small amount, 4.4% (332 samples), originated from the Atlantic region with the remainder collected from Quebec and Ontario at 29.8% (2266 samples) and 23.8% (1807 samples) respectively. The number of samples collected approximates the amount of food produced within each operational area in Canada.

Of the 4916 imported NCRMP and FSO samples that were collected, most were taken at the point of entry into Canada. The top 10 countries from which NCRMP import samples originated are presented in Table 2. This table indicates that the majority of imported samples, over 55%, originated from the USA and Mexico. NCRMP import samples were collected from products originating from a total of 67 different countries. The number of samples collected by country of origin generally represented the availability of those products on the Canadian market. There were 170 imported samples collected with an unknown country of origin.

Two retail collection surveys were run during the 2020/21 year. These surveys collected domestic and imported non-bovine products and imported milk and dairy powders as well as imported butters. These surveys were added to fill program data gaps for those products.

Table 2: Number of import NCRMP samples collected by country of origin in 2020/21

Country of Origin	Number Samples	% Total Import Samples
United States	2073	42.2%
Mexico	647	13.2%
Italy	276	5.6%
Spain	147	3.0%
China	135	2.7%
Peru	112	2.3%
France	105	2.1%
Chile	83	1.7%
Brazil	82	1.7%
Great Britain	81	1.6%
All others	1175	23.9%

How did the CFIA test the food samples?

Testing for the NCRMP and FSO Program was performed by ISO/IEC 17025 accredited laboratories, including CFIA and private laboratories under contract with the Government of Canada. Methods used by the laboratories included both single-residue and multi-residue methods. Single-residue methods target only one chemical within a food sample while multi-residue methods can target dozens or even hundreds of compounds from both similar and different compound classes, e.g. fungicides, insectides, herbicides and organophosphorus pesticides.

What tests were performed?

The labs conducting this work for CFIA employed over 60 different testing methods to generate the analytical results on roughly 12,500 food samples obtained under the NCRMP and FSO programs in 2020/21. Not every sample was tested with every method, but most samples were analyzed with more than one method, leading to more than 95,000 tests performed for chemical residues and contaminants. Given that many of the methods looked for more than one chemical compound, the 2020/21 NCRMP and FSO monitoring programs generated approximately 5 million individual results. The vast majority of those results were not-detected, which is to say that no detectable amount was found for the analyte of interest. Table 3 provides examples of the chemicals and chemical groups by compound class. Figures 6 through 9 illustrate the breakdown of testing by chemical class performed by CFIA and contracted laboratories on a per test method basis.

Table 3: List of the chemical classes included in the NCRMP and FSO Program

Chemical class *	Examples included in each chemical class
Veterinary Drugs	Antibiotics, Anti-parasitics, Analgesics, Tranquilizers, Growth Promotants, Steroids and Hormones
Pesticides	Fungicides, Insecticides and Herbicides
Metals	Arsenic, Cadmium, Lead, Mercury, Tin, Copper and other elements
Environmental Chemicals	Dioxins, Furans, Polychlorinated biphenyls (PCBs), Polyaromatic hydrocarbons (PAHs)
Mycotoxins	Aflatoxins M1

* Chemicals are grouped into broad classes. Within any one class there are groups of chemicals which may include many hundreds of chemicals. A full list of all multi-analyte NCRMP and FSO Program methods is available in Annex A.

Figure 6: Testing by chemical class (all foods)

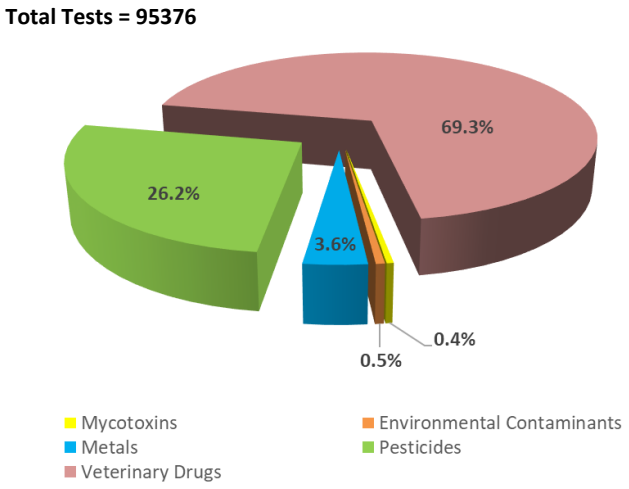


Figure 7: Testing by chemical class in meat

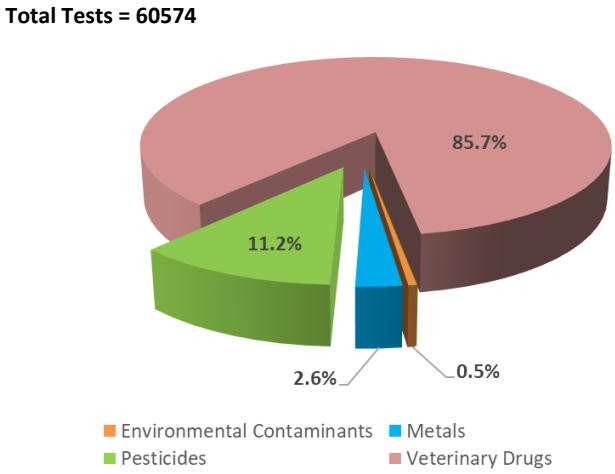


Figure 8: Testing by chemical class in fresh fruit and vegetables

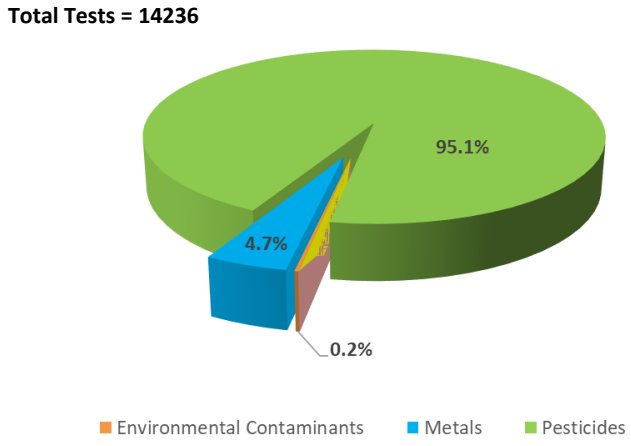
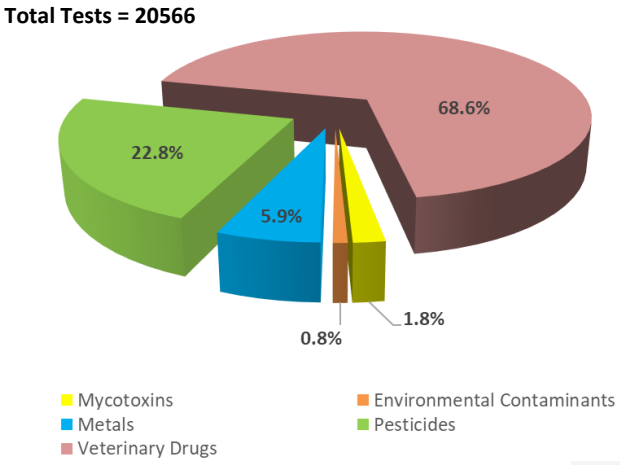


Figure 9: Testing by chemical class in other agrifood products*



* Other agrifood products includes dairy products, maple products, honey, shell eggs, and processed fruits and vegetables.

How were the results assessed?

The CFIA assessed all test results against Canadian regulations[7] and limits (MRLs and MLs) or, in certain cases where no Canadian limits exist, guidance levels set by Health Canada. Specifically:

- Each contaminant or residue result was assessed individually, for every sample.
- Results detected at or below the Canadian limit or guidance level were considered **compliant**.
- Results quantified above the Canadian limit or guidance level were considered **non-compliant**. For veterinary drug residues with no MRLs, NCRMP results at or exceeding the method limit of quantification, known as the regulatory LOQ, were also considered **non-compliant**.

- Each banned drug residue detected and adequately confirmed at any level was considered **non-compliant.**
- In the absence of Canadian limits or guidance levels, results were recorded but no assessment decision was made. If these results were abnormally high based on previous historical results, they were provided to Health Canada for a health risk assessment. The collected data (i.e., PAH data, dioxins, certain metals, etc.) were provided to Health Canada for potential standard setting, assessing risk, and/or other risk management purposes.

For each food commodity group listed in Table 1 an annual **compliance rate** was calculated, which was the percentage of samples that were compliant compared to the total number of samples collected. Note that if a sample was found to have multiple non-compliances, it was considered 'non-compliant' only once in this report.

What enforcement/follow-up actions were taken?

All non-compliant sample results were evaluated to determine the appropriate follow-up action. 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 remaining in the marketplace. These actions may have included notification of the producer or importer, notification of the foreign competent authority, follow-up inspections, further directed sampling, or recall of products if Health Canada determined that the product posed an unacceptable health risk to consumers or a certain segment of the population.

What did the CFIA find?

Data collected from the 2020/21 NCRMP and FSO Program fiscal year are summarized in Annexes B1-B7. The following is a summary of the compliance result outcomes for the samples collected.

The compliance rate is one measure that the CFIA uses to assess the safety of the food supply and gauge the effectiveness of food safety controls in the food production system.

Figure 10: Overall 2020/21 compliance rate by NCRMP and FSO Program food commodity group

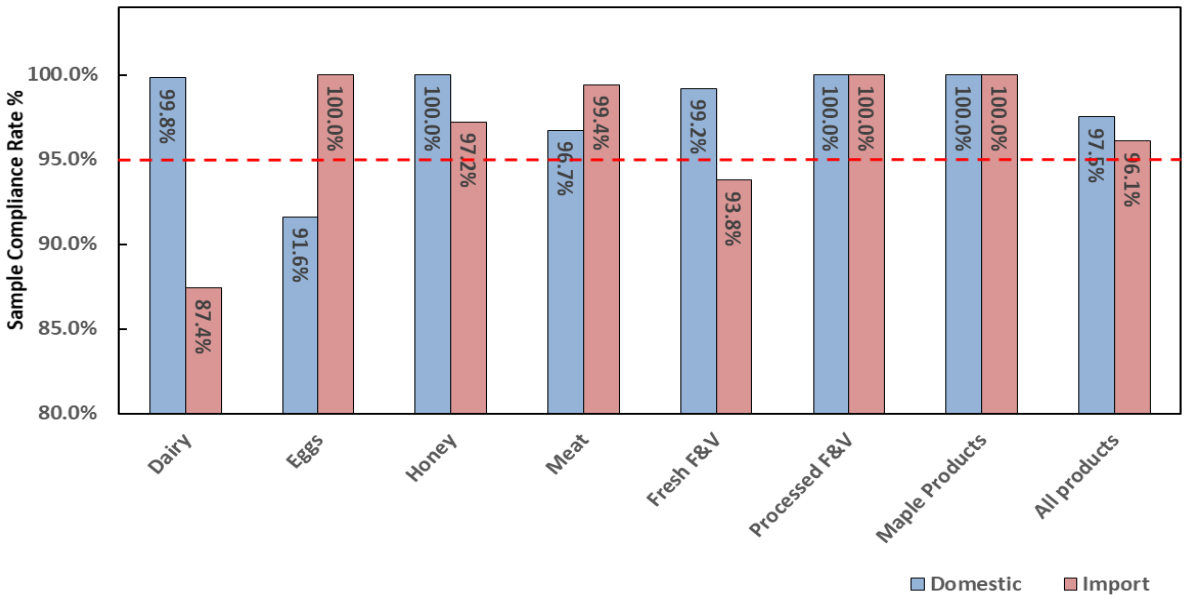


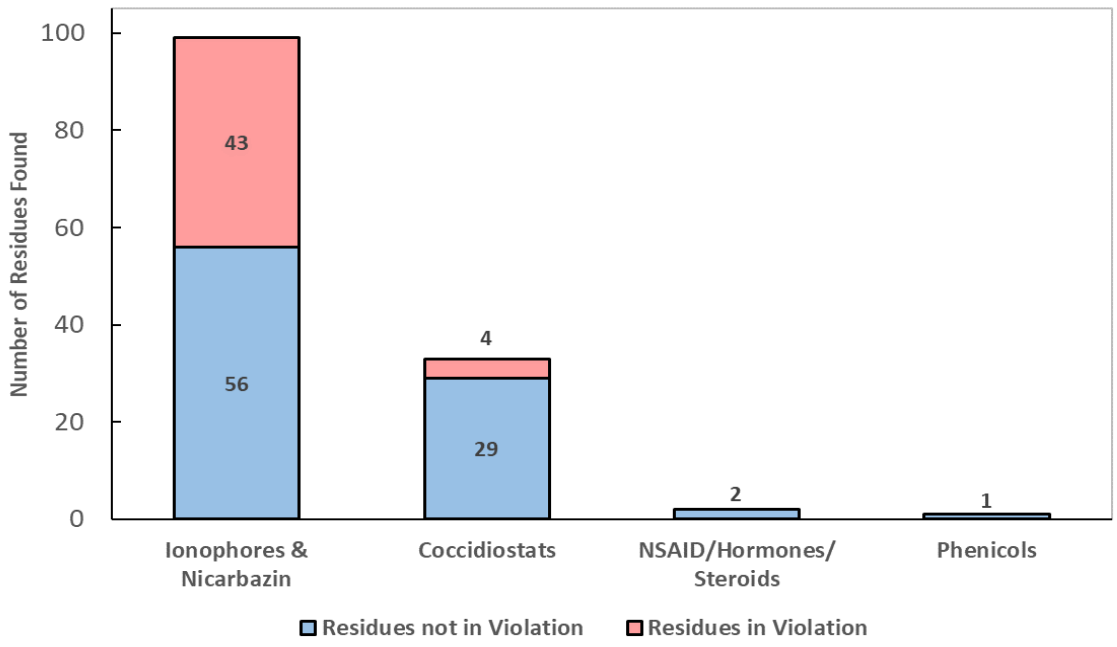
Figure 10 indicates that in the 2020/21 fiscal year 97.5% of domestic foods and 96.1% of imported foods sampled and tested were compliant with Canadian regulations[6], limits, and guidelines. These results are comparable to the compliance rates observed in previous sampling years. Most food commodity groups had overall compliance rates exceeding 95% in the 2020/21 fiscal year. However, three commodity groups had overall compliance rates below 95%; imported fresh fruit & vegetables, domestic eggs, and imported dairy products.

Lower compliance in domestic eggs

A compliance rate of 91.6% was observed in domestic eggs, which was less than the program target of 95%. Most of the positive and non-compliant results in domestic eggs were from residues of nicarbazin and ionophore drugs. These drugs are used to treat enteric parasites in broiler chickens, but they are not approved to be administered to laying hens in Canada, so no MRLs have been established in eggs. Therefore, the regulatory LOQ was used to determine compliance of these samples.

The low level residues of nicarbazin and ionophores observed in eggs are likely due to contaminated feed being fed to laying hens. During the mixing and preparation process, carry-over from a previous batch of feed, where the use of these drugs is permitted, can cause elevated levels to be present in feed meant for laying hens. These low levels of nicarbazin and ionophore residues do not appear to result from unapproved drug use and are considered unlikely to pose a human health concern according to Health Canada[7]. Figure 11 indicates the number of veterinary drug and pesticide residues found in domestic shell eggs and includes how many of those residues were in violation of the MRL or regulatory LOQ, which is used to assess compliance when no MRL exists. The results shown were compiled from performing roughly 4000 tests on 465 domestic egg samples and looking for over 80 000 individual residues.

Figure 11: Veterinary Drug and Pesticide Residues Found in Domestic Shell Eggs

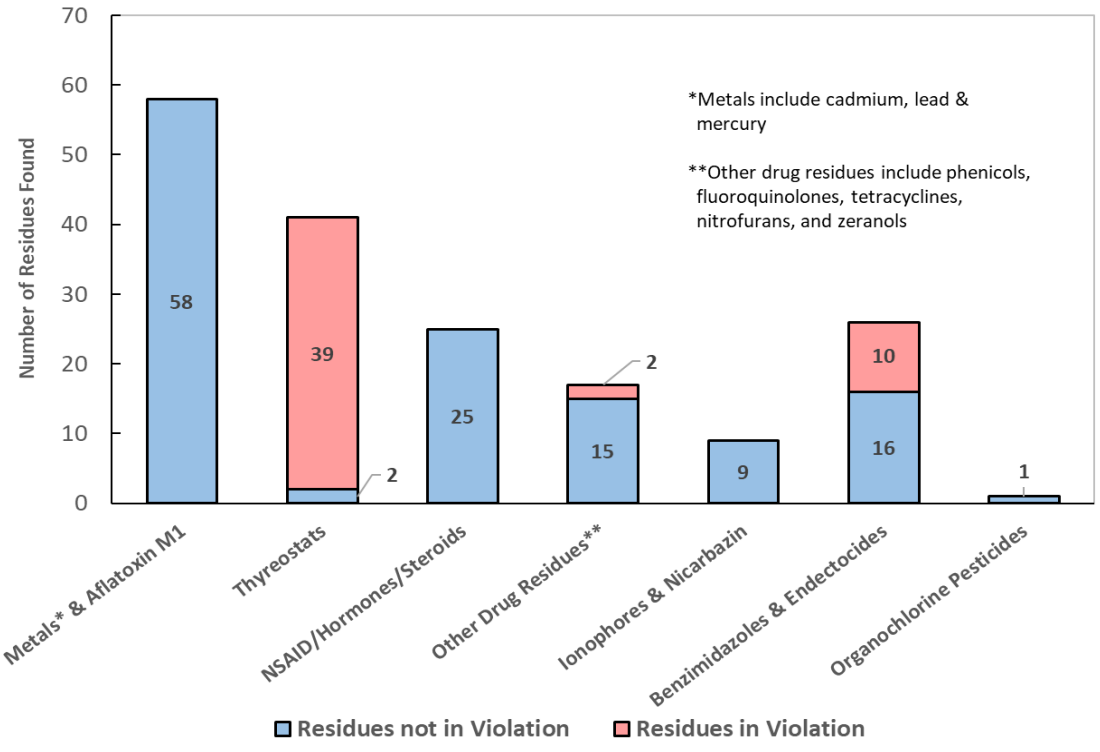


In Figure 11, it can be seen that close to half (43%) of the ionophore and nicarbazin residues found were above the allowed limit and therefore non-compliant. Also, four of the thirty-three coccidiostat residues found were above the allowed limit and also non-compliant. None of the other residues observed in domestic shell eggs were above the allowed limits. In 2012, Health Canada established guidance that enabled the CFIA to use action levels (for follow-up) for residues of ionophores and nicarbazin in eggs[7]. The action levels were established at a value that is protective of both human and animal health while still being low enough to detect deliberate drug use. The CFIA does not take enforcement or follow-up action on non-compliant residues detected below the established action levels. Thirty-six of the forty-three non-compliant ionophore/nicarbazin residues found in domestic shell eggs, or 84%, were below the established Health Canada action levels.

Lower compliance in imported dairy products

The types of domestic and imported dairy products sampled under the NCRMP were very different. Most of the domestic dairy samples were raw milk, except for those products collected at retail locations for non-bovine dairy products, which included milk, cheese, yogourt and frozen yogurt. By contrast, the imported dairy products sampled were a mix of cheeses, both from bovine and non-bovine sources, as well as some non-bovine milk, yogourt and frozen yogurt samples. While the preference for the NCRMP is to monitor the raw agricultural commodity, Canada did not import very much raw milk for the Canadian market, therefore these secondary products were sampled instead. Results from the NCRMP indicate that compliance in domestic dairy was very high at 99.8%. However, imported dairy products had the lowest compliance rate (87.4%) of all food commodity groups, mainly due to veterinary drug residues found in cheeses. Figure 12 shows the number and type of residues found in imported dairy products as well as the number and type that were non-compliant.

Figure 12: Residues Found in Imported Dairy Products



While there are Canadian MRLs established for some veterinary drugs in milk, none have been established for residues in secondary products derived from milk. In the absence of MRLs for cheese and other dairy products, drug residues detected at or above the regulatory LOQ are assessed as non-compliant. These LOQs can be quite low and the results do not necessarily represent a risk to human health. Furthermore, most of the residues found to be non-compliant (76%) in imported dairy products were due to thiouracil, which is a thyreostat drug. Thiouracil has been used in the past to increase weight gain in animals prior to slaughter. These veterinary drugs are no longer permitted for use in food-producing animals in Canada and there are no established MRLs. The presence of thiouracil residues in ruminant liver however has been attributed to dietary consumption of sulphur-rich Brassica species, rather than the use of veterinary drugs[8]. Brassica are a genus of plants that include many vegetable crops that form the diet of both humans (broccoli, kale, etc.) and animals (canola, rape seed)[9]. It is therefore likely that the presence of thiouracil in imported cheese was due to dairy cattle being fed diets containing brassicas such as canola or rape seed. Thiouracil may be secreted in the milk and subsequently detected in secondary products such as cheese. Health Canada has indicated that the levels detected in imported cheese were not expected to result in a risk to human health[10]. Health Canada and the CFIA have set an action level for thiouracil in dairy products in order to identify residues which may be from non-permitted drug use. Out of the 39 imported cheeses found to be non-compliant for thiouracil, only 3 results were found above the action level.

Slightly lower compliance in domestic meat samples

Domestic meat samples tested under the NCRMP are collected exclusively at slaughter facilities across the country. The samples consisted of unprocessed raw meat, and included muscle, fat, kidney, liver and occasionally other tissues. For imported meat the NCRMP is limited to sampling what arrives at the border, which was mainly muscle, both cooked and uncooked, as well as processed meat (e.g. sausage, ready-to-eat products, nuggets, etc.). Although the compliance rates for both domestic and imported meat were high (96.7% and 99.4% respectively), more non-compliances (n=158) were observed in domestic samples versus imported samples (n=8). The difference in compliance rates between domestic and imported meat was mainly from veterinary drug residues and can be attributed to the types of domestic and imported samples tested. A greater number (and amount) of residues was expected in domestic meat samples because they often occur or accumulate at higher levels, and for longer periods of time, in tissues such as liver, fat, and kidney, which were targeted as part of NCRMP domestic sampling. Also, meat samples that are further processed and/or precooked tend to have less of these same residues.

The compliance rates for the domestic major and minor meat species and production/market classes are presented in Tables 4 and 5, respectively. Most major domestic meat species and their production/market classes (e.g. for bovine – beef, veal, cow) exceeded 95% compliance for veterinary drug residues, pesticide residues, and contaminants. Minor meat species had (generally) lower compliance, mostly from veterinary drug residues as well as the thiouracil issue described above for imported dairy products. In Canada, most minor species as well as lamb/mutton do not have many established MRLs for veterinary drug residues. As a result, when residues of veterinary drugs are detected in minor species' meat products, mainly from extra-label drug use (i.e., the administration of a drug to a species or to treat a condition that does not appear on the product label), they are considered non-compliant with Canadian regulations[6]. Residue levels detected in minor species were typically lower than the MRLs established for the same drug in other major meat species, and therefore these products are not expected to result in a risk to human health. See Annex B for specific results in each of the above animal species.

Table 4: Compliance rate by domestic major meat species or production/market class in 2020/21

Meat Species/Class	# of Samples	# of Violations	Percent (%) Compliance	Meat Species/Class	# of Samples	# of Violations	Percent (%) Compliance
Pork	568	2	99.6	**Cow**	366	6	98.4
Beef	550	11	98.0	**Sow**	320	2	99.4
Chicken	519	6	98.8	**Lamb/Mutton**	305	62	79.7
Veal	497	15	97.0	**Fowl**	280	2	99.3
Horse	410	6	98.5	**Turkey**	265	9	96.6
All major species	**4080**	**121**	**97.0**				

Table 5: Compliance rate by domestic minor meat species or production/market class in 2020/21

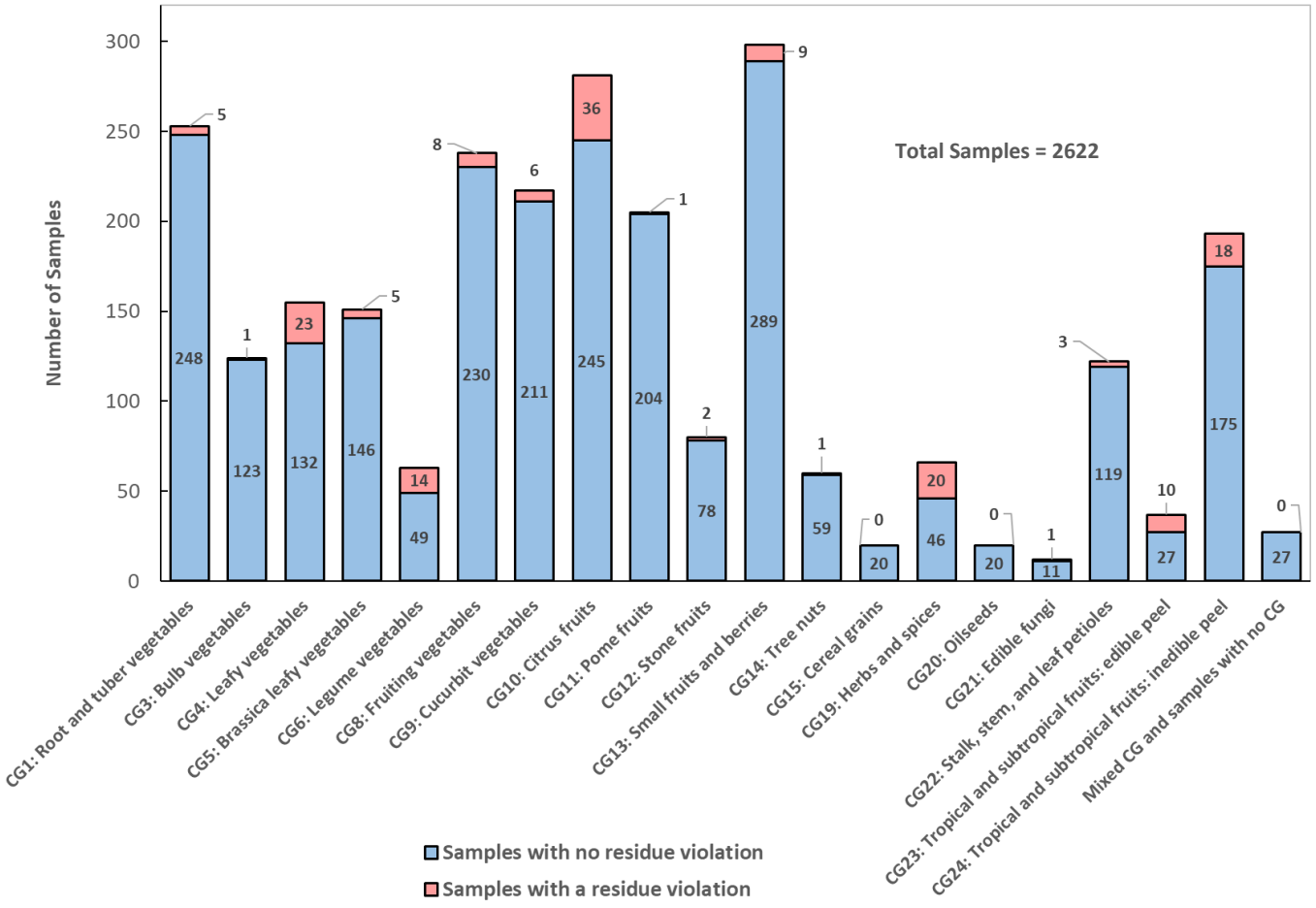
Meat Species/Class	# of Samples	# of Violations	Percent (%) Compliance	Meat Species/Class	# of Samples	# of Violations	Percent (%) Compliance
Bison	163	7	95.7	**Wild boar**	31	0	100
Game Bird	134	6	95.5	**Elk**	24	6	75.0
Piglet	108	0	100	**Goat**	18	4	77.8
Duck/Goose	135	3	97.8	**Deer**	14	4	71.4
Rabbit	98	7	92.9	**Ostrich/Water buffalo**	2	0	100
All minor species	**727**	**37**	**94.9**				

Lower compliance in imported fresh fruit and vegetable samples

In 2020/21 the overall compliance rate for fresh fruit and vegetables (FFVs) collected under the NCRMP and FSO was similar to previous years at 95.6%. NCRMP samples were a broad mixed of fruits and vegetables available on the Canadian market while FSO sampling focused on collecting nuts and seeds. 160 out of 162 (98.8%) of the nut and seed samples that were collected under the FSO program in 2020/21 were found to be compliant for pesticides and contaminants. All of the non-compliant results in the FSO and NCRMP samples were due to one or more pesticide being found above the MRL.

Figure 13 below shows the number of imported fresh fruit and vegetable samples tested and number of non-compliances by residue crop group. Crop groups are used by Health Canada PMRA to categorize product types that are similar botanically and taxonomically, or have similar cultivation practices. They help facilitate the establishment of MRLs and are equivalent to the crop group (CG) categories used by the U.S. Environmental Protection Agency (EPA) and other international bodies[11]. According to Figure 13, non-compliance rates are higher than 95% in imported leafy vegetables (CG4), legume vegetables (CG6), citrus fruits (CG10), herbs and spices (CG19), and tropical and subtropical fruits (CG23 and CG24).

Figure 13: Number of Compliant and Non-Compliant Imported Fresh Fruit & Vegetable Samples



In 2020/21 the overall compliance rate was lower for imported FFV samples (93.8%) as compared with domestic FFV samples (99.2%), which is consistent with observed compliance rates in past years. This difference can be attributed to the lower number (and type) of pesticides registered for use in Canada as compared to the number (and type) registered and used in other countries. Many of the pesticides detected in imported fruits and vegetables, including those from the United States and Mexico for example, are not registered in Canada. This is because some fruits and vegetables grown in more southern climates are not grown in Canada, and/or because Canada does not have the same pest pressures as those countries and therefore does not require their use.

For detected pesticide residues with no established Canadian MRLs, such as those used in other countries but not registered in Canada, the general MRL of 0.1 ppm is used to assess compliance. For many of the pesticide results detected in imported FFV samples, the levels exceeded the general MRL, which meant that the results were non-compliant with Canadian regulations. Although the compliance rate was generally higher in domestic FFVs (see Table 6 below), due to the reasons mentioned above, these results do not necessarily indicate that imported FFVs are a concern for consumers.

Table 6: Compliance rates by Crop Group for domestic and imported fresh fruits & vegetables in 2020/21

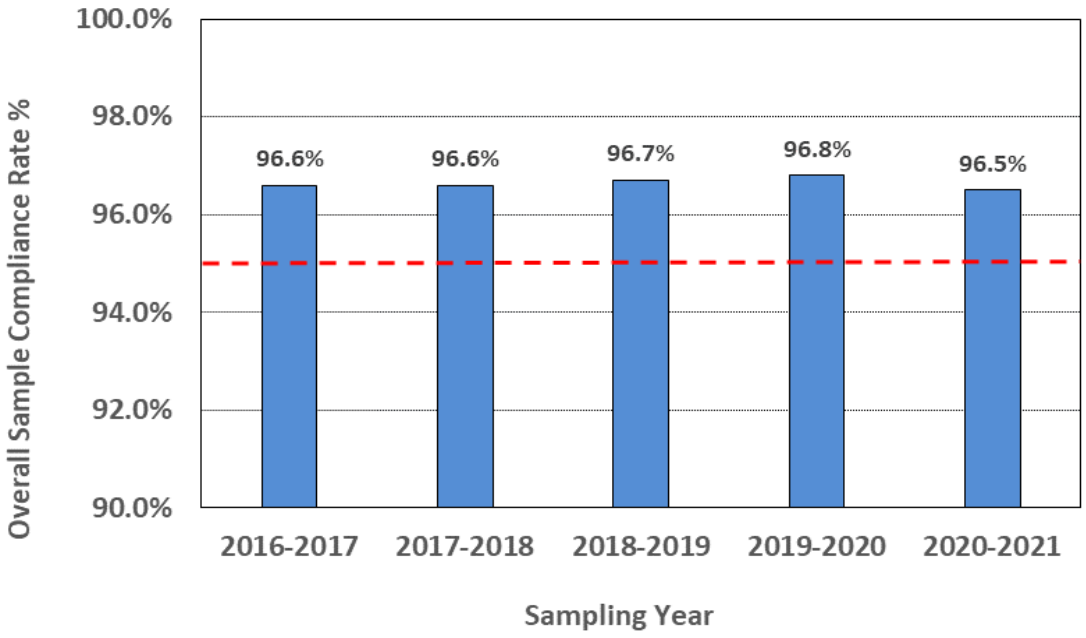
Crop Groups	Example Product Types	Compliance Rate*	
		Domestic	Import
CG1: Root and tuber vegetables	Artichoke, beet, carrot, ginger root, potato, parsnip, radish, sweet potato, turnip, yam	99.3%	98.0%
CG3: Bulb vegetables	Garlic, green onion, leek, bulb onion	98.8%	99.2%
CG4: Leafy vegetables	Bok choy, chard, kale, leaf and head lettuce, radicchio, spinach	98.8%	85.2%
CG5: Brassica leafy vegetables	Broccoli, Brussel sprouts, cabbage, cauliflower, Chinene cabbage	100%	96.7%
CG6: Legume vegetables	Beans, peas, snow peas	100%	77.8%
CG8: Fruiting vegetables	Eggplant, bell peppers, okra, tomato	100%	96.6%
CG9: Cucurbit vegetables	Cantaloupe, cucumber, honeydew, melon, pumpkin, squash, watermelon, zucchini	99.1%	97.2%
CG10: Citrus fruits	Grapefruit, lemon, lime, orange, pomelo, tangerine/manderin/clementine	N/A	87.2%
CG11: Pome fruits	Apple, pear	100%	99.5%
CG12: Stone fruits	Apricot, cherry, nectarine, peach, plum, prune	100%	97.5%
CG13: Small fruits and berries	Blackberry, blueberry, cranberry, grape, kiwifruit, raspberry, strawberry	98.7%	97.0%
CG14: Tree nuts	Almond, brazil nut, coconut, hazelnut/filbert, pecan, walnut	N/A	98.3%
CG15: Cereal grains	Corn, barley, rice, wheat	100%	100%
CG19: Herbs and spices	Basil, chive, cilantro, dill, mint, oregano, parsley, rosemary, sage, tarragon, thyme	80.0%	69.7%
CG20: Oilseeds	Canola, flax seed, hemp seed, sesame seed, sunflower seed	100%	100%
CG21: Edible fungi	Mushroom	95.7%	91.7%
CG22: Stalk, stem, and leaf petioles	Asperagus, bamboo shoot, celery, kohlrabi	100%	97.5%
CG23: Tropical and subtropical fruits: edible peel	Date, fig, guava, olive, papaya, persimmon, starfruit	N/A	73.0%
CG24: Tropical and subtropical fruits: inedible peel	Avocado, banana, lychee, mango, passion fruit, pineapple, pomegranite	N/A	90.7%
No CG or CG unknown	Peanut, mixed fruits and vegetables	N/A	100%

*Less than 10 samples tested, therefore no compliance results presented

What do the NCRMP and FSO Program results mean?

The overall combined NCRMP and FSO sample compliance rate in the 2020/21 fiscal year was 96.5%, which was consistent with rates seen in previous years (see Figure 14) and above the 95% target compliance rate. Similar overall compliance rates were observed for domestic and imported products, with the exception of a few food commodity groups, where the type of products being tested (e.g. raw milk vs cheese, muscle tissue vs other tissues, domestic vs imported fruits and vegetables) was likely responsible for the observed differences. These specific cases have been discussed in greater detail in the sections above.

Figure 14: Overall Sample Compliance Rates by Year



The results obtained through the NCRMP and FSO Program enabled the CFIA to take appropriate follow-up actions on non-compliant food samples, to identify trends in the prevalence of chemical residues and contaminants in the Canadian food supply, and to further optimize the Agency's surveillance activities and other control measures to minimize potential health risks to Canadians. The NCRMP data were routinely provided to Health Canada for potential standard setting, assessing risk, and/or other risk management purposes. These data were also shared with Canada's major trading partners, including the United States and the European Union.

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Annex A Analytical methods

Table A-1: Analytes included in selective multi-residue methods for pesticide residues by food commodity group

Program	Food Commodity Group	Analytes
Carbamates	Dairy Egg Meat	3-hydroxyCarbofuran, Aldicarb, Aldicarb Sulfone, Aldicarb, sulfoxide, Bendiocarb, Bufencarb, Carbaryl, Carbofuran, Dioxacarb, Isoprocarb, Methiocarb, Methiocarb Sulfoxide, Methomyl, Oxamyl, Promecarb, Propoxur
Chlorinated Phenols	Dairy Egg Meat	2,3,4,5 TetraChlorophenol, 2,3,4,6 TetraChlorophenol, 2,3,5,6 TetraChlorophenol, Pentachlorophenol
Glyphosate	Fresh fruits and vegetables Processed products	AMPA, Glyphosate
Phenoxy Herbicides	Fresh fruit and vegetables Processed products	2,4,5-T, 2,4-D, 2,4-DB, Acifluorfen, Bentazon, Bromoxynil, Chloramben, Clopyralid, Dicamba, Dichlorprop, Dithiopyr, Fenoprop, MCPA, MCPB, Mecoprop, Picloram, Triclopyr
Synthetic Pyrethrins	Dairy Egg Meat	Cyfluthrin (I,II,III,IV), Cyhalothrin-lambda, Cypermethrin, Deltamethrin, Esfenvalerate, Fenvalerate, Flucythrinate, Fluvalinate, Permethrin (Total), Permethrin cis, Permethrin trans

Table A-2: Analytes included in multi-residue method (with LC-MS/MS & GC-MS/MS detection) for pesticide residue analysis in fresh fruit and vegetables, honey, and processed products (PESTICIDES-GCLC)

3-hydroxyCarbofuran	Demeton-S	Griseofulvin	Piperonyl butoxide
5-hydroxythiabendazole (P/H)	Demeton-S-methyl	Halofenozide (F/P)	Piperophos
Abamectin	Demeton-s-methyl sulfone	Haloxyfop	Pirimicarb
Acephate	Demeton-s-methyl sulfoxide	Heptachlor	Pirimiphos-ethyl
Acetamiprid	Des-ethyl Atrazine	Heptachlor epoxide endo	Pirimiphos-methyl
Acetochlor	Desmedipham	Heptachlor epoxide exo	Prallethrin (P/H)
Acibenzolar-s-methyl	Desmetryn	Heptenophos	Pretilachlor
Aclonifen	Di-allate	Hexachlorobenzene	Primisulfuron-methyl
Alachlor	Dialofos	Hexaconazole	Prochloraz
Alanycarb	Diazinon	Hexaflumuron (F/P)	Procymidone
Aldicarb	Diazinon-o-analogue	Hexazinone	Prodiamine
Aldicarb Sulfone	Dichlobenil	Hexythiazox (F/P)	Profenofos
Aldicarb sulfoxide (F/P)	Dichlofenthion	Hydramethylnon (F/P)	Profluralin
Aldrin	Dichlofluanid	Imazalil	Promecarb
Allidochlor	Dichloran	Imazamethabenz-methyl	Prometon
Ametryn	Dichlormid	Imazethapyr	Prometryne
Aminocarb	Dichlorvos	Imidacloprid	Pronamide
Amitraz	Diclobutrazole	Indoxacarb	Propachlor
Anilofos	Diclocymet	Iodofenphos	Propamocarb

Aramite	Diclofop-methyl	Ipconazole	Propanil
Aspon	Dicofol	Iprobenfos	Propargite
Atrazine	Dicrotophos	Iprodione	Propazine
Azaconazole	Dieldrin	Iprovalicarb	Propetamphos
Azinphos-ethyl	Diethatyl-ethyl	Isazophos	Propham
Azinphos-methyl	Diethofencarb	Isocarbamide	Propiconazole
Azoxystrobin	Difenoconazole	Isofenphos	Propoxur
Benalaxyl	Diflubenzuron	Isoprocarb	Propyzamide
Bendiocarb	Dimethachlor	Isopropalin	Prothioconazole (F/P)
Benfluralin	Dimethametryn	Isoprothiolane	Prothiophos
Benfuracarb (F/P)	Dimethenamid (F/P)	Isoproturon	Pymetrozine
Benodanil	Dimethoate	Isoxadifen-ethyl	Pyracarbolid
Benomyl	Dimethomorph	Isoxathion	Pyraclostrobin
Benoxacor	Dimetilan	Kresoxim-methyl	Pyraflufen-ethyl
Bensulide	Dimoxystrobin	Leptophos	Pyrazophos
Benzoximate (F/P)	Diniconazole	Lindane or gamma-BHC	Pyrethrin
Benzoylprop-ethyl	Dinitramine	Linuron	Pyridaben (F/P)
BHC Alpha	Dinotefuran	Lufenuron (F/P)	Pyridalyl
BHC beta	Dioxacarb	Malaoxon	Pyridaphenthion
Bifenazate (F/P)	Dioxathion	Malathion	Pyridate
Bifenox	Diphenamid	Mandipropamid	Pyrifenox
Bifenthrin	Diphenylamine	Mecarbam	Pyrimethanil
Biphenyl	Dipropetryn	Mefenacet (F/P)	Pyriproxyfen
Bitertanol	Disulfoton	Mepanipyrim	Pyroquilon
Boscalid	Disulfoton sulfone	Mephosfolan	Pyroxsulam
Bromacil	Diuron	Mepronil (F/P)	Quinalphos
Bromophos	DNOC	Mesotrione (F)	Quinomethionate
Bromophos-ethyl	Dodemorph	Metaflumizone (F/P)	Quinoxyfen
Bromopropylate	Dodine (P/H)	Metalaxyl	Quintozene
Bromuconazole	Edifenphos	Metazachlor	Quizalofop
Bufencarb	Emamectin B1a	Metconazole (F/P)	Quizalofop-ethyl
Bupirimate	Emamectin B1b (F/P)	Methabenzthiazuron	Schradan
Buprofezin	Endosulfan alpha	Methamidophos	Secbumeton
Butachlor	Endosulfan beta	Methidathion	Sethoxydim (P/H)
Butafenacil	Endosulfan sulfate	Methiocarb	Siduron (F/P)
Butocarboxim	Endosulfan Total	Methiocarb sulfone	Simazine
Butocarboxim sulfoxide	Endrin	Methiocarb Sulfoxide	Simeconazole
Butoxycarboxim (F/P)	EPN	Methomyl	Simetryn
Butralin	Epoxiconazole	Methoprotryne	Spinetoram

Butylate	EPTC	Methoxychlor	Spinosyn A
Cadusafos	Erbon	Methoxyfenozide	Spinosyn D
Captafol	Esfenvalerate	Methyl - trithion	Spirodiclofen
Captan	Etaconazole	Methyl Pentachlorophenyl sulphide	Spiromesifen
Captan metabolite THPI	Ethalfluralin	Metobromuron	Spirotetramat
Carbaryl	Ethiofencarb	Metolachlor	Spiroxamine
Carbendazim	Ethiofencarb sulfone	Metolcarb	Sulfallate
Carbetamide	Ethiofencarb sulfoxide	Metosulam	Sulfentrazone
Carbofenthion	Ethion	Metoxuron	Sulfotep
Carbofuran	Ethiprole	Metribuzin	Sulprophos
Carbosulfan	Ethirimol	Mevinphos-cis	TCMTB
Carboxin	Ethofumesate	Mevinphos-trans	Tebuconazole
Carfentrazone-ethyl	Ethoprop	Mexacarbate	Tebufenozide
Chlorantraniliprole	Ethoprophos (F)	Mirex	Tebufenpyrad
Chlorbenside	Ethylan	Molinate	Tebupirimfos
Chlorbromuron	Etofenprox	Monocrotophos	Tebuthiuron (F/P)
Chlorbufam	Etoxazole	Monolinuron	Tecnazene
Chlordane	Etridiazole	Myclobutanil	Teflubenzuron (F/P)
Chlordane cis (F/P)	Etrimfos	Naled	Temephos (F/P)
Chlordane trans (F/P)	Famoxadone (F/P)	Napropamide	Tepraloxydim
Chlordimeform	Fenamidone	Naptalam	Terbacil
Chlorfenapyr	Fenamiphos	Neburon	Terbufos
Chlorfenson	Fenamiphos sulfone	Nitenpyram	Terbumeton
Chlorfenvinphos	Fenamiphos sulfoxide	Nitralin	Terbutryne
Chlorfluazuron (F/P)	Fenarimol	Nitrapyrin	Terbutylazine
Chlorflurenol-methyl	Fenazaquin	Nitrofen	Tetrachlorvinphos
Chloridazon	Fenbuconazole	Nitrothal-isopropyl	Tetraconazole
Chlorimuron-ethyl	Fenchlorphos or Ronnel	Norflurazon	Tetradifon
Chlormephos	Fenfuram	Novaluron	Tetraiodoethylene
Chlorobenzilate	Fenhexamid	Nuarimol	Tetramethrin
Chloroneb	Fenitrothion	o,p'-DDD or o,p'-TDE	Tetrasul
Chloropropylate	Fenobucarb (F/P)	o,p'-DDE	Thiabendazole
Chlorothalonil	Fenoxanil	o,p'-DDT	Thiacloprid
Chloroxuron	Fenoxycarb	Octhilinone	Thiamethoxam
Chlorpropham	Fenpropathrin	Ofurace	Thiazopyr
Chlorpyrifos	Fenpropidin	Omethoate	Thidiazuron (F/P)
Chlorpyrifos-methyl	Fenpropimorph	Ortho-phenylphenol	Thiobencarb
Chlorthiamid	Fenpyroximate	Oxadiazon	Thiodicarb
Chlorthion	Fenson	Oxadixyl	Thiofanox

Chlorthiophos	Fensulfothion	Oxamyl	Thiofanox sulfone
Chlortoluron	Fenthion	Oxamyl-oxime	Thiofanox sulfoxide
Chlozolinate	Fenthion oxon	Oxycarboxin	Thiophanate-methyl
Clethodim (F/P)	Fentrazamide	Oxychlordane	Tolclofos-methyl
Clodinafop-propargyl	Fenuron (F/P)	Oxydemeton-methyl	Tolfenpyrad
Clofentezine	Fenvalerate	Oxyfluorfen	Tolyfluanid
Clomazone	Fipronil	p,p'-DDD or p,p'-TDE	Toxaphene B
Cloquintocet-mexyl	Fipronil Desulfinyl	p,p'-DDE	Tolyfluanid
Clothianidin	Flamprop-isopropyl	p,p'-DDT	Tralkoxydim
Coumaphos	Flamprop-methyl	Paclobutrazol	Tralomethrin (F/P)
Crotoxyphos	Flonicamid (F/P)	Paraoxon	Triadimefon
Crufomate	Fluazifop-butyl	Parathion	Triadimenol
Cyanazine	Flubendiamide	Parathion-methyl	Tri-allate
Cyanofenphos	Fluchloralin	Pebulate	Triazophos
Cyanophos	Flucythrinate	Penconazole	Tribufos
Cyazofamid	Fludioxonil	Pencycuron	Trichlorfon
Cycloate	Flufenoxuron (F/P)	Pendimethalin	Tricyclazole
Cycloxydim	Flumetralin	Penoxsulam	Trietazine
Cycluron	Fluometuron (F/P)	Pentachloroaniline	Trifloxystrobin
Cyfluthrin I,II,III,IV	Fluorochloridone	Pentachlorobenzene	Trifloxysulfuron
Cyhalothrin-lambda	Fluorodifen	Permethrin	Triflumizole
Cymoxanil (F/P)	Fluquinconazole (F/P)	Permethrin cis	Triflumuron (F/P)
Cypermethrin	Flusilazole	Permethrin trans	Trifluralin
Cyprazine	Flusilazole	Phenmedipham	Triforine
Cyproconazole	Flutriafol	Phenthoate	Trimethacarb
Cyprodinil	Fluvalinate	Phorate	Triticonazole (F/P)
Cyromazine	Folpet	Phorate sulfone	Vamidothion (F/P)
Dacthal or chlorthal-dimethyl	Fonofos	Phosalone	Vernolate
delta-HCH or delta-lindane	Formetanate	Phosmet	Vinclozolin
Deltamethrin	Fuberidazole	Phosphamidon	Zinophos
delta-trans-allethrin	Furalaxyl (F/P)	Picolinafen	Zoxamide
Demeton-O	Furathiocarb	Picoxystrobin	

(F/P) = Fresh fruit and vegetables and processed products only; (P/H) = Processed products and honey only; (F) – Fresh fruit and vegetables only

Table A-3: Analytes included in multi-residue method (with GC-MS/MS detection) for pesticide residue analysis in fresh fruit and vegetables and processed products (PESTICIDES-F)

3-hydroxyCarbofuran	Cyprazine	Fluorochloridone	Pentachlorobenzene
Acephate	Cyproconazole	Fluorodifen	Pentachlorothioanisole
Acetamiprid	Cyprodinil	Flusilazole	Permethrin (Total)
Acetochlor	Cyromazine	Fluvalinate	Permethrin cis
Acibenzolar-s-methyl	Dacthal (chlorthal-dimethyl)	Folpet	Permethrin trans
Acrinathrin	delta-HCH (delta-lindane)	Fonofos	Phenthoate
Alachlor	Deltamethrin	Heptachlor	Phorate
Aldicarb	delta-trans-allethrin	Heptachlor epoxide endo	Phorate sulfone
Aldicarb sulfone	Demeton-O	Heptachlor epoxide exo	Phosalone
Aldicarb sulfoxide	Demeton-S	Heptenophos	Phosmet
Aldrin	Demeton-S-methyl	Hexachlorobenzene	Phosphamidon
Allidochlor	Des-ethyl Atrazine	Hexaconazole	Piperonyl butoxide
Ametryn	Desmetryn	Hexazinone	Pirimicarb
Aminocarb	Di-allate	Hexythiazox	Pirimiphos-ethyl
Aramite	Dialofos	Imazalil	Pirimiphos-methyl
Aspon	Diazinon	Indoxacarb	Prochloraz
Atrazine	Diazinon o analogue	Iodofenphos	Procymidone
Azinphos-ethyl	Dichlobenil	Iprobenfos	Profenofos
Azinphos-methyl	Dichlofenthion	Iprodione	Profluralin
Azoxystrobin	Dichlofluanid	Isazophos	Promecarb
Benalaxyl	Dichloran	Isofenphos	Prometon
Bendiocarb	Dichlormid	Isofenphos-methyl	Prometryne
Benfluralin	Dichlorvos	Isoprocarb	Pronamide
Benodanil	Diclobutrazole	Isopropalin	Propachlor
Bensulide	Diclofop-methyl	Isoprothiolane	Propamocarb
Benzoylprop-ethyl	Dicofol	Kresoxim-methyl	Propanil
BHC Alpha	Dicrotophos	Leptophos	Propargite
BHC beta	Dieldrin	Lindane (gamma-BHC)	Propazine
Bifenox	Diethatyl-ethyl	Linuron	Propetamphos
Bifenthrin	Dimethachlor	Malaoxon	Propham
Biphenyl	Dimethoate	Malathion	Propiconazole
Boscalid	Dimethomorph	Mecarbam	Propoxur
Bromacil	Dinitramine	Metaconazole	Propyzamide
Bromophos	Dioxacarb	Metalaxyl	Prothiophos
Bromophos-ethyl	Dioxathion	Metazachlor	Pymetrozine
Bromopropylate	Diphenamid	Methamidophos	Pyracarbolid
Bufencarb	Diphenylamine	Methidathion	Pyraclostrobin
Bupirimate	Disulfoton	Methiocarb	Pyrazophos
Buprofezin	Disulfoton sulfone	Methiocarb Sulfoxide	Pyrethrin

Butachlor	DNOC	Methomyl	Pyridaben
Butralin	Edifenphos	Methoprotryne	Pyridalyl
Butylate	Endosulfan alpha	Methoxychlor	Pyriproxyfen
Captafol	Endosulfan beta	Methyl - trithion	Quinalphos
Captan	Endosulfan sulfate	Methyl Pentachlorophenyl sulphide	Quinomethionate
Carbaryl	Endosulfan Total	Metobromuron	Quintozene
Carbendazim	Endrin	Metolachlor	Schradan
Carbetamide	EPN	Metribuzin	Secbumeton
Carbofenthion	EPTC	Mevinphos-cis	Simazine
Carbofuran	Erbon	Mevinphos-trans	Simetryn
Carbosulfan	Esfenvalerate	Mexacarbate	Spinosyn A
Carboxin	Etaconazole	Mirex	Sulfallate
Chlorbenside	Ethalfluralin	Molinate	Sulfotep
Chlorbromuron	Ethion	Monocrotophos	Sulprophos
Chlorbufam	Ethofumesate	Monolinuron	TCMTB
Chlordane	Ethoprophos	Myclobutanil	Tebuconazole
Chlordane cis	Ethylan	Naled	Tebufenozide
Chlordane trans	Etridiazole	Nitralin	Tecnazene
Chlordimeform	Etrimfos	Nitrapyrin	Terbacil
Chlorfenapyr	Fenamidone	Nitrofen	Terbufos
Chlorfenson	Fenamiphos	Nitrothal-isopropyl	Terbumeton
Chlorfenvinphos (e+z)	Fenamiphos sulfone	Norflurazon	Terbutryne
Chlorflurenol-methyl	Fenamiphos sulfoxide	Nuarimol	Terbutylazine
Chloridazon	Fenarimol	o,p'-DDD (o,p'-TDE)	Tetrachlorvinphos
Chlormephos	Fenbuconazole	o,p'-DDE	Tetradifon
Chlorobenzilate	Fenchlorphos (Ronnel)	o,p'-DDT	Tetraiodoethylene
Chloroneb	Fenfuram	Octhilinone	Tetramethrin
Chloropropylate	Fenhexamid	Omethoate	Tetrasul
Chlorothalonil	Fenitrothion	Ortho-phenylphenol	Thiabendazole
Chlorpropham	Fenoxycarb	Oxadiazon	Thiobencarb
Chlorpyrifos	Fenpropathrin	Oxadixyl	Thiodicarb
Chlorpyrifos-methyl	Fenpropimorph	Oxamyl	Tolclofos-methyl
Chlorthiamid	Fenson	Oxycarboxin	Tolyfluanid
Chlorthion	Fensulfothion	Oxychlordane	Toxaphene B
Chlorthiophos	Fenthion	Oxydemeton-methyl	Tralomethrin
Chlozolinate	Fenthion oxon	Oxyfluorfen	Triadimefon
Clomazone	Fenvalerate	p,p'-DDD (p,p'-TDE)	Triadimenol
Coumaphos	Fipronil	p,p'-DDE	Tri-allate
Crotoxyphos	Fipronil Desulfinyl	p,p'-DDT	Triazophos
Crufomate	Fipronil Sulfone	Paraoxon	Tribufos
Cyanazine	Flamprop-isopropyl	Parathion	Tricyclazole

Cyanofenphos	Flamprop-methyl	Parathion-methyl	Trifloxystrobin
Cyanophos	Fluchloralin	Pebulate	Triflumizole
Cycloate	Flucythrinate	Penconazole	Trifluralin
Cyfluthrin (I, II, III, IV)	Fludioxonil	Pendimethalin	Vernolate
Cyhalothrin-lambda	Flufenacet	Penoxsulam	Vinclozolin
Cypermethrin	Flumetralin	Pentachloroaniline	Zinophos

Table A-4: Analytes included in multi-residue method (with LC-MS/MS) for pesticide residue analysis in fresh fruit and vegetables and processed products (PESTICIDES-LC)

3-hydroxyCarbofuran	Dimethametryn	Indoxacarb	Pyraclostrobin
Abamectin (F)	Dimethenamid	Ipconazole (F)	Pyraflufen-ethyl
Acetamiprid (F)	Dimethomorph	Iprovalicarb	Pyridalyl
Acetochlor	Dimetilan (F)	Isocarbamide	Pyridaphenthion
Aclonifen	Dimoxystrobin (F)	Isoprocarb	Pyridate
Aldicarb	Diniconazole	Isoproturon (F)	Pyrifenox
Aldicarb Sulfone	Dinotefuran (F)	Isoxadifen-ethyl (F)	Pyrimethanil
Aldicarb sulfoxide	Dioxacarb	Isoxathion	Pyriproxyfen
Anilofos (F)	Dipropetryn	Linuron	Pyroquilon (F)
Azaconazole	Diuron	Mandipropamid (F)	Pyroxsulam (F)
Benomyl	Dodemorph	Mepanipyrim	Quinoxyfen
Benoxacor	Emamectin B1a	Mephosfolan	Quizalofop
Bitertanol	Epoxiconazole	Methabenzthiazuron	Quizalofop-ethyl
Boscalid (F)	Ethiofencarb	Methidathion	Schradan
Bromuconazole	Ethiofencarb sulfone	Methiocarb	Simeconazole (F)
Butafenacil	Ethiofencarb sulfoxide	Methiocarb sulfone	Spinosyn A
Butocarboxim (F)	Ethiprole (F)	Methiocarb Sulfoxide	Spinosyn D
Butocarboxim sulfoxide	Ethirimol	Methomyl	Spirodiclofen
Cadusafos	Ethoprop	Methoxyfenozide	Spiromesifen
Carbaryl	Ethoprophos	Metolcarb	Spirotetramat
Carbendazim	Etofenprox	Metosulam (F)	Spiroxamine
Carbetamide (F)	Etoxazole	Metoxuron	Sulfentrazone
Carbofuran	Famoxadone (F)	Mexacarbate	Tebufenozide
Carbosulfan	Fenamidone	Molinate	Tebufenpyrad
Carfentrazone-ethyl	Fenazaquin	Monocrotophos	Tebupirimfos
Chlorantraniliprole	Fenhexamid	Napropamide	Tepraloxydim
Chlorbromuron	Fenoxanil	Naptalam	Tetraconazole
Chloridazon	Fenoxycarb (F)	Neburon	Thiabendazole
Chlorimuron-ethyl	Fenpropidin	Nicotine (F)	Thiacloprid
Chloroxuron	Fenpropimorph	Norflurazon (F)	Thiamethoxam

Chlorthiamid	Fenpyroximate	Novaluron (F)	Thiazopyr
Chlortoluron	Fentrazamide	Ofurace	Thiodicarb
Clodinafop-propargyl	Fluazifop-butyl	Oxadixyl	Thiofanox
Clofentezine (F)	Flubendiamide (F)	Oxamyl	Thiofanox sulfone
Cloquintocet-mexyl	Flucarbazone-sodium	Oxamyl-oxime	Thiofanox sulfoxide
Clothianidin	Fluoxastrobin (F)	Oxycarboxin	Thiophanate-methyl
Cyanofenphos	Fluroxypyr (F)	Paclobutrazol	Tolfenpyrad (F)
Cyazofamid (F)	Flutolanil	Pencycuron	Tolyfluanid
Cycloxydim	Flutriafol	Penoxsulam	Tralkoxydim
Cycluron	Forchlorfenuron	Picolinafen	Trichlorfon
Cyromazine	Formetanate	Picoxystrobin	Tricyclazole
Demeton-s-methyl sulfone	Fosthiazate	Piperophos	Trietazine
Demeton-s-methyl sulfoxide	Fuberidazole	Pretilachlor	Trifloxysulfuron
Desmedipham	Furathiocarb	Primisulfuron-methyl	Triforine
Dialofos (F)	Griseofulvin (F)	Prodiamine	Trimethacarb
Diclocymet	Haloxyfop	Propamocarb	Zinophos
Diethofencarb	Imazamethabenz-methyl	Propoxur	Zoxamide
Difenoconazole	Imidacloprid	Pymetrozine	

(F) = Fresh fruit and vegetables only

Table A-5: Analytes included in multi-residue method (with GC-MS/MS detection) for pesticide residue analysis in nuts and seeds (PESTICIDES-N-GC)

Acephate	Cyprazine	Flumetralin	Penconazole
Acibenzolar-s-methyl	Cyproconazole	Fluorochloridone	Pendimethalin
Acrinathrin	Cyprodinil	Fluorodifen	Pentachloroaniline
Alachlor	Dacthal (chlorthal-dimethyl)	Flusilazole	Pentachlorothioanisole
Aldrin	delta-HCH (delta-lindane)	Fluvalinate	Permethrin cis
Allidochlor	Deltamethrin	Folpet	Permethrin trans
Ametryn	delta-trans-allethrin	Fonofos	Phenthoate
Aminocarb	Demeton-O	Heptachlor	Phorate
Aramite	Demeton-S	Heptachlor epoxide endo	Phorate sulfone
Aspon	Demeton-S-methyl	Heptenophos	Phosalone
Atrazine	Des-ethyl atrazine	Hexachlorobenzene	Phosmet
Azinphos-ethyl	Desmetryn	Hexaconazole	Phosphamidon
Azinphos-methyl	Di-allate	Hexazinone	Phthalimide
Azoxystrobin	Diazinon	Hexythiazox	Piperonyl butoxide
Benalaxyl	Diazinon o analogue	Imazalil	Pirimicarb
Bendiocarb	Dichlobenil	Iodofenphos	Pirimiphos-ethyl
Benfluralin	Dichlofenthion	Iprobenfos	Pirimiphos-methyl
Benodanil	Dichlofluanid	Iprodione	Prochloraz

Benzoylprop-ethyl	Dichloran	Isazophos	Procymidone
BHC Alpha	Dichlormid	Isofenphos	Profenofos
BHC beta	Dichlorvos	Isofenphos-methyl	Profluralin
Bifenox	Diclobutrazole	Isopropalin	Promecarb
Bifenthrin	Diclofop-methyl	Isoprothiolane	Prometon
Biphenyl	Dicofol	Kresoxim-methyl	Prometryne
Bromacil	Dicrotophos	Leptophos	Pronamide
Bromophos	Dieldrin	Lindane (gamma-BHC)	Propachlor
Bromophos-ethyl	Diethatyl-ethyl	Linuron	Propanil
Bromopropylate	Dimethachlor	Malaoxon	Propargite
Bupirimate	Dimethoate	Malathion	Propazine
Buprofezin	Dinitramine	Mecarbam	Propetamphos
Butachlor	Dioxathion	Metalaxyl	Propham
Butralin	Diphenamid	Metazachlor	Propiconazole
Butylate	Diphenylamine	Metconazole	Prothiophos
Captafol	Disulfoton	Methamidophos	Pyracarbolid
Captan	Disulfoton sulfone	Methidathion	Pyrazophos
Captan metabolite (THPI)	Edifenphos	Methoprotryne	Pyridaben
Carbetamide	Endosulfan alpha	Methoxychlor	Quinalphos
Carbofenthion	Endosulfan beta	Methyl - trithion	Quinomethionate
Carboxin	Endosulfan sulfate	Metobromuron	Quintozene
Chlorbenside	Endrin	Metolachlor	Secbumeton
Chlorbromuron	EPN	Metribuzin	Simazine
Chlorbufam	EPTC	Mevinphos-cis	Simetryn
Chlordane cis	Erbon	Mevinphos-trans	Sulfallate
Chlordane trans	Esfenvalerate	Mexacarbate	Sulfotep
Chlordimeform	Etaconazole	Mirex	Sulprophos
Chlorfenapyr	Ethalfluralin	Monocrotophos	TCMTB
Chlorfenson	Ethion	Monolinuron	Tebuconazole
Chlorfenvinphos (e+z)	Ethofumesate	Myclobutanil	Tecnazene
Chlorflurenol-methyl	Ethoprophos	Naled	Terbacil
Chloridazon	Ethylan	Nitralin	Terbufos
Chlormephos	Etridiazole	Nitrapyrin	Terbumeton
Chlorobenzilate	Etrimfos	Nitrofen	Terbutryne
Chloroneb	Fenamiphos	Nitrothal-isopropyl	Terbutylazine
Chloropropylate	Fenamiphos sulfoxide	Norflurazon	Tetrachlorvinphos
Chlorothalonil	Fenarimol	Nuarimol	Tetradifon
Chlorpropham	Fenbuconazole	o,p'-DDD (o,p'-TDE)	Tetraiodoethylene
Chlorpyrifos	Fenchlorphos (Ronnel)	o,p'-DDT	Tetramethrin
Chlorpyrifos-methyl	Fenfuram	Octhilinone	Tetrasul
Chlorthiamid	Fenitrothion	Omethoate	Thiobencarb
Chlorthion	Fenpropathrin	Ortho-phenylphenol	Tolclofos-methyl

Chlorthiophos	Fenpropimorph	Oxadiazon	Tolyfluanid
Chlozolinate	Fenson	Oxadixyl	Triadimefon
Clomazone	Fensulfothion	Oxycarboxin	Triadimenol
Coumaphos	Fenthion	Oxychlordane	Tri-allate
Crotoxyphos	Fenvalerate	Oxyfluorfen	Triazophos
Crufomate	Fipronil	p,p'-DDD (p,p'-TDE)	Tribufos
Cyanazine	Fipronil sulfone	p,p'-DDE	Tricyclazole
Cyanophos	Flamprop-isopropyl	p,p'-DDT	Trifloxystrobin
Cycloate	Flamprop-methyl	Paraoxon	Triflumizole
Cyfluthrin (I, II, III, IV)	Fluchloralin	Parathion	Trifluralin
Cyhalothrin-lambda	Fludioxonil	Parathion-methyl	Vernolate
Cypermethrin	Flufenacet	Pebulate	Vinclozolin

Table A-6: Analytes included in multi-residue method (with LC-MS/MS detection) for pesticide residue analysis in nuts and seeds (PESTICIDES-N-LC)

3-hydroxyCarbofuran	Dimethomorph	Ipconazole	Pymetrozine
Abamectin	Dimetilan	Iprovalicarb	Pyraclostrobin
Acetamiprid	Dimoxystrobin	Isocarbamide	Pyraflufen-ethyl
Acetochlor	Diniconazole	Isoprocarb	Pyridalyl
Aldicarb	Dinotefuran	Isoproturon	Pyridaphenthion
Aldicarb Sulfone	Dioxacarb	Isoxadifen-ethyl	Pyridate
Aldicarb sulfoxide	Dipropetryn	Isoxathion	Pyrifenox
Anilofos	Diuron	Linuron	Pyrimethanil
Azaconazole	Dodemorph	Mandipropamid	Pyriproxyfen
Benoxacor	Emamectin B1a	Mepanipyrim	Pyroquilon
Bitertanol	Epoxiconazole	Mephosfolan	Pyroxsulam
Boscalid	Ethiofencarb	Methabenzthiazuron	Quinoxyfen
Bromuconazole	Ethiofencarb sulfone	Methidathion	Quizalofop
Butafenacil	Ethiofencarb sulfoxide	Methiocarb	Quizalofop-ethyl
Butocarboxim	Ethiprole	Methiocarb sulfone	Schradan
Butocarboxim sulfoxide	Ethirimol	Methiocarb Sulfoxide	Simeconazole
Cadusafos	Ethoprop	Methomyl	Spinosyn A+D
Carbaryl	Etofenprox	Methoxyfenozide	Spirodiclofen
Carbendazim	Etoxazole	Metolcarb	Spiromesifen
Carbetamide	Famoxadone	Metosulam	Spirotetramat
Carbofuran	Fenamidone	Metoxuron	Spiroxamine
Carbosulfan	Fenazaquin	Mexacarbate	Sulfentrazone
Carfentrazone-ethyl	Fenhexamid	Molinate	Tebufenozide
Chlorantraniliprole	Fenoxanil	Monocrotophos	Tebufenpyrad
Chlorbromuron	Fenoxycarb	Napropamide	Tebupirimfos

Chloridazon	Fenpropidin	Naptalam	Tepraloxydim
Chlorimuron-ethyl	Fenpropimorph	Neburon	Tetraconazole
Chloroxuron	Fenpyroximate	Nicotine	Thiabendazole
Chlortoluron	Fentrazamide	Norflurazon	Thiacloprid
Clodinafop-propargyl	Fluazifop-butyl	Novaluron	Thiamethoxam
Clofentezine	Flubendiamide	Ofurace	Thiazopyr
Cloquintocet-mexyl	Flucarbazone-sodium	Oxadixyl	Thiofanox
Clothianidin	Fluoxastrobin	Oxamyl	Thiofanox sulfone
Cyanofenphos	Fluroxypyr	Oxamyl-oxime	Thiofanox sulfoxide
Cyazofamid	Flutolanil	Oxycarboxin	Thiophanate-methyl
Cycloxydim	Flutriafol	Paclobutrazol	Tolfenpyrad
Cycluron	Forchlorfenuron	Pencycuron	Tralkoxydim
Cyromazine	Formetanate	Penoxsulam	Trichlorfon
Demeton-s-methyl sulfone	Fosthiazate	Picolinafen	Tricyclazole
Demeton-s-methyl sulfoxide	Fuberidazole	Picoxystrobin	Trietazine
Desmedipham	Furathiocarb	Piperophos	Trifloxysulfuron
Dialofos	Griseofulvin	Pretilachlor	Triforine
Diclocymet	Haloxyfop	Primisulfuron-methyl	Trimethacarb
Diethofencarb	Imazamethabenz-methyl	Prodiamine	Zinophos
Difenoconazole	Imidacloprid	Propamocarb	Zoxamide
Dimethametryn	Indoxacarb	Propoxur	

Table A-7: Analytes included in multi-residue method (with GC-MS/MS detection) for pesticide residue analysis in meat and poultry (PESTICIDES-M)

3-hydroxyCarbofuran	Clothianidin	Fluridone	Oxamyl
Acephate	Coumaphos	Fluroxypyr-1-methylhepyl ester	Oxychlordane
Acetamiprid	Cyfluthrin (I, II, III, IV)	Fluvalinate	p,p'-DDD (p,p'-TDE)
Alachlor	Cyhalothrin-lambda	Fonofos	p,p'-DDE
Alachlor metabolite(2-chloro-2',6'-diethylanilide)	Cypermethrin	Heptachlor	p,p'-DDT
Aldicarb	delta-HCH (delta-lindane)	Heptachlor epoxide endo	Parathion
Aldicarb Sulfone	Deltamethrin	Heptachlor epoxide exo	Parathion-methyl
Aldicarb sulfoxide	Des-ethyl Atrazine	Hexachlorobenzene	Permethrin (Total)
Aldrin	Diazinon	Hexazinone	Phorate
Aminocarb	Dichlofenthion	Imazalil	Phorate sulfone
Atrazine	Dichlorvos	Imidacloprid	Piperonyl butoxide
Azinphos-methyl	Dicofol	Indoxacarb	Profenofos
Azoxystrobin	Dieldrin	Isoprocarb	Promecarb
Bendiocarb	Difenoconazole	Lindane (gamma-BHC)	Pronamide

Benoxacor	Diflubenzuron	Linuron	Propachlor
BHC Alpha	Dimethoate	Malathion	Propanil
BHC beta	Dioxacarb	Metalaxyl	Propetamphos
Bifenthrin	Disulfoton	Methidathion	Propiconazole
Boscalid	Diuron	Methiocarb	Propoxur
Bufencarb	Endosulfan alpha	Methiocarb sulfone	Pyraclostrobin
Buprofezin	Endosulfan beta	Methiocarb Sulfoxide	Pyridaben
Carbaryl	Endosulfan sulfate	Methomyl	Pyriproxyfen
Carbofenthion	Endrin	Methoxychlor	Quizalofop-ethyl
Carbofuran	Endrin Ketone	Methoxyfenozide	Resmethrin
Carbosulfan	Esfenvalerate	Metolachlor	Simazine
Carboxin	Ethion	Metribuzin	Tebufenozide
Carfentrazone-ethyl	Ethofumesate	Mirex	Tefluthrin
Chlordane	Fenchlorphos (Ronnel)	Myclobutanil	Terbufos
Chlordane cis	Fenoxaprop-ethyl	Nonachlor cis	Tetrachlorvinphos
Chlordane trans	Fenpropathrin	Nonachlor trans	Tetraconazole
Chlorfenvinphos (e+z)	Fenthion	Norflurazon	Thiabendazole
Chloroneb	Fenvalerate	o,p'-DDD (o,p'-TDE)	Thiamethoxam
Chlorpropham	Fipronil	o,p'-DDE	Thiobencarb
Chlorpyrifos	Fipronil Desulfinyl	o,p'-DDT	Tribufos
Chlorpyrifos-methyl	Fipronil Sulfide	Ortho-phenylphenol	Trifloxystrobin
Clofentezine			

Table A-8: Analytes included in multi-residue method (with GC/MS/MS & GC/MS detection) for organochloride pesticide residue analysis in dairy and egg (PESTICIDES-OC)

Alachlor	Dicofol	Heptachlor epoxide endo	Oxychlordane
Alachlor metabolite(2-chloro-2',6'-diethylanilide)	Dieldrin	Heptachlor epoxide exo	p,p'-DDD or p,p'-TDE
Aldrin	Diethylacetanilide Chloride (D)	Hexachlorobenzene	p,p'-DDE
BHC Alpha	Endosulfan alpha	Lindane or gamma-BHC	p,p'-DDT
BHC beta	Endosulfan beta	Methoxychlor	Permethrin (D)
Chlordane (D)	Endosulfan sulfate	Mirex	Permethrin cis
Chlordane cis	Endosulfan Total (D)	Myclobutanil	Permethrin trans
Chlordane trans	Endrin	o,p'-DDD or o,p'-TDE	Quizalofop-ethyl
Chlorpyrifos	Fenchlorphos or Ronnel	o,p'-DDE	Tefluthrin
Cyfluthrin I,II,III,IV	Heptachlor	o,p'-DDT	

(D) = Dairy only

Table A-9: Analytes included in selective multi-residue methods for veterinary drugs in specific food commodity groups

Program	Food Commodity Group	Analytes
β-agonists	Dairy Egg Meat	Brombuterol, Cimaterol, Clenbuterol, Clenpenterol, Clenproperol, Fenoterol, Formoterol, Free Ractopamine, Free Zilpaterol, Isoxsuprine, Mabuterol, Mapenterol, Metaproterenol, OH-Me-Clenbuterol, Ractopamine, Ritodrine, Salbutamol, Terbutaline, Tulobuterol, Zilpaterol
Benzimidazoles	Dairy Egg Meat	2-aminosulfone albendazole, 5-hydroxythiabendazole, Albendazole, Albendazole Sulfone, Albendazole Sulfoxide, Cambendazole, Carbendazim, Fenbendazole, Fenbendazole Sulfone, Flubendazole, Levamisole, Mebendazole, Oxfendazole, Oxibendazole, Thiabendazole
Carbadox / Desoxycarbadox	Meat	Desoxycarbadox, Methylenequinoxaline-2-carboxylic acid, Quinoxaline-2-carboxylic acid
Ceftiofur	Dairy Egg Meat	Ceftiofur, Desfuroyl ceftiofur Cystine Disulfide
Coccidiostats	Egg Meat	Amprolium, Buquinolate, Clopidol, Decoquinate, Diclazuril, Dinitolmide, Halofuginone, Lasalocid, Maduramicin, Monensin, Narasin, Nicarbazin, Robenidine, Salinomycin, Toltrazuril Sulfone
Dipyrone	Dairy Meat	4-aminoantipyrine, 4-formylaminoantipyrine, 4-methylaminoantipyrine, Dipyrone
Endectocides	Dairy Egg Meat	Abamectin, Doramectin, Emamectin B1a, Eprinomectin, Ivermectin, Moxidectin
Fluoroquinolones	Dairy Egg Honey Meat	Ciprofloxacin, Danofloxacin, Desethylene-ciprofloxacin, Difloxacin, Enoxacin, Enrofloxacin, Flumequine, Marbofloxacin, Nalidixic Acid, Norfloxacin, Ofloxacin, Orbifloxacin, Oxolinic Acid, Pipemidic acid, Sarafloxacin, Sparfloxacin
Gestagens	Dairy Meat	Chlormadinone Acetate, Megestrol Acetate, Melengestrol Acetate
Glycosides	Dairy Egg Honey Meat	Amikacin, Apramycin, Dihydrostreptomycin, Gentamicin, Hygromycin, Kanamycin, Neomycin, Spectinomycin, Streptomycin, Tobramycin
Macrolides	Dairy Honey Meat	Clindamycin, CP 60,300 (as Tulathromycin equivalents), Erythromycin, Josamycin, Lincomycin, Oleandomycin, Pirlimycin, Spiramycin, Tilmicosin, Tylosin
Macrolides / Lincosamides	Dairy Egg Honey Meat	Clindamycin, CP 60,300 (as Tulathromycin equivalents), Desmycosin, Erythromycin, Gamithromycin, Josamycin, Lincomycin, Neospiramycin, Oleandomycin, Pirlimycin, Spiramycin, Tildipirosin, Tilmicosin, Tulathromycin, Tylosin, Tylvalosin

Program	Food Commodity Group	Analytes
Multi-Class Antibiotics	Meat	Amoxicillin, Ampicillin, Amprolium, Cefazolin, Cephalexin, Chloramphenicol, Chlortetracycline, Ciprofloxacin, Clindamycin, Clopidol, Cloxacillin, Danofloxacin, Desacetyl Cephapirin, Desethylene-ciprofloxacin, Desfuroyl ceftiofur Cystine Disulfide, Dicloxacillin, Doxycycline, Enrofloxacin, Erythromycin, Fenbendazole, Florfenicol, Flunixin, Gamithromycin, Josamycin, Ketoprofen, Lincomycin, Meloxicam, Nafcillin, neosaxitoxin, Neospiramycin, Norfloxacin, Novobiocin, Ofloxacin, Oleandomycin, Oxacillin, Oxytetracycline, Penicillin G, Pirlimycin, Sarafloxacin, Spiramycin, Sulfabenzamide, Sulfacetamide, Sulfachloropyridazine, Sulfadiazine, Sulfadimethoxine, Sulfadoxine, Sulfaethoxypyridazine, Sulfaguanidine, Sulfamerazine, Sulfamethazine, Sulfamethoxypyridazine, Sulfanilamide, Sulfanitran, Sulfaquinoxaline, Sulfathiazole, Tetracycline, Thiamphenicol, Tiamulin Hydrogen Fumarate, Tilmicosin, Trimethoprim, Tulathromycin, Tylosin
NSAIDs	Dairy	5-Hydroxyflunixin, Diclofenac, Flunixin, Ibuprofen, Ketoprofen, Mefenamic Acid, Meloxicam, Naproxen, Phenylbutazone, Tolfenamic Acid
NSAID/Hormone/Steroid/ Tranquilizer	Meat	19-Nortestosterone, 20-Dihydroprednisolone, 20-Dihydroprednisone, Acepromazine, alpha Trenbolone, Altrenogest, Azaperol, Azaperone, Beclomethasone, beta Trenbolone, Betamethasone, Boldenone, Butorphanol, Carazolol, Carprofen, Chlorpromazine, Detomidine, Dexamethasone, Dianabol, Diclofenac, Epi-19-nortestosterone, Epi-testosterone, Etodolac, Firocoxib, Flumethasone, Flunixin, Haloperidol, Ketoprofen, Mefenamic Acid, Meloxicam, Methylprednisolone, Naproxen, Niflumic Acid, Oxyphenbutazone, Phenylbutazone, Prednisolone, Prednisone, Progesterone, Propionylpromazine, Testosterone, Tolfenamic Acid, Triamcinolone, Acetonide, Vedaprofen, Xylazine
Phenylbutazone/ Diclofenac	Meat	Diclofenac, Oxyphenbutazone, Phenylbutazone
Steroids	Dairy Meat	19-Nortestosterone, 20-Dihydroprednisolone, 20-Dihydroprednisone, alpha Trenbolone, Beclomethasone, beta Trenbolone, Betamethasone, Boldenone, Carprofen, Dexamethasone, Dianabol, Epi-19-nortestosterone, Epi-testosterone, Etodolac, Flumethasone, Flunixin, Ketoprofen, Mefenamic Acid, Meloxicam, Methylprednisolone, Naproxen, Niflumic Acid, Prednisolone, Progesterone, Testosterone, Tolfenamic Acid, Triamcinolone Acetonide, Vedaprofen
Sulfonamides	Dairy Egg Honey	Dapsone, Ormetoprim, Sulfabenzamide, Sulfacetamide, Sulfachloropyridazine, Sulfadiazine, Sulfadimethoxine, Sulfadoxine, Sulfaethoxypyridazine, Sulfaguanidine, Sulfamerazine, Sulfameter, Sulfamethazine, Sulfamethizole, Sulfamethoxazole, Sulfamethoxypyridazine, Sulfamonomethoxine, Sulfamoxole, Sulfanilamide, Sulfaphenazole, Sulfapyridine, Sulfaquinoxaline, Sulfathiazole, Sulfisomidine, Sulfisoxazole, Trimethoprim

Program	Food Commodity Group	Analytes
Sulfonamides-M	Meat	Dapsone, Ormetoprim, Sulfabenzamide, Sulfacetamide, Sulfachloropyridazine, Sulfadiazine, Sulfadimethoxine, Sulfadoxine, Sulfaethoxypyridazine, Sulfaguanidine, Sulfamerazine, Sulfameter, Sulfamethazine, Sulfamethizole, Sulfamethoxazole, Sulfamethoxypyridazine, Sulfamonomethoxine, Sulfamoxole, Sulfanilamide, Sulfaphenazole, Sulfapyridine, Sulfaquinoxaline, Sulfathiazole, Sulfisomidine, Sulfisoxazole, Trimethoprim
Tetracyclines	Dairy Egg Honey Meat	Chlortetracycline, Doxycycline, Epi-Chlortetracycline, Epi-Oxytetracycline, Epi-Tetracycline, Oxytetracycline, Tetracycline
Thyreostats	Dairy Egg Meat	Mercaptobenzimidazole, Methylthiouracil, Phenylthiouracil, Propylthiouracil, Tapazole, Thiouracil
Trenbolone Acetate	Meat	alpha Trenbolone, beta Trenbolone
Zeranol / Stilbenes	Dairy Meat	Dienestrol, Diethylstilbestrol, Hexestrol, Taleranol, Zearalanone, Zearalenol – Alpha, Zearalenol – Beta, Zearalenone, Zeranol

Table A-10: Analytes included in multi-residue method for veterinary drugs analysis in dairy and honey (IONOPHORES)

Lasalocid	Monensin	Nicarbazin
Maduramicin (H)	Narasin	Salinomycin

(H) = Honey only

Table A-11: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg and meat (IONOPHORES/NICARBAZIN)

Decoquinate (D)	Maduramicin (D/M)	Narasin	Salinomycin
Lasalocid	Monensin	Nicarbazin	

(D) = Meat only; (D/M) = Dairy and meat only

Table A-12: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg, honey and meat (NITROFURANS)

AHD (Nitrofurantoin Metabolite)	AOZ (Furazolidone Metabolite)	DNSAH (Nifursol metabolite)
AMOZ (Furaltadone Metabolite)	SEM (Nitrofurazone metabolite)	

Table A-13: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg, honey and meat (MULTI-CLASS ANTIBIOTICS)

Amoxicillin (D/E/M)	Enrofloxacin	Oleandomycin (M)	Sulfamethazine
Ampicillin (D/E/M)	Erythromycin	Oxacillin (D/E/M)	Sulfamethizole (D/E)
Amprolium (M)	Fenbendazole (M)	Oxolinic Acid (D/E)	Sulfamethoxazole (D/E)
Cefazolin (M)	Florfenicol (M)	Oxytetracycline	Sulfamethoxypyridazine (D/E/M)
Cephalexin (M)	Flumequine (D/E)	Penicillin G (D/E/M)	Sulfamonomethoxine (D/E)
Chloramphenicol (H/M)	Flumequine (D)	Penicillin V (D/E)	Sulfanilamide (M)
Chlortetracycline	Flunixin (M)	Pirlimycin (M)	Sulfapyridine (D/E/H)
Ciprofloxacin	Fumagillin (H)	Ractopamine (M)	Sulfaquinoxaline (D/E/M)
Clindamycin (M)	Gamithromycin (M)	Sarafloxacin	Sulfathiazole
Clopidol (M)	Josamycin (D/E/M)	Spiramycin (D/E/M)	Sulfisoxazole (D/E)
Cloxacillin (D/E/M)	Ketoprofen (M)	Streptomycin (H)	Tetracycline
CP 60, 300 (M)	Lincomycin	Sulfabenzamide (M)	Thiamphenicol (M)
Danofloxacin	Marbofloxacin (D/E)	Sulfacetamide (M)	Tiamulin Hydrogen Fumarate (M)
Desacetyl Cephapirin (M)	Meloxicam (M)	Sulfachloropyridazine (D/E/M)	Tildipirosin (M)
Desethylene-ciprofloxacin (M)	Monensin (H)	Sulfadiazine	Tilmicosin (D/E/M)

Desfuroyl ceftiofur Cystine Disulfide (M)	Nafcillin (D/E/M)	Sulfadimethoxine (D/E/M)	Trimethoprim (D/E/M)
Desmycosin (H)	Neospiramycin (M)	Sulfadoxine (D/E/M)	Tulathromycin (M)
Dicloxacillin (D/E/M)	Norfloxacin (D/E/M)	Sulfaethoxypyridazine (M)	Tylosin
Difloxacin (D/E/H)	Novobiocin (M)	Sulfaguanidine (M)	Tylvalosin (M)
Doxycycline	Ofloxacin (M)	Sulfamerazine	Zilpaterol (M)

(M) = Meat only; (D) = Dairy only; (H) = Honey only; (H/M) = Honey and meat only; (D/E) = Dairy and egg only; (D/E/M) = Dairy, egg and meat only; (D/E/H) = Dairy, egg, and honey only

Table A-14: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg, honey, and meat (NITROIMIDAZOLES)

Dimetridazole	Ipronidazole	Ronidazole
Hydroxy Dimetridazole	Ipronidazole metabolite	Tinidazole
Hydroxy Metronidazole	Metronidazole	

Table A-15: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg, and meat (NSAID/HORMONE/STEROID)

19-Nortestosterone	Boldenone	Etodolac	Oxyphenbutazone
20-Dihydroprednisolone	Butorphanol (M)	Firocoxib (M)	Phenylbutazone
20-Dihydroprednisone	Carazolol (M)	Flumethasone	Prednisolone
Acepromazine (M)	Carprofen	Flunixin	Prednisone
alpha Trenbolone	Chlorpromazine (M)	Haloperidol (M)	Progesterone (M)
Altrenogest (M)	Detomidine (M)	Ketoprofen	Propionylpromazine (M)
Azaperol (M)	Dexamethasone	Mefenamic Acid	Testosterone
Azaperone (M)	Dianabol	Meloxicam	Tolfenamic Acid
Beclomethasone	Diclofenac	Methylprednisolone	Triamcinolone Acetonide
beta Trenbolone	Epi-19-nortestosterone	Naproxen	Vedaprofen
Betamethasone	Epi-testosterone	Niflumic Acid	Xylazine (M)

(M) = Meat only

Table A-16: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg, honey and meat (PENICILLINS)

Amoxicillin	Cephapirin (D)	Nafcillin	Penicillin V
Ampicillin	Cloxacillin	Oxacillin	
Ceftiofur (D)	Dicloxacillin	Penicillin G	

(D) = Dairy only

Table A-17: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg, honey and meat (PHENICOLS)

Chloramphenicol	Florfenicol	Florfenicol amine	Thiamphenicol (D/E/M)

(D/E/M) = Dairy, egg, and meat only

Table A-18: Analytes included in multi-residue method for veterinary drugs analysis in dairy, egg and meat (TRANQUILIZER)

Acepromazine	Butorphanol (M)	Detomidine (M)	Xylazine
Azaperol	Carazolol	Haloperidol	
Azaperone	Chlorpromazine	Propionylpromazine	

(M) = Meat only

Table A-19: Analytes included in multi-residue method for metals in dairy, egg, fresh fruit and vegatables, honey, maple[1], meat, processed products (METALS)

Aluminum	Chromium	Magnesium	Thallium (D)
Antimony	Cobalt	Manganese	Tin
Arsenic	Copper	Mercury	Titanium
Beryllium	Iron	Molybdenum	Uranium (D)
Boron	Lead	Nickel	Vanadium (D)
Cadmium	Lithium (D)	Selenium	Zinc

(D) = Dairy only.

[1]Maple products are tested for lead only.

Table A-20: WHO 2005 Toxic Equivalency Factors (TEFs) for dioxins and dioxin-like compounds

Analyte Name	TEF
Chlorinated dibenzo-p-dioxins	
2,3,7,8-TCDD	1
1,2,3,7,8-PeCDD	1
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
1,2,3,4,6,7,8,9-OCDD	0.0003
Chlorinated dibenzofurans	
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDF	0.03
2,3,4,7,8-PeCDF	0.3
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
1,2,3,4,6,7,8,9-OCDF	0.0003
Polychlorinated biphenyls	
3,3',4,4'-TeCB (PCB 77)	0.0001
3,4,4',5-TeCB (PCB 81)	0.0003
2,3,3',4,4'-PeCB (PCB 105)	0.00003
2,3,4,4',5-PeCB (PCB 114)	0.00003
2,3',4,4',5-PeCB (PCB 118)	0.00003
2',3,4,4',5-PeCB (PCB 123)	0.00003
3,3',4,4',5-PeCB (PCB 126)	0.1
2,3,3',4,4',5-HxCB (PCB 156)	0.00003
2,3,3',4,4',5'-HxCB (PCB 157)	0.00003
2,3',4,4',5,5'-HxCB (PCB 167)	0.00003
3,3',4,4',5,5'-HxCB (PCB 169)	0.03
2,3,3',4,4',5,5'-HpCB (PCB 189)	0.00003

Table A-21: Analytes included in polychlorinated biphenyl (PCB) analytical method

Number	Congener Name	Number	Congener Name
PCB #001	2-Chlorobiphenyl	PCB #128	2,2',3,3',4,4'-Hexachlorobiphenyl
PCB #003	4-Chlorobiphenyl	PCB #129	2,2',3,3',4,5-Hexachlorobiphenyl
PCB #004	2,2'-Dichlorobiphenyl	PCB #137	2,2',3,4,4',5-Hexachlorobiphenyl
PCB #008	2,4'-Dichlorobiphenyl	PCB #138	2,2',3,4,4',5'-Hexachlorobiphenyl
PCB #010	2,6-Dichlorobiphenyl	PCB #141	2,2',3,4,5,5'-Hexachlorobiphenyl
PCB #015	4,4'-Dichlorobiphenyl	PCB #149	2,2',3,4,5',6-Hexachlorobiphenyl
PCB #018	2,2',5-Trichlorobiphenyl	PCB #151	2,2',3,5,5',6-Hexachlorobiphenyl
PCB #019	2,2',6-Trichlorobiphenyl	PCB #153	2,2',4,4',5,5'-Hexachlorobiphenyl
PCB #022	2,3,4'-Trichlorobiphenyl	PCB #155	2,2',4,4',6,6'-Hexachlorobiphenyl
PCB #028	2,4,4'-Trichlorobiphenyl	PCB #156	2,3,3',4,4',5-Hexachlorobiphenyl
PCB #033	2',3,4'-Trichlorobiphenyl	PCB #157	2,3,3',4,4',5'-Hexachlorobiphenyl
PCB #037	3,4,4'-Trichlorobiphenyl	PCB #158	2,3,3',4,4',6-Hexachlorobiphenyl
PCB #040	2,2',3,3'-Tetrachlorobiphenyl	PCB #167	2,3',4,4',5,5'-Hexachlorobiphenyl
PCB #041	2,2',3,4-Tetrachlorobiphenyl	PCB #168	2,3',4,4',5',6-Hexachlorobiphenyl
PCB #044	2,2',3,5-Tetrachlorobiphenyl	PCB #169	3,3',4,4',5,5'-Hexachlorobiphenyl
PCB #049	2,2',4,5'-Tetrachlorobiphenyl	PCB #170	2,2',3,3',4,4',5-Heptachlorobiphenyl
PCB #052	2,2',5,5'-Tetrachlorobiphenyl	PCB #171	2,2',3,3',4,4',6-Heptachlorobiphenyl
PCB #054	2,2',6,6'-Tetrachlorobiphenyl	PCB #177	2,2',3,3',4',5,6-Heptachlorobiphenyl
PCB #060	2,3',4,4'-Tetrachlorobiphenyl	PCB #178	2,2',3,3',5,5',6-Heptachlorobiphenyl
PCB #066	2,3',4,4'-Tetrachlorobiphenyl	PCB #180	2,2',3,4,4',5,5'-Heptachlorobiphenyl
PCB #070	2,3',4',5-Tetrachlorobiphenyl	PCB #183	2,2',3,4,4',5',6-Heptachlorobiphenyl
PCB #074	2,4,4',5-Tetrachlorobiphenyl	PCB #187	2,2',3,4',5,5',6-Heptachlorobiphenyl
PCB #077	3,3',4,4'-Tetrachlorobiphenyl	PCB #188	2,2',3,4',5,6,6'-Heptachlorobiphenyl
PCB #081	3,4,4',5-Tetrachlorobiphenyl	PCB #189	2,3,3',4,4',5,5'-Heptachlorobiphenyl
PCB #087	2,2',3,4,5'-Pentachlorobiphenyl	PCB #191	2,3,3',4,4',5',6-Heptachlorobiphenyl
PCB #095	2,2',3,5',6-Pentachlorobiphenyl	PCB #193	2,3,3',4',5,5',6-Heptachlorobiphenyl
PCB #099	2,2',4,4',5-Pentachlorobiphenyl	PCB #194	2,2',3,3',4,4',5,5'-Octachlorobiphenyl
PCB #104	2,2',4,6,6'-Pentachlorobiphenyl	PCB #199	2,2',3,3',4,5,6,6'-Octachlorobiphenyl
PCB #105	2,3,3',4,4'-Pentachlorobiphenyl	PCB #201	2,2',3,3',4,5,5',6'-Octachlorobiphenyl
PCB #110	2,3,3',4',6'-Pentachlorobiphenyl	PCB #202	2,2',3,3',5,5',6,6'-Octachlorobiphenyl
PCB #114	2,3,4,4',5-Pentachlorobiphenyl	PCB #203	2,2',3,4,4',5,5',6-Octachlorobiphenyl
PCB #118	2,3',4,4',5-Pentachlorobiphenyl	PCB #205	2,3,3',4,4',5,5',6-Octachlorobiphenyl
PCB #119	2,3',4,4',6-Pentachlorobiphenyl	PCB #206	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl
PCB #123	2',3,4,4',5-Pentachlorobiphenyl	PCB #208	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl
PCB #126	3,3',4,4',5-Pentachlorobiphenyl	PCB #209	Decachlorobiphenyl

Table A-22: Analytes included in the polycyclic aromatic hydrocarbon (PAH) analytical method in egg, fresh fruits and vegetables, processed products, honey and meat

Acenaphthene	Chrysene
Acenaphthylene	Dibenzo(a,h)anthracene
Anthracene	Fluoranthene
Benzo(a)anthracene	Fluorene
Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene
Benzo(b)fluoranthene	Naphthalene
Benzo(g,h,i)perylene	Phenanthrene
Benzo(k)fluoranthene	Pyrene

Table A-23: Toxic Equivalency Factors (TEFs) for individual polycyclic aromatic hydrocarbons (PAHs)[1-4]

Analyte Name	TEF
Acenaphthene[1]	0.001
Acenaphthylene[1]	0.001
Anthracene[1]	0.01
Benzo(a)anthracene[1,2,3,4]	0.1
Benzo(a)pyrene[1,2,3,4]	1
Benzo(b)fluoranthene[1,2]	0.1
Benzo(g,h,i)perylene[1,4]	0.01
Benzo(k)fluoranthene[1,4]	0.1
Chrysene[1,2,4]	0.01
Dibenzo(a,h)anthracene[1,3,4]	1
Fluoranthene[1]	0.001
Fluorene[1]	0.001
Indeno(1,2,3-cd)pyrene[1,2,3,4]	0.1
Naphthalene[1]	0.001
Phenanthrene[1]	0.001
Pyrene[1]	0.001

[1]Nisbet, I.C.T.; LaGoy, P.K. Toxic equivalency factors (TEFs) for polycyclic aromatic hydrocarbons (PAHs). Regul. Toxicol. Pharm. 1992,16, 290–300.

[2]Collins, J.F.; Brown, J.P.; Alexeeff, G.V.; Salmon, A.G. Potency Equivalency Factors for Some Polyciclic Aromatic Hydrocarbons and Polycyclic Aromatic Hydrocarbon Derivatives; Regulatory Toxicology and Pharmacology 28, 45-54 (1998) (EPA)

[3] EPA (United States Environmental Protection Agency), *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons.* 1993. p. 17

[4]Canadian Council of Ministers of the Environment, Canadian Soil Quality Guidelines for Carcinogenic and Other Polycyclic Aromatic Hydrocarbons (Environmental and Human Health Effects). 2008, Environment Canada. p. 218.