Pesticide Residue Monitoring Program Fiscal Year 2018 Pesticide Report

U.S. Food and Drug Administration

https://www.fda.gov/food/chemicals-metals-pesticides-food/pesticides

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Acknowledgments

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FDA Pesticide Residue Monitoring Program Reports and Data

For more information about FDA pesticide residue monitoring program reports, see https://www.fda.gov/food/pesticides/pesticide-residue-monitoring-program-reports-and-data. Since 1987, annual pesticide reports have been prepared to summarize results of the Food and Drug Administration's (FDA or the Agency) pesticide residue monitoring program. Reports from Fiscal Year (FY) 1987 to FY 1993 were published in the Journal of the Association of Official Analytical Chemists/Journal of AOAC International. FY 1993 and FY 1994 reports were published in the journal and also made available on the public FDA website (www.fda.gov). Subsequent reports are only available on the FDA website. Each report is available in the format(s) used at the time they were written.

In addition to the annual reports, specific pesticide monitoring data and statistical analyses of human and animal foods for each year are also available in text format on the FDA website as "database" files. The database files include statistical analysis of findings by multiple country/commodity/pesticide combinations, along with data for individual samples from which the summary information was compiled. Instructions and explanations of the data and statistical analyses are provided for each database file. The database files are available from FY 1996 on.

Executive Summary

Growers often use pesticides to protect their products from insects, weeds, fungi, and other pests. U.S. regulators help ensure that food produced with the use of pesticides is safe to eat by setting allowable levels called tolerances for pesticide chemical residues and by monitoring foods in the market to determine if those levels are being exceeded.
The role of the Environmental Protection Agency (EPA) is to establish pesticide tolerances on the amount of a pesticide chemical residue a food can contain. The Food and Drug Administration (FDA) is responsible for enforcing those tolerances for domestic foods shipped in interstate commerce and foods imported into the United States (U.S.).*

This report summarizes the results of FDA's pesticide monitoring program for Fiscal Year (FY) 2018. The findings show that the levels of pesticide chemical residues measured by FDA in the U.S. food supply are generally in compliance with EPA pesticide tolerances.

FDA employs a three-fold strategy to enforce EPA's pesticide tolerances in human and animal foods. In its regulatory pesticide residue monitoring program, FDA selectively monitors a broad range of domestic and import commodities for residues of over 800 different pesticides and selected industrial compounds. FDA may also carry out focused sampling surveys for specific commodities or selected pesticides of special interest. In addition, FDA monitors the levels of pesticide chemical residues in foods prepared for consumption in its Total Diet Study (TDS), an ongoing program that monitors contaminants and nutrients in the average U.S. diet.

In FY 2018 (October 1, 2017 through September 30, 2018), FDA analyzed 4,404 human food samples (1,448 domestic and 2,956 import samples) in its regulatory monitoring program. FDA collected domestic human food samples from 47 states and Puerto Rico and import human food samples from 91 countries.

FDA found that 96.8% of domestic and 87.1% of import human foods were compliant with federal standards. No pesticide chemical residues were found in 47.1% of the domestic and 47.2% of the import samples.

In FY 2018, FDA also analyzed 492 animal food samples (264 domestic and 228 import samples) for pesticides. The Agency found that 96.2% of domestic and 96.5% of import animal food samples were compliant with federal standards. No pesticide chemical residues were found in 39.8% of the domestic and 50.0% of the import animal food samples. Most of the animal food samples were for livestock or poultry; 55 of the samples were pet food.

In some human food commodity groups, the violation rate was higher for import samples. The higher violation rate affirms the validity of the sampling design in targeting import commodities more likely to contain violative pesticide chemical residues, and the countries more likely to export them. Factors considered in targeting import commodities include past problem areas, findings from state and federal monitoring, and foreign pesticide usage data.

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* With the exception of meat, poultry, *Siluriformes* fish, including catfish, and certain egg products regulated by the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA).

In FY 2018, FDA conducted pesticide analyses for 215 domestic milk, shell eggs, honey, and game meat samples for the "Domestically Produced Animal-Derived Foods" assignment. No violative pesticide residues were found in any of the animal-derived foods, and 90.7% of the samples contained no residues.

Glossary and Abbreviations

Term	Definition
Action level	Food or feed may contain a pesticide chemical residue from sources of contamination that cannot be avoided by good agricultural or manufacturing practices, such as contamination by a pesticide that persists in the environment. In the absence of an EPA tolerance, or tolerance exemption, FDA may establish an "action level" for such unavoidable pesticide chemical residues. An action level is a recommended level of a contaminant not to exceed. An action level is not legally binding, and FDA may take enforcement action on a case-by-case basis whether a contaminant is below, at, or above an action level. (http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm077969.htm)
Agency	U.S. Food and Drug Administration
APEC	Asia-Pacific Economic Cooperation
CFR	U.S. Code of Federal Regulations
CFSAN	FDA Center for Food Safety and Applied Nutrition
Codex	Codex Alimentarius Commission
CVM	FDA Center for Veterinary Medicine
Domestic sample	Sample of a commodity produced and held for sale in the U.S.
DWPE	Detention Without Physical Examination
EPA	U.S. Environmental Protection Agency
FFDCA	Federal Food, Drug, and Cosmetic Act
FDA	U.S. Food and Drug Administration
FSCF	Food Safety Cooperation Forum
FSIS	USDA Food Safety and Inspection Service
FY	Fiscal Year
Import sample	Sample of products, which originate from another country, collected while the goods are in import status.
JIFSAN	Joint Institute for Food Safety and Applied Nutrition
LOD	Limit of Detection – The minimum concentration of a pesticide chemical residue that can be reliably distinguished from zero.[1]

LOQ	Limit of Quantitation – The minimum concentration of a pesticide chemical residue that can be quantified with acceptable precision.[1]
MOU	Memorandum of Understanding
MRL	Maximum Residue Level
MRM	Multiresidue Method – FDA pesticide method designed to analyze multiple pesticide chemical residues during a single analysis.
No-tolerance violation	Pesticide chemical residue found at, or above, the LOQ for pesticides in a commodity in which EPA has not established a tolerance for that particular pesticide/commodity combination or a tolerance exemption.
Over-tolerance violation	Pesticide chemical residue found at a level above an EPA tolerance.
ORA	FDA Office of Regulatory Affairs
PDP	USDA Pesticide Data Program
PPB	Parts per billion – residue concentration equivalent to microgram/kilogram
PPM	Parts per million – residue concentration equivalent to milligram/kilogram
SPS	Sanitary and Phytosanitary
SRM	Selective Residue Method – FDA pesticide method designed to analyze selected pesticide chemicals or a single pesticide chemical.
TDS	Total Diet Study
Tolerance	The EPA-established maximum residue level of a specific pesticide chemical that is permitted in or on a human or animal food in the United States. The tolerances are listed in 40 CFR Part 180 – Tolerances and Exemptions for Pesticide Chemical Residues in Food.
Trace level	Residue level less than the LOQ but greater than, or equal to, the LOD
USDA	U.S. Department of Agriculture
WTO	World Trade Organization

FDA Pesticide Residue Monitoring Program

Three federal government agencies share responsibility for the regulation and oversight of pesticide chemical residues in or on food. The U.S. Environmental Protection Agency (EPA) registers (i.e., approves) the use of pesticides and establishes tolerances for pesticide chemical residues in or on food resulting from the use of the pesticides. Tolerances are the EPA-established maximum residue levels (MRLs) of a specific pesticide chemical that is permitted in or on a human or animal food in the United States.[2] EPA also provides a strong U.S. preventive controls program by licensing pesticide applicators, conducting pesticide use inspections, and establishing and enforcing pesticide labeling provisions. The Food and Drug Administration (FDA) enforces tolerances in both import and domestic foods shipped in interstate commerce, except for meat, poultry, *Siluriformes* fish, including catfish, and certain egg products for which the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) is responsible. FDA also monitors pesticide chemical residue levels in commodities representative of the U.S. diet by carrying out market basket surveys under the Total Diet Study (TDS).

Regulatory Monitoring and Enforcement

FDA samples individual lots of domestically produced and imported foods and analyzes them to determine whether they contain pesticide chemical residues that are "unsafe" within the meaning of the Federal Food, Drug, and Cosmetic Act (FFDCA). This activity is carried out pursuant to the enforcement of tolerances established by EPA and includes the monitoring of food for residues of cancelled pesticides used in the past that persist in the environment, which may be addressed by FDA action levels. Domestic samples of foods produced and held for sale in the U.S. are typically collected close to the point of production in the distribution system, e.g., at growers, packers, and distributors. Import samples are collected when products are offered for entry into U.S. commerce. Because the EPA tolerances are established primarily for raw agricultural commodities, the emphasis of FDA's regulatory sampling is on the unwashed, whole (unpeeled) raw commodity; however, some processed foods are also sampled.

FDA may take regulatory action against food commodities containing pesticide chemical residues when they are found:

- at a level above an EPA tolerance for the pesticide/commodity combination, or
- in a commodity for which EPA has not established a tolerance or a tolerance exemption for that particular pesticide/commodity combination ("no tolerance" violations).

Food or feed may contain a pesticide chemical residue from sources of contamination that cannot be avoided by good agricultural or manufacturing practices, such as contamination by a pesticide that persists in the environment. FDA may establish an "action level" for unavoidable residues that do not have a tolerance or tolerance exemption. The action level is not legally binding, but FDA monitors unavoidable residues and may take enforcement action on a case-by-case basis, considering the action level and other factors.

For domestic foods, FDA may issue Warning Letters to the responsible growers and invoke other sanctions such as seizure to remove the food from commerce or injunction to correct the cause of the violation. Shipments of import food commodities may be refused entry into U.S. commerce. Firms may be placed under an import alert and "Detention Without Physical Examination," or DWPE, may be invoked for future shipments of that firm's commodity based on the finding of a single violative shipment. Section 801 of the FFDCA authorizes FDA to refuse admission of regulated articles that appear to be adulterated or misbranded. Typically, the information to make this determination is obtained by physical examination of the entry, although physical examination is not required. For example, entries of imported foods with a violative history would likely create an appearance of adulteration under the FFDCA for future shipments, based on the results obtained from previous examinations of the same foods that were found to contain violative pesticide residues. DWPE can be applied to a product or products from specific growers, manufacturers, or shippers, and may extend to a geographic area or country if the problem is demonstrated to be sufficiently broad-based.

FDA's import alerts describe current DWPEs for pesticide chemical residues and other food issues. There are currently four import alerts that address food products that are under DWPE for pesticides:

- Import Alert 99-05: "Detention Without Physical Examination of Raw Agricultural Products for Pesticides"
- Import Alert 99-08: "Detention Without Physical Examination of Processed Human and Animal Foods for Pesticides"
- Import Alert 99-14: "Countrywide Detention Without Physical Examination of Raw Agricultural Products for Pesticides"
- Import Alert 99-15: "Countrywide Detention Without Physical Examination of Processed Foods for Pesticides"

Growers, manufacturers, and shippers that have products under import alert may be asked to provide evidence of compliance for each lot of product exported to the United States. This procedure places the burden of demonstrating product compliance with U.S. tolerances for pesticide chemical residues on the importer before the entry can be released into domestic commerce. Firms can have their product(s) removed from DWPE under an FDA import alert by petitioning the Agency and providing evidence establishing that the conditions that gave rise to the appearance of a violation have been resolved and that there is sufficient evidence for the Agency to have confidence that future entries will be in compliance with the FFDCA. Additionally, a minimum of five consecutive non-violative commercial shipments, as demonstrated by providing FDA with acceptable reports of private laboratory analyses, is expected in order to remove a grower's, manufacturer's, or shipper's product from an import alert. Removal of a countrywide or geographic area import alert would typically require submission to FDA of an effective, detailed approach to correcting the problem, along with acceptable laboratory reports demonstrating compliance of the commodity in question.

Regulatory Monitoring Program Sampling Design

The goal of FDA's pesticide residue monitoring program is to carry out selective monitoring to achieve an adequate level of consumer protection. FDA samples are primarily of the surveillance type, meaning there is no specific prior knowledge or evidence that a particular food shipment contains illegal residues. However, FDA's monitoring is not random or statistically designed; rather, emphasis is given to the sampling of certain commodities. Commodity choice is based upon multiple factors, including:

- most frequently consumed or imported;
- commodities and places of origin with a history of violations;
- size of shipments;
- analysis of past problem areas;
- commodity/pesticide findings from state, USDA, and FDA monitoring;
- foreign pesticide usage data and regional intelligence on pesticide use;
- dietary significance of the food;
- volume and product value of individual commodities of domestic food produced and entered into interstate commerce and of import food offered for entry into the United States;
- origin of imported food; and
- chemical characteristics and toxicity of the pesticide(s) used

One important consideration when designing the FDA pesticide residue monitoring program for human foods is the distinction between domestic and import commodities. Historically, the violation rate of import samples is 3-5 times higher than the rate for domestic samples. For example, in FY 2012-2017 the violation rate for domestic samples ranged from 0.9-3.8%, whereas the rate for import samples ranged from 9.4-12.6%. Because the violation rate of import samples is higher than for domestic samples, FDA allocates more resources towards testing import compared with domestic commodities. Typically, import commodities comprise about 70% of all samples analyzed each year.

In addition to increased sampling of import commodities, FDA targets specific commodities and countries that might warrant special attention based upon historically high violation rates and trends. FDA also utilizes available foreign pesticide usage data and data from the USDA's Pesticide Data Program (PDP), a statistically representative survey of pesticide residues in selected food commodities, to develop its sampling program (https://www.ams.usda.gov/datasets/pdp).

Other federal agencies and several states have their own monitoring programs for pesticides. Through collaboration and agreements, they provide FDA information and data on violative samples found in domestic commerce (see Cooperative Arrangements and International Activities section). FDA leverages these data to focus its resources where they are most efficiently and effectively used.

Sampling levels and bias for particular import or domestic commodities can vary significantly from year to year. Pesticide applications are modified in response to changing weather patterns, new or re-emergent pests, or developed resistance to pesticides. Targeted commodities may not be the largest imports by volume from a particular country.

A high violation rate for a targeted commodity does not mean that a country's overall violation rate for all commodities is high; rather, it affirms FDA's sampling design to select commodities and production sources that are likely to be higher risk.

In the early 1990s, FDA conducted statistically based, comprehensive incidence and level monitoring studies of four major foods and published the results.[3,4] Aside from these surveys, FDA has not attempted to develop a monitoring program that would be statistically based (i.e., based on incidence and level monitoring). The current pesticide sampling program, coupled with broad-based enforcement strategies for imports, allows FDA to achieve the program's main objective of consumer protection. Incidence and level monitoring data are available from FDA's TDS program and the USDA PDP.

Focused Sampling

In addition to samples collected for routine regulatory monitoring, FDA may conduct special "focused sampling" assignments to target specific food commodities for analysis. Focused sampling is generally used to follow up on suspected problem areas or to acquire residue data on selected commodities and/or selected pesticides, not usually or previously covered during regulatory monitoring. Typically, samples collected for a focused sampling assignment are analyzed using routine pesticide procedures; but in some cases, the samples are analyzed for targeted residues of interest.

Animal Food

In addition to monitoring food for human consumption, FDA samples and analyzes domestic and imported animal foods for pesticide chemical residues. FDA's Center for Veterinary Medicine (CVM) directs this portion of the Agency's surveillance program via its Animal Food Contaminants Program. CVM's program focuses on animal food that is consumed by livestock and poultry animals that ultimately become or produce food for human consumption, although some pet food samples are also included.

Analytical Methods and Pesticide Coverage

To analyze large numbers of samples with unknown pesticide treatment history, FDA uses multi-residue methods (MRMs) capable of simultaneously determining many different pesticide chemical residues. These MRMs are also able to detect many metabolites, impurities, and alteration products of pesticides, as well as selected industrial chemicals. In addition, FDA uses selective residue methods (SRMs) that target specific pesticides. SRMs are sometimes needed to analyze pesticides that are not adequately extracted or detected using standard MRMs or to target specific pesticide/commodity combinations. FDA pesticide SRMs are optimized to determine one or several specific pesticide chemical residues in foods. They are more resource intensive and therefore employed more judiciously. The complete list of pesticides analyzed in FY 2018 is provided in Appendix A.

FDA pesticide methods can detect approximately 85 percent of the pesticides with current or revoked EPA tolerances in Title 40 of the U.S. Code of Federal Regulations (CFR) part 180, as well as more than 400 other pesticide chemical residues that have no EPA

tolerance.[†] By testing for pesticides without EPA tolerances, FDA provides protection against pesticides that do not have EPA approval. FDA continues to expand the scope of its analytical testing as new pesticides are registered by EPA, but acknowledges that some pesticides with EPA-established tolerances are not part of the current FDA testing scope, and FDA does not know the extent to which exposure to these pesticides may occur in the foods that FDA regulates.

The lower limit of residue measurement in FDA's determination of a specific pesticide is well below typical tolerance levels, which range from 0.01 to over 100 parts per million (ppm). Most pesticides analyzed can be quantified at FDA's default limit of quantitation (LOQ) of 0.01 ppm.[5] Residue levels detected above the limit of detection (LOD) but below the LOQ are designated as "trace" values.

FDA conducts ongoing research to update its pesticide residue monitoring program. This research includes testing the behavior of new or previously untested pesticides through existing analytical methods, as well as developing new methods to improve efficiencies and detection capabilities. Newer extraction procedures and more sensitive detection techniques have increasingly replaced older methods, allowing for a greater breadth of pesticide coverage.

FDA Total Diet Study

An important complement to FDA's regulatory pesticide residue monitoring program is the TDS program. TDS monitors levels of pesticide chemicals, toxic and nutritional elements, industrial chemicals, and radionuclides in foods representing the totality of the American diet. TDS is distinct from FDA's regulatory pesticide residue monitoring program. Regulatory monitoring determines pesticide chemical residues primarily in raw commodities, but TDS monitors foods prepared table-ready for consumption. TDS foods are analyzed at levels 10-100 times lower than the regulatory monitoring program, with residue levels as low as 0.1 parts per billion (ppb) reported routinely. Data from TDS can be used to calculate exposures to pesticides, nutrients, and contaminants from the U.S. diet, and to suggest potential areas of focus for FDA's food safety and nutrition programs. TDS pesticide results through FY 2017 were included in the pesticide residue monitoring program reports. TDS pesticide results from FY 2018 on will be posted on the FDA's TDS website, along with additional information about the history and design of the TDS.

Cooperative Agreements and International Activities

FDA collaborates with local, state, federal, and international authorities, leveraging their programs and capacities to maximize the effectiveness of its pesticide program. For example, the FDA and USDA have a Memorandum of Understanding (MOU) in which USDA alerts FDA monthly of presumptive tolerance violations they find in the PDP. FDA

[†] Additional information on EPA tolerances for pesticide ingredients can be found at: https://www.epa.gov/pesticide-tolerances/how-search-tolerances-pesticide-ingredients-code-federal-regulations (accessed July 18, 2020).

uses this information when designing the annual pesticide residue monitoring program, and for directing immediate sample collection efforts, as appropriate.

FDA-State Cooperation

FDA field offices interact with their counterparts in many states to enhance the effectiveness of the Agency's pesticide residue monitoring program. Partnership agreements and MOUs have been established between FDA and many state agencies. These agreements provide for more efficient residue monitoring by both parties by coordinating efforts, broadening coverage, and eliminating duplication of effort. These agreements are specific to each state and take into account available resources. The agreements stipulate how FDA and the state will jointly plan work for collecting and analyzing samples, sharing data, and enforcing compliance follow-up responsibilities for individual commodities of domestic and import products.

International Activities

As an agency of the U.S. government, FDA is subject to the obligations placed on World Trade Organization (WTO) members by the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). FDA's enforcement of pesticide residue tolerances and monitoring activities fall under the definition of sanitary measures within the SPS Agreement. FDA's obligations under this agreement include the requirement that its measures are based on an assessment, as appropriate to the circumstances, of the risk to human and animal life or health, and on international standards except when a more stringent standard can be scientifically supported. The measures must also be applied equally to domestic and import products unless there is scientifically based justification for doing otherwise. Similarly, FDA is subject to obligations arising from several bilateral and multilateral free trade agreements with U.S. trading partners that contain provisions on sanitary measures that are consistent with the provisions of the SPS Agreement.

FDA pesticide residue monitoring activities, for domestic and imported products, are a part of the Agency's overall food safety programs and are in keeping with these international obligations. Additionally, arrangements FDA makes with other countries with respect to food safety programs, and the activities that FDA carries out internationally with respect to food safety, can also affect how the agency's pesticide residue monitoring is conducted.

FDA maintains a number of cooperative arrangements with counterpart agencies in foreign governments including MOUs and Confidentiality Commitments. These arrangements most often contain information-sharing provisions that encompass the ability to share analytical findings about pesticide residues, while protecting any confidential information from external disclosure. Several of these MOUs have specific provisions relating to pesticide residue information sharing or cooperative efforts relating to pesticide residues.

FDA participates regularly in meetings with food safety regulatory agencies of foreign governments in a variety of settings, including bilateral and multilateral fora and in formal and informal technical and policy meetings. FDA carries out bilateral discussions on food safety with our regulatory partners from around the world; pesticide control programs and pesticide residue issues can be subjects for discussion at these meetings. Multilateral fora in which FDA participates include the Food Safety Cooperation Forum (FSCF) of the

Asia-Pacific Economic Cooperation (APEC), which promotes regulatory cooperation in food safety including information sharing on pesticide MRLs.

FDA also participates in the work of international standards-setting organizations, including that of the Codex Alimentarius Commission (Codex). Within Codex, FDA is an active participant in the work of the Codex Committee on Pesticide Residues. In addition, FDA supports the Joint Institute for Food Safety and Applied Nutrition (JIFSAN), which implements several training programs on pesticide risk assessment and the use of pesticide residue analytical methods.

Results and Discussion

This report discusses results of the FY 2018 FDA pesticide residue monitoring program, including routine monitoring and special assignments. Additionally, the report examines data to evaluate import products that may warrant special attention.

In FY 2018, FDA analyzed 4,896 samples under the regulatory monitoring program, of which 4,404 were human foods and 492 were animal foods. Results for the testing of human and animal foods are reviewed under separate headings, "Regulatory Monitoring of Human Foods" and "Regulatory Monitoring of Animal Foods." Sampling and analytical data were obtained from the FDA Field Accomplishment and Compliance Tracking System (FACTS) database. Results in this report represent samples with a collection date occurring in FY 2018.

Regulatory Monitoring of Human Foods

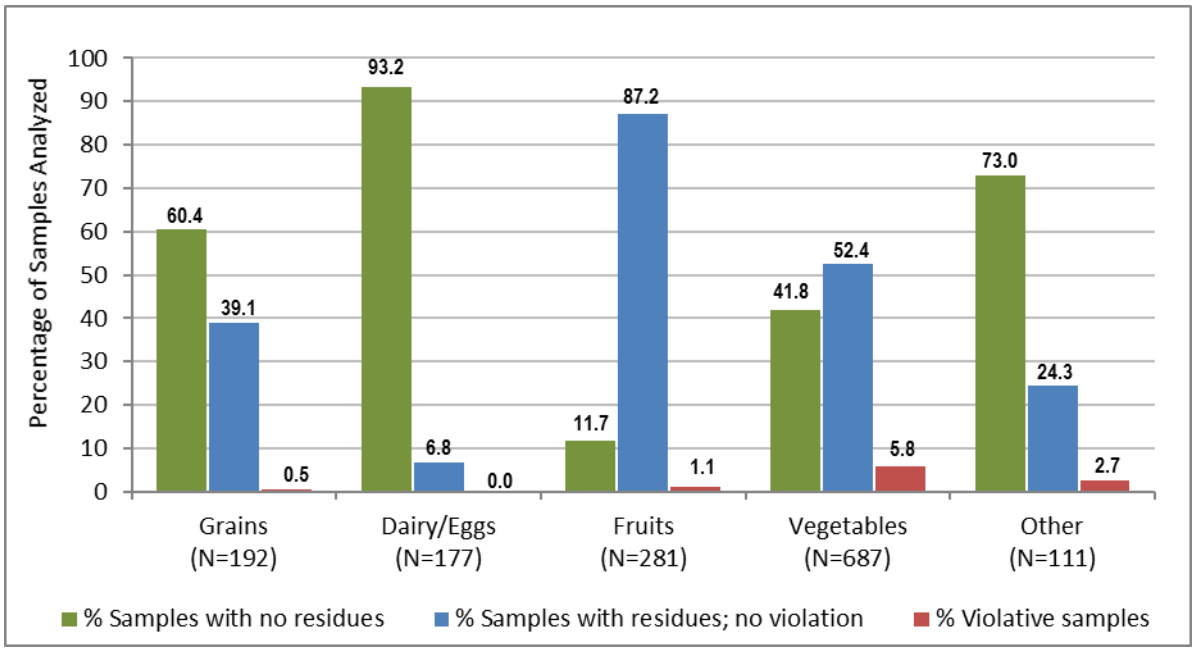
The 4,404 human foods analyzed in FY 2018 include results from 215 samples analyzed for the "Domestically Produced Animal-Derived Foods" assignment. Results of the assignment are discussed separately in the section "Focused Sampling"; however, the findings are included in the sample summaries and statistics for human foods.

Of the human foods analyzed for pesticides in FY 2018, 1,448 were domestic samples and 2,956 were import samples. Results for the domestic samples are tabulated in Appendix B, "Analysis of Domestic Human Foods by Commodity Group in FY 2018," and results for the import samples are tabulated in Appendix C, "Analysis of Import Human Foods by Commodity Group in FY 2018." Each appendix includes information on the total number of samples analyzed, the number and percentage of samples with no residues detected, and the number and percentage of violative samples including the nature of the violation (over-tolerance vs. no-tolerance). Results are summarized for all samples analyzed, by commodity groups and by subgroups.

Results

Of the 1,448 domestic samples analyzed in FY 2018, 96.8% were in compliance and 47.1% had no detectable residues (Appendix B). Samples collected under the domestic commodity groups "Fruits" and "Vegetables" accounted for the majority (66.9%) of domestic samples.

Figure 1. Results of Domestic Samples by Commodity Group

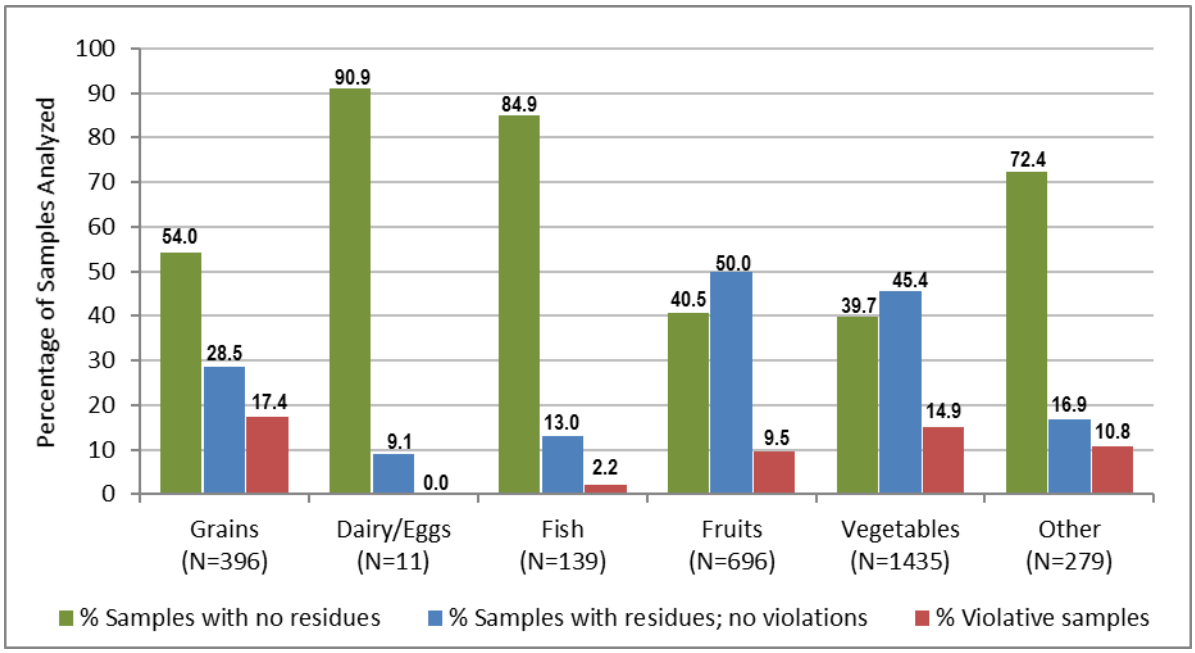


N = Number of samples analyzed for commodity group

Figure 1 summarizes the number of samples analyzed and the residue findings in domestic samples by commodity groups. For the grains and grain products commodity group, no residues were detected in 60.4% of the 192 samples analyzed and 1 sample (0.5%) contained violative residues. In the milk/dairy products/eggs commodity group, 93.2% of the 177 samples analyzed contained no pesticide residues and none were violative. In the fruits commodity group, 281 samples were analyzed; 11.7% contained no residues and 3 samples (1.1%) contained violative residues. For the vegetables commodity group, no residues were found in 41.8% of the 687 samples analyzed and 40 (5.8%) contained violative residues. In the commodity group of other food products, consisting largely of nuts, seeds, oils, honey, and spices, no residues were found in 73.0% of the 111 samples analyzed and only 3 (2.7%) samples contained violative residues.

Of the 2,956 import samples analyzed in FY 2018, 87.1% were in compliance and 47.2% had no detectable residues (Appendix C). Fruits and vegetables accounted for the majority (72.1%) of import samples.

Figure 2. Results of Import Samples by Commodity Group



N = Number of samples analyzed for commodity group

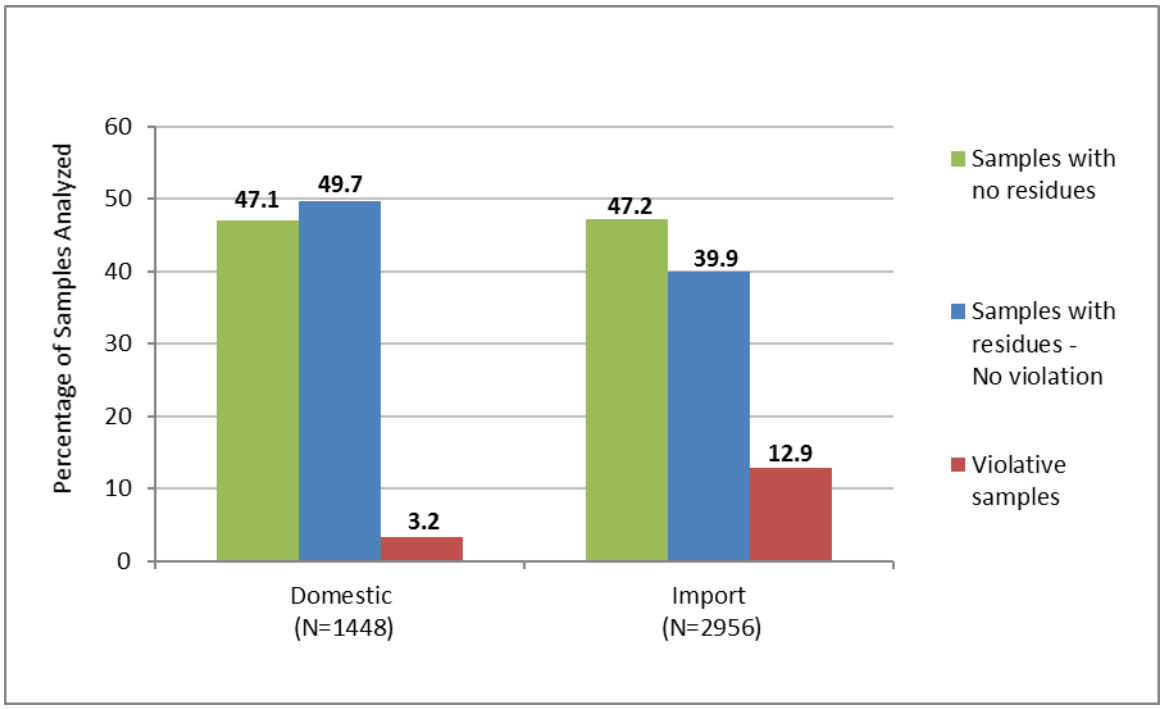
Figure 2 summarizes the number of samples analyzed and the residue findings in import samples by commodity groups. In the import grains and grain products commodity group, 54.0% of the 396 samples analyzed had no detectable residues and 69 (17.4%) contained violative residues. Rice comprises most of the violations in this commodity group; 62 (89.9%) of the grain product violations were rice and rice products. For the import milk/dairy products/eggs commodity group, no residues were found in 10 (90.9%) of the 11 samples and none had violative residues. For the import fish/shellfish/other aquatic products commodity group, no residues were found in 118 (84.9%) of the 139 samples analyzed, and three samples (2.2%) were found to contain violative residues. For the import fruit commodity group, no residues were detected in 282 (40.5%) of 696 samples analyzed and 66 (9.5%) had violative residues. Of the 1,435 import vegetable commodity group samples analyzed, 569 (39.7%) had no residues detected and 214 (14.9%) had violative residues. In the commodity group of other import food products, 202 (72.4%) of the 279 samples analyzed had no residues detected, while 30 (10.8%) of the samples had violative residues.

Overall Results for Domestic and Import Human Food Samples

In total, 1,448 domestic and 2,956 import human food samples were collected and analyzed for the pesticides listed in Appendix A. No residues were found in 47.1% of domestic samples and 47.2% of import samples (Figure 3). Violative residues were found in 3.2% of the domestic samples and 12.9% of the import samples. The violation rate for domestic samples in FY 2018 was consistent with recent years; for FY 2012-2017 the violation rate ranged from 0.9-3.8%. The import violation rate was slightly higher than FY 2012-2017, i.e., 9.4-12.6% for import samples. The increase in FY 2018 is due in part to

the higher violation rate of cilantro (44.9%) and radishes (34.5%) that were targeted for increased sampling based on past results.

Figure 3. Summary of Results of Domestic and Import Human Food Samples



For several commodity groups, the violation rate was higher for import samples. For example, 17.4% of import grain samples were violative; however, only 0.5% of the domestic grain samples were violative. Similarly, 9.5% of the import fruit samples were violative compared with 1.1% of the domestic fruit samples, and 14.9% of import vegetable samples were violative, whereas 5.8% of domestic samples were violative. In the commodity group of other food products, the violation rate was 10.8% for import samples compared with 2.7% for domestic samples.

Of the 47 domestic violative samples, 39 contained pesticide chemical residues that have no EPA tolerance, i.e., no-tolerance violations, and 14 contained pesticide chemical residues that exceeded an EPA tolerance, i.e., over-tolerance violations. Six samples had both no-tolerance and over-tolerance violations for different pesticides contained in the same sample.

Of the 382 import violative samples, 364 had no-tolerance violations and 59 had over-tolerance violations; 41 samples had both no-tolerance and over-tolerance violations for different pesticides contained in the same sample.

Geographic Coverage

Domestic: A total of 1,448 domestic samples were collected from 47 states and Puerto Rico. Table 1 lists the number of domestic samples from each state and territory, in descending order. No domestic samples were collected from the states of Alaska, Nevada, Wyoming, or the District of Columbia.

Table 1. Domestic Samples Collected and Analyzed per State/Territory

State/Territory	Samples (N)	State/Territory	Samples (N)
California	278	New Hampshire	11
Texas	99	Kentucky	11
Kansas	77	Puerto Rico	11
Illinois	75	Virginia	11
Minnesota	72	Utah	11
New York	66	Alabama	8
Wisconsin	61	Montana	8
Washington	61	Maryland	7
Michigan	61	Arkansas	6
Oregon	56	Idaho	5
Ohio	44	North Carolina	5
Pennsylvania	42	New Mexico	5
Missouri	40	South Dakota	5
New Jersey	37	Arizona	4
Massachusetts	35	Rhode Island	4
Colorado	34	Indiana	4
Florida	26	Maine	4
Nebraska	25	South Carolina	4
Georgia	24	West Virginia	3
Louisiana	23	Vermont	3
North Dakota	22	Delaware	2
Iowa	21	Connecticut	2
Tennessee	20	Oklahoma	2
Mississippi	12	Hawaii	1

Imports: A total of 2,956 import samples were collected representing food shipments from 91 countries/economies. Table 2 lists the number of samples and names of countries/economies from which ten or more samples were collected. Table 2a lists from left to right the countries/economies of origin that had fewer than ten samples collected, in order of decreasing number of samples.

Table 2. Import Samples per Country/Economy of Origin for Which Ten or More Samples Were Collected and Analyzed

Country	Samples (N)	Country	Samples (N)
Mexico	1063	Philippines	18
China	248	Poland	16
India	236	Costa Rica	15
Canada	211	Taiwan	15
Guatemala	105	Afghanistan	14
Peru	104	Argentina	14
Chile	98	Iran	14
Turkey	76	Russia	14
Vietnam	71	South Africa	14
Thailand	61	France	13
Italy	55	Indonesia	13
Dominican Republic	42	Lebanon	13
Pakistan	42	Greece	12
United States*	39	Morocco	12
Egypt	26	Netherlands	10
South Korea	21	Saudi Arabia	10
Spain	21	Serbia	10
Ecuador	18		

*Import goods purchased while in U.S. commerce.

Table 2a. Countries/Economies of Origin from Which Fewer Than Ten Samples Were Collected and Analyzed

Countries		
Belgium	Germany	Austria
Algeria	Madagascar	Benin
Bangladesh	Nigeria	Cambodia
Honduras	Cameroon	Estonia
Australia	Jordan	Ghana
Brazil	Nicaragua	Ivory Coast
Bulgaria	Uzbekistan	Kazakhstan
Colombia	Albania	Latvia
Jamaica	Armenia	Myanmar
Japan	Cyprus	Paraguay
New Zealand	Ethiopia	Romania
United Kingdom	Iraq	Singapore
Syrian Arab Republic	Ireland	Sri Lanka
United Arab Emirates	Malaysia	Tanzania
Bolivia	Portugal	Uganda
El Salvador	Togo	Uruguay
Haiti	Tonga	West Bank
Israel	Tunisia	Zambia
Ukraine	Yemen	

Pesticides Detected

In FY 2018, FDA pesticide methods could detect the 809 pesticides and industrial chemicals listed in Appendix A. Of these chemicals, residues of 212 different pesticides were actually found in the samples analyzed. They are listed from left to right in Table 3 in order of frequency of detection along with the number of samples in which they were found. No new pesticides were detected in FY 2018 that had not been detected previously by the FDA regulatory pesticide monitoring program.

Table 3. Pesticides Found in Human Foods in FY 2018 Listed in Order of Frequency

Pesticide (No. samples found)		
Imidacloprid (395)	Boscalid (331)	Azoxystrobin (258)
Pyraclostrobin (240)	Chlorpyrifos (228)	Carbendazim (214)†
Tebuconazole (203)	Acetamiprid (189)	Cypermethrin (182)
Thiamethoxam (167)	Fludioxonil (160)	Chlorantraniliprole (144)
Clothianidin (138)	Malathion (132)	Thiabendazole (129)
Bifenthrin (121)	Permethrin (121)	Propiconazole (120)
Lambda-cyhalothrin (113)	Glyphosate (111)	Cyprodinil (110)
Difenoconazole (110)	Myclobutanil (109)	Metalaxyl (95)
Pyrimethanil (90)	Linuron (88)	Propamocarb (85)
Chlorothalonil (83)	Spinetoram (81)	Dimethomorph (79)
Flonicamid (79)	Tricyclazole (76)	Methoxyfenozide (75)
Piperonyl butoxide (74)	Buprofezin (73)	Dimethoate (72)
Trifloxystrobin (72)	Imazalil (66)	Fluopyram (64)
DCPA (62)	Fenpropathrin (61)	Fenhexamid (60)
Captan (57)	Thiacloprid (55)	Spirotetramat (52)
Acephate (51)	Isoprothiolane (51)	Mandipropamid (51)
Methamidophos (51)	Bifenazate (50)	Flubendiamide (46)
Methomyl (44)	Spirodiclofen (44)	Ametoctradin (43)
Fluxapyroxad (41)	Cyfluthrin (40)	Fluopicolide (40)
Thiophanate-methyl (40)	Dinotefuran (39)	Fenamidone (39)
Quinoxyfen (39)	Iprodione (38)	Carbaryl (37)
Chlorpropham (37)	Ethoxyquin (37)	Spinosad (36)
Flupyradifurone (35)	Spiromesifen (35)	Fenpyroximate, e- (34)
Flutriafol (34)	Indoxacarb (34)	Novaluron (31)
Phosmet (30)	DDT (26)	Diazinon (26)
Fenbuconazole (26)	Deltamethrin (25)	Cyromazine (23)

Penthiopyrad (21)	Triazophos (21)	Fipronil (20)
Profenofos (20)	Diflubenzuron (19)	Hexythiazox (19)
Chlorfenapyr (18)	Cyazofamid (17)	Cyflumetofen (16)
Famoxadone (16)	Metrafenone (16)	Sulfoxaflor (16)
Etoxazole (15)	Triflumizole (15)	Kresoxim-methyl (14)
Dicloran (13)	Prochloraz (13)	2,4-D (12)
BAM (12)	Dichlorvos (12)	Prometryn (12)
Pyridaben (12)	Tetraconazole (12)	Carbofuran (11)
Cyantraniliprole (11)	Ethion (11)	Fenvalerate (11)
Hexaconazole (11)	Pyriproxyfen (11)	Clopyralid (10)
Methoprene (10)	Monocrotophos (10)	Phorate (10)
Procymidone (10)	Propargite (10)	Quintozene (10)
Trifluralin (10)	Dieldrin (9)	Dodine (9)
Esfenvalerate (9)	Pendimethalin (9)	Fluoxastrobin (8)
Pirimiphos methyl (8)	Triadimenol (8)	Atrazine (7)
Tebufenozide (7)	Flusilazole (6)	Oxamyl (6)
Pronamide (6)	Triadimefon (6)	Abamectin (5)
Chlorpyrifos methyl (5)	Diphenylamine (5)	Endosulfan (5)
MGK 264 (5)	Oxathiapiprolin (5)	Phosalone (5)
Propoxur (5)	Pymetrozine (5)	Cyflufenamid (4)
Fenbutatin oxide (4)	Fluridone (4)	Imazamox (4)
Lufenuron (4)	Methiocarb (4)	Metribuzin (4)
Rotenone (4)	Ametryn (3)	Bromopropylate (3)
Diethofencarb (3)	Diuron (3)	Fenuron (3)
Glufosinate (3)	Imazethapyr (3)	Oxyfluorfen (3)
Penconazole (3)	Carbetamide (2)	Chlordane (2)
Dicofol (2)	Emamectin benzoate (2)	Ethirimol (2)
Ethoprop (2)	Etofenprox (2)	Fenobucarb (2)
Formetanate HCl (2)	Metolachlor (2)	Oxadixyl (2)
Pirimicarb (2)	Quinclorac (2)	Spiroxamine (2)
Tecnazene (2)	Zoxamide (2)	2,6-DIPN (1)
Amitraz (1)	Benalaxyl (1)	Bitertanol (1)
Bupirimate (1)	Clofentezine (1)	Coumaphos (1)
Cymoxanil (1)	Cyproconazole (1)	Diafenthiuron (1)
Dichlobenil (1)	Dichlofluanid (1)	Dichlorprop (1)

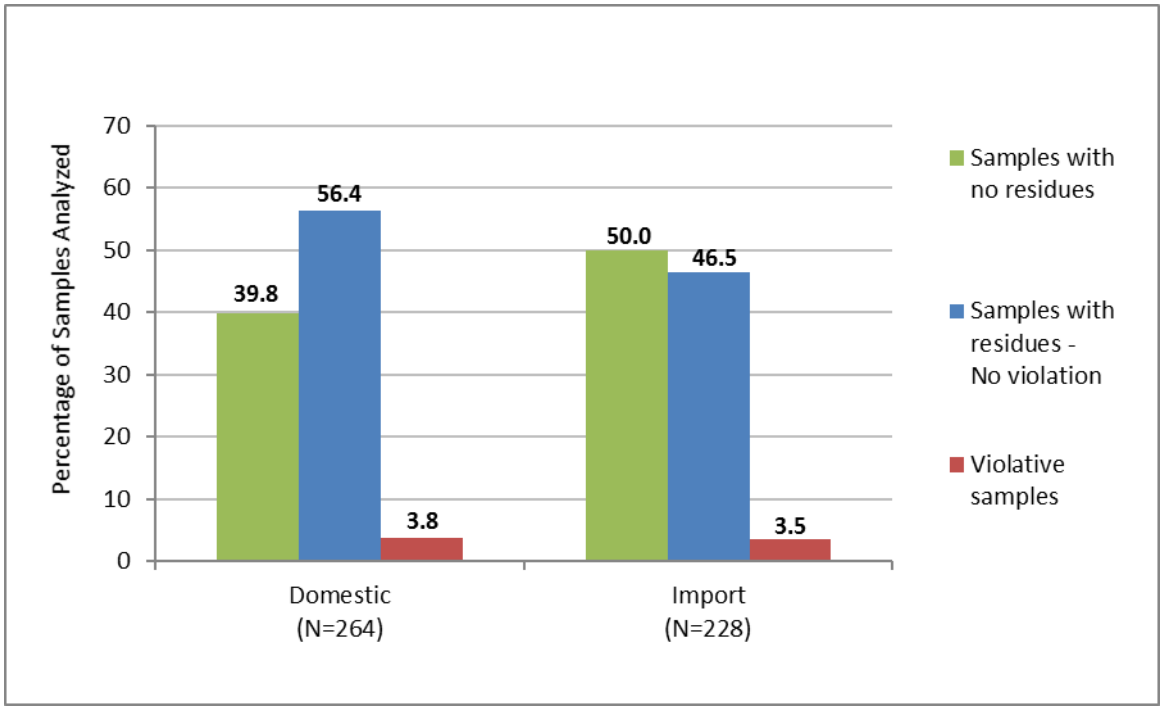
Diniconazole (1)	Endrin (1)	Fenarimol (1)
Fenazaquin (1)	Fenitrothion (1)	Fenpyrazamine (1)
Fluroxypyr (1)	Fluvalinate (1)	Folpet (1)
Fuberidazole (1)	Haloxyfop (1)	IBP (1)
Imazapyr (1)	Isocarbophos (1)	Isoprocarb (1)
Metaflumizone (1)	Paclobutrazol (1)	Phenylphenol, o- (1)
Prothioconazole (1)	Quinalphos (1)	Resmethrin (1)
Sedaxane (1)	Tebufenpyrad (1)	Terbuthylazine (1)
Tetramethrin (1)	Thifluzamide (1)	Thiodicarb (1)
Tolclofos methyl (1)	Tolfenpyrad (1)	

[†]Carbendazim is both a fungicide and a degradant of thiophanate methyl; it was reported under the category of thiophanate methyl in the 2015 and 2016 pesticide residue monitoring reports.

Regulatory Monitoring of Animal Foods

In FY 2018, FDA analyzed 492 animal food samples for pesticides. Figure 4 summarizes the number of samples analyzed and residue findings in domestic and import samples.

Figure 4. Summary of Results of Domestic and Import Animal Food Samples



Of the 492 animal food samples, 264 samples were domestic and 228 samples were imports. No residues were found in 105 (39.8%) of the 264 domestic samples, and 10 samples (3.8%) were violative. Of the 228 import samples, 114 (50.0%) contained no residues and 8 samples (3.5%) were violative.

The violation rate of 3.8% for domestic animal foods in FY 2018 is slightly higher than FY 2012-2017; i.e., 0.8-2.3%. The violation rate of 3.5% for import animal foods is consistent with FY 2012-2017; i.e., 1.9-5.6%. In FY 2018, unlike in previous years, the percentage of violations in domestic animal food samples was slightly higher than that of imported foods.

Table 4 summarizes residue findings for eight different animal food categories.

Table 4. Summary of Animal Foods by Commodity Type

Commodity Type	Samples Analyzed N	Without Residues N (%)†	Violative Samples N (%)†
Totals – All Samples	**492**	**219 (44.5)**	**18 (3.7)**
Whole and Ground Grains/Seeds	219	143 (65.3)	5 (2.3)
Mixed Livestock Food Rations	97	13 (13.4)	5 (5.2)
Medicated Livestock Food Rations	26	1 (3.8)	0 (0)
Plant Byproducts	71	41 (57.7)	3 (4.2)
Hay and Silage	2	1 (50.0)	1 (50.0)
Animal Byproducts	10	2 (20.0)	3 (30.0)
Pet Food/Treats	55	11 (20.0)	0 (0)
Other Animal Food Ingredients	12	7 (58.3)	1 (8.3)

†Percentage of the number of samples analyzed per commodity type.

Commodities commonly used to feed livestock that produce food for human consumption comprised 84.3% of the samples analyzed, i.e., Whole and Ground Grains/Seeds, Mixed Livestock Food Rations, Medicated Livestock Food Rations, Plant Byproducts, and Hay and Silage. Of these 415 samples, 14 violations (2.8%) were found. In FY 2018 the highest percentage of violative samples was in Hay and Silage (50%), Animal Byproducts (30%), and Other (8.3%); however, since these commodity groups also had the smallest overall sample sizes (2, 10, and 12, respectively), the results may not adequately reflect the violation rates in these commodities.

All animal foods were analyzed for 809 different chemicals using the FDA pesticide MRMs (Appendix A). In FY 2018, residues of 79 different pesticides were found in the 492 animal food samples analyzed. They are listed from left to right in Table 5 in order of frequency of detection along with the number of samples in which they were found.

For all samples, ethoxyquin, malathion, and piperonyl butoxide were the most frequently found pesticide chemicals. Ethoxyquin, an approved food additive for specific uses as a chemical preservative in animal foods,[6] was found in 135 (27.4%) of the commodities analyzed. The residue levels of all samples were well below the food additive approved use level of 150 ppm, with the exception of two violative fish meal samples intended as ingredients for animal foods. Malathion was found in 112 (22.8%) of the samples; none were violative. Piperonyl butoxide, a synergist used in combination with pyrethrins for control of insects, was found in 16.3% (80 samples) of the commodities analyzed.

Overall for animal food samples analyzed in FY 2018, the following pesticide residues were found at levels above the EPA tolerance, i.e., over tolerance violations: (n = number of samples): deltamethrin (1), diflubenzuron (2), ethoxyquin (2), glyphosate (1), novaluron (1), permethrin (1), and piperonyl butoxide (1). The following pesticide residues were found in commodities with no listed tolerance, i.e., no tolerance violations: carbendazim (3), chlorpyrifos (1), diflubenzuron (2), emamectin benzoate (1), glufosinate (1),

hexathiazox (1), propiconazole (2), pyraclostrobin (1), tetrachlorvinphos (1), and thiophanate-methyl (1).

Table 5. Pesticides Found in Animal Foods in FY 2018 Listed in Order of Frequency

Pesticide (No. Samples Detected)		
Ethoxyquin (135)	Malathion (112)	Piperonyl butoxide (80)
Glyphosate (52)	Azoxystrobin (21)	Methoprene (20)
Chlorpyrifos methyl (19)	Chlorpropham (17)	Deltamethrin (15)
Boscalid (12)	Diflubenzuron (12)	Propiconazole (11)
Pyraclostrobin (9)	Tebuconazole (8)	2,4-D (7)
Chlorpyrifos (7)	Difenoconazole (7)	Imidacloprid (7)
Pirimiphos methyl (7)	Carbendazim (5)	Chlorantraniliprole (5)
Cypermethrin (5)	Cyromazine (5)	Lambda-cyhalothrin (5)
Trifloxystrobin (5)	Acephate (4)	MGK 264 (4)
Thiamethoxam (4)	Clothianidin (3)	Diuron (3)
Fludioxonil (3)	Fluxapyroxad (3)	Metalaxyl (3)
Metconazole (3)	Cyfluthrin (2)	Fenbuconazole (2)
Flubendiamide (2)	Fluopicolide (2)	Fluopyram (2)
Fluridone (2)	Flutriafol (2)	Glufosinate (2)
Novaluron (2)	Permethrin (2)	Propamocarb (2)
Pyrimethanil (2)	Acetamiprid (1)	Atrazine (1)
Bifenthrin (1)	Captan (1)	Clopyralid (1)
Cyprodinil (1)	DDT (1)	DEF (1)
Dicamba (1)	Dichlorvos (1)	Dimethomorph (1)
Diphenylamine (1)	Emamectin benzoate (1)	Fenpropathrin (1)
Fenpyroximate, e- (1)	Fipronil (1)	Flupyradifurone (1)
Gardona (1)	Haloxyfop (1)	Hexythiazox (1)
Imazamox (1)	Linuron (1)	Lufenuron (1)
Mandipropamid (1)	Methoxyfenozide (1)	Phorate (1)
Prallethrin (1)	Propargite (1)	Saflufenacil (1)
Spinosad (1)	Thiabendazole (1)	Thiacloprid (1)
Thiophanate-methyl (1)		

Focused Sampling

In FY 2018, FDA conducted pesticide analyses for the field assignment "Domestically Produced Animal-Derived Foods" (Animal-Derived Foods) for which selected animal-derived foods were analyzed for pesticides and other chemical contaminants. FDA collected and analyzed 215 samples, consisting of 99 domestic milk, 69 shell eggs, 36 honey, and 11 game meat samples. Results are listed in Table 6.

Table 6. Pesticides Found in Samples Analyzed for the Animal-Derived Foods Assignment

Commodity	Samples Analyzed N	Without Residues N (%)	Violative Samples N (%)
Total	**215**	**195 (90.7)**	**0**
Milk	99	99 (100)	0
Eggs	69	57 (82.6)	0
Honey	36	30 (83.3)	0
Bison	5	4 (80)	0
Elk	2	1 (50)	0
Rabbit	2	No residues found	
Venison	2		

No violative pesticide residues were found in any of the Animal-Derived Food commodities. Residues of five pesticide chemicals were found in domestic honey, mostly at trace levels. Of those, piperonyl butoxide is exempted from tolerances when used as a synergist with pesticides on growing crops. Coumaphos and amitraz are registered for use against Varroa mites in beehives. Dichlobenil and flonicamid are registered for use on a variety of fruits and vegetables and were likely detected in honey due to inadvertent contamination introduced by bees as they collect nectar from flowers.

Imported Products That May Warrant Special Attention

The design of the FDA pesticide program focuses on products that have a history of violations or are suspected of violations, based on information such as reports from other agencies and pesticide usage data. Historically, the violation rate for import foods is higher than for domestic foods; results from FY 2018 continue that trend. The violation rate for import foods (12.9%) was over 4 times higher than the rate for domestic foods (3.2%). The majority of the violations for import commodities are no-tolerance violations, and about 80% of them are < 0.1 ppm. Examination of the FY 2018 pesticide data from the analysis of imported human foods indicates that the commodities listed in Table 7 may warrant special attention in the future.

The following criteria were applied to the FY 2018 data to select import commodities that may warrant special attention:

- commodities with at least 20 samples analyzed OR with a minimum of 3 violations, and
- a violation rate of 10% or higher.

Table 7 lists the import commodities analyzed in FY 2018 that meet the above criteria. The commodities are sorted alphabetically and include the total number of samples analyzed and violation rate per commodity.

Some of the commodity counts in Table 7 differ from those found in Appendix C because of differences in the way commodities are grouped. To simplify reporting in Appendix C, similar commodities sometimes have been consolidated; however, in Table 7, those same commodities might be extracted and reported separately. For example, Appendix C indicates FDA analyzed 248 import rice and rice products in FY 2018. Table 7 indicates that rice is flagged for special attention, but only lists 235 samples. The other 13 rice samples from Appendix C have been excluded from Table 7 because they are processed products, e.g., rice flour.

Table 7. Import Commodities That May Warrant Special Attention

Commodity†	Samples Analyzed	Violation Rate (%)
Barley grain	20	10.0
Carrot*	40	10.0
Celery*	47	17.0
Cherries	14	21.4
Cilantro*	89	44.9
Dragon fruit	21	28.6
Garlic	9	33.3
Lime	53	13.2
Mango	30	13.3
Mushrooms and fungi	32	12.5
Olive oil	43	11.6
Onions, leeks, scallions, shallots*	52	11.5
Orange	20	10.0
Peas*	93	24.7
Pepper, hot*	120	25.8
Pepper, sweet	39	10.3
Prickly pear*	11	27.3
Radish*	53	34.0
Raisins*	17	17.7
Rice*	235	24.7
Spinach*	36	11.1
String beans*	54	13.0
Taro, Dasheen	14	42.9
Yams/Sweet potato	17	23.5

†Data listed for the commodities in this table are based upon specific product definitions, and may not be directly comparable to product summary subcategories listed in Appendix C.
*Commodity was on the FY 2017 table of import commodities warranting special attention.

References

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5. Pesticide Analytical Manual, Volume I, 3rd Ed., 1999, Chapter 1, Section 105, https://www.fda.gov/media/74473/download.
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Appendices

Appendix A lists the 809 pesticides and industrial chemicals analyzed using FDA methods in FY 2018. The MRM method is used to analyze the majority of pesticides (780), and two SRMs were used to analyze (1) glyphosate and glufosinate (glyphosate SRM) and (2) 27 selected acid herbicides (acid herbicides SRM). In addition to these chemicals, FDA analytical procedures detect other metabolites and isomers associated with the pesticides listed below.

All residue findings for human foods are summarized in Appendices B (domestic) and C (import). In FY 2018, 116 different domestic human food commodities and 465 different import human food commodities were tested. In both appendices, all commodities have been assigned to the same six commodity groups:

Grains and Grain Products
Milk/Dairy Products/Eggs
Fish/Shellfish/Other Aquatic Products
Fruits
Vegetables
Other Food Products

Commodities are further categorized within each commodity group. For example, the subcategories for domestic commodities listed under the "Grains and Grain Products" commodity group in Appendix B include:

Barley and barley products
Corn and corn products
Oats and oat products
Rice and rice products
Soybeans and soybean products
Wheat and wheat products
Other grains and grain products

Each of these subcategories includes commodities derived from a single agricultural commodity. For example, the subcategory "Wheat and wheat products" includes commodities composed exclusively, or almost exclusively, from wheat, such as whole wheat grain, milled wheat, wheat flour, enriched wheat flour, wheat germ, wheat malt, wheat bran, and wheat gluten.

The subcategories within each commodity group may differ between the appendices for domestic and the import commodities. This is because the numbers and kinds of individual commodities available are different for domestic and import commodities. For example, under the "Fruit" commodity group, 43 subcategories are listed for the import samples in Appendix C, but only 16 subcategories are listed for the domestic samples in Appendix B. The additional import "Fruit" subcategories are mostly for fruits not available domestically.

Appendix A. Pesticides and Industrial Chemicals Analyzed by FDA Pesticide Methods in FY 2018

Pesticides		
2,4,5-T	2,4,5-T methyl ester	2,4-D[1]
2,4-D methyl ester	2,4-D sec-butyl ester	2,4-DB[1]
2,4-DB methyl ester	2,6-Dimethylaniline	2,6-DIPN
3,4-Dichloroaniline[2]	3,5-Dichloroaniline[3]	4-CPA[1]
Abamectin	Acephate	Acequinocyl
Acetamiprid	Acetochlor	Acibenzolar-S-methyl
Acifluorfen[1]	Acifluorfen methyl ester	Aclonifen
Acrinathrin	Akton	Alachlor
Alanycarb	Aldicarb	Aldrin
Allethrin	Allidochlor	Ametoctradin
Ametryn	Amicarbazone	Amidithion
Amidoflumet	Aminocarb	Aminopyralid[1]
Amisulbrom	Amitraz	Ancymidol
Anilazine	Anilofos	Aniten
Aramite	Aspon	Atraton
Atrazine	Azaconazole	Azamethiphos
Azinphos ethyl	Azinphos-methyl	Aziprotryne
Azocyclotin	Azoxystrobin	BAM[4]
Barban	Beflubutamid	Benalaxyl
Benazolin	Bendiocarb	Benfluralin
Benfuracarb	Benfuresate	Benodanil
Benoxacor	Bentazon	Benthiavalicarb-isopropyl
Benzovindiflupyr	Benzoximate	Benzoylprop ethyl
Benzyl benzoate	BHC	Bicyclopyrone
Bifenazate	Bifenox	Bifenthrin
Binapacryl	Biphenyl	Bistrifluron
Bitertanol	Bithionol	Bixafen
Boscalid	Bromacil	Bromfenvinphos ethyl
Bromfenvinphos methyl	Bromobutide	Bromocyclen
Bromophos	Bromophos-ethyl	Bromopropylate
Bromoxynil[1]	Bromoxynil octanoate	Bromuconazole
Bufencarb	Bupirimate	Buprofezin
Butachlor	Butafenacil	Butamifos
Butocarboxim	Butoxycarboxim	Butralin
Butylate	Cadusafos	Cafenstrole
Captafol	Captan	Carbaryl
Carbendazim[5]	Carbetamide	Carbofuran
Carbophenothion	Carbosulfan	Carboxin

Pesticides		
Carfentrazone ethyl ester	Carpropamid	Chloramben methyl ester
Chlorantraniliprole	Chlorbenside	Chlorbicyclen
Chlorbromuron	Chlorbufam	Chlordane
Chlordecone	Chlordimeform	Chlorethoxyfos
Chlorfenapyr	Chlorfenethol	Chlorfenprop-methyl
Chlorfenvinphos	Chlorfenvinphos methyl	Chlorfluazuron
Chlorflurecol methyl	Chlorimuron-ethyl	Chlormephos
Chlornitrofen	Chlorobenzilate	Chloroneb
Chloropropylate	Chlorothalonil	Chlorotoluron
Chloroxuron	Chlorpropham	Chlorpyrifos
Chlorpyrifos methyl	Chlorthiamid	Chlorthion
Chlorthiophos	Chlozolinate	Chromafenozide
Cinerin	Cinidon-ethyl	Clethodim
Clodinafop-propargyl	Cloethocarb	Clofentezine
Clomazone	Clopyralid[1]	Cloquintocet-mexyl
Clothianidin	Coumaphos	Crimidine
Crotoxyphos	Crufomate	Cumyluron
Cyanazine	Cyanofenphos	Cyanophos
Cyantraniliprole	Cyazofamid	Cyclafuramid
Cycloate	Cycloxydime	Cycluron
Cyenopyrafen	Cyflufenamid	Cyflumetofen
Cyfluthrin	Cyhalofop butyl ester	Cymiazole
Cymoxanil	Cypermethrin	Cyphenothrin
Cyprazine	Cyproconazole	Cyprodinil
Cyprofuram	Cyromazine	Cythioate
Daimuron	Dazomet	DCPA
DDT	DEET	DEF
Deltamethrin	Demephion	Demeton
Desmedipham	Desmetryn	Diafenthiuron
Dialifor	Diallate	Diamidafos
Diazinon	Dicamba[1]	Dicamba methyl ester
Dicapthon	Dichlobenil	Dichlofenthion
Dichlofluanid	Dichlone	Dichlormid
Dichlorobenzene, 1,3-	Dichlorophen	Dichlorprop[1]
Dichlorprop methyl ester	Dichlorvos	Diclobutrazol
Diclocymet	Diclofop[1]	Diclofop-methyl
Diclomezine	Dicloran	Dicofol
Dicrotophos	Dicryl	Dicyclanil
Dieldrin	Diethatyl-ethyl	Diethofencarb
Difenoconazole	Difenoxuron	Diflovidazin
Diflubenzuron	Diflufenican	Diflufenzopyr[1]
Diflumetorim	Dimefluthrin	Dimefox

Pesticides		
Dimepiperate	Dimethachlone	Dimethachlor
Dimethametryn	Dimethenamid	Dimethipin
Dimethirimol	Dimethoate	Dimethomorph
Dimetilan	Dimoxystrobin	Diniconazole
Dinitramine	Dinobuton	Dinocap
Dinoseb	Dinoseb acetate	Dinoseb methyl esther
Dinotefuran	Dinoterb acetate	Diofenolan
Diothyl	Dioxacarb	Dioxathion
Diphacinone	Diphenamid	Diphenylamine
Dipropetryn	Disulfoton	Ditalimfos
Dithianon	Dithiopyr	Diuron
DNOC	Dodemorph	Dodine
Doramectin	Drazoxolon	Edifenphos
Emamectin benzoate	Empenthrin	Endosulfan
Endrin	EPN	Epoxiconazole
Eprinomectin	EPTC	Esfenvalerate
Esprocarb	Etaconazole	Ethaboxam
Ethalfluralin	Ethidimuron	Ethiofencarb
Ethiolate	Ethion	Ethiprole
Ethirimol	Ethofumesate	Ethoprop
Ethoxyfen-ethyl	Ethoxyquin	Ethychlozate
Etobenzanid	Etofenprox	Etoxazole
Etridiazole	Etrimfos	Eugenol
Famoxadone	Famphur	Fenamidone
Fenamiphos	Fenarimol	Fenazaflor
Fenazaquin	Fenbuconazole	Fenbutatin oxide
Fenchlorazole-ethyl	Fenclorim	Fenfuram
Fenhexamid	Fenitrothion	Fenobucarb
Fenothiocarb	Fenoxanil	Fenoxaprop-ethyl
Fenoxycarb	Fenpiclonil	Fenpropathrin
Fenpropidin	Fenpropimorph	Fenpyrazamine
e-Fenpyroximate	Fenson	Fensulfothion
Fenthion	Fenuron	Fenvalerate
Ferimzone	Fipronil	Flamprop-isopropyl
Flamprop-methyl	Flonicamid	Fluacrypyrim
Fluazifop butyl ester	p-butyl Fluazifop	Fluazinam
Fluazolate	Fluazuron	Flubendiamide
Flubenzimine	Fluchloralin	Flucycloxuron
Flucythrinate	Fludioxonil	Fluensulfone
Flufenacet	Flufenoxuron	Flufenpyr ethyl
Flufiprole	Flumetralin	Flumetsulam
Flumiclorac-pentyl	Flumioxazin	Flumorph

Pesticides		
Fluometuron	Fluopicolide	Fluopyram
Fluoranthene	Fluorene	Fluorochloridone
Fluorodifen	Fluoroglycofen	Fluoroimide
Fluotrimazole	Fluoxastrobin	Flupyradifurone
Fluquinconazole	Flurenol n-butyl ester	Flurenol-methyl ester
Fluridone	Fluroxypyr[1]	Fluroxypyr meptyl
Flurprimidol	Flurtamone	Flusilazole
Flusulfamide	Fluthiacet-methyl	Flutolanil
Flutriafol	Fluvalinate	Fluxapyroxad
Folpet	Fomesafen	Fonofos
Forchlorfenuron	Formetanate	Formothion
Fosthiazate	Fosthietan	Fuberidazole
Furalaxyl	Furametpyr	Furathiocarb
Furilazole	Furmecyclox	Gardona
Glufosinate[6]	Glyphosate[6]	Halauxifen-methyl
Halfenprox	Halofenozide	Haloxyfop[1]
Haloxyfop-methyl	Heptachlor	Heptenophos
Hexachlorobutadiene	Hexachlorophene	Hexaconazole
Hexaflumuron	Hexazinone	Hexythiazox
Hydramethylnon	Hydroprene	IBP
Imazalil	Imazamethabenz[1]	Imazamethabenz methyl ester
Imazamox[1]	Imazapic[1]	Imazapyr[1]
Imazaquin[1]	Imazasulfuron	Imazethapyr[1]
Imibenconazole	Imidacloprid	Imiprothrin
Indanofan	Indaziflam	Indoxacarb
Ioxynil	Ipconazole	Ipfencarbazone
Iprodione	Iprovalicarb	Isazofos
Isobenzan	Isocarbamid	Isocarbophos
Isodrin	Isofenphos	Isofetamid
Isomethiozin	Isoprocarb	Isopropalin
Isoprothiolane	Isoproturon	Isopyrazam
Isotianil	Isoxaben	Isoxadifen-ethyl
Isoxaflutole	Isoxathion	Ivermectin
Jodfenphos	Karbutilate	Kinoprene
Kresoxim-methyl	Lactofen	Lambda-cyhalothrin
Lenacil	Leptophos	Lindane
Linuron	Lufenuron	Malathion
Maleic hydrazide	Mandestrobin	Mandipropamid
MCPA[1]	MCPA methyl ester	MCPA-butoxyethyl ester
MCPB[1]	MCPB methyl ester	Mecarbam
Mecoprop[1]	Mecoprop methyl ester	Mefenacet
Mefenpyr-diethyl	Mefluidide	Mepanipyrim

Pesticides		
Meperfluthrin	Mephosfolan	Mepronil
Meptyldinocap	Mesotrione	Metaflumizone
Metalaxyl	Metaldehyde	Metamifop
Metamitron	Metazachlor	Metconazole
Methabenzthiazuron	Methacrifos	Methamidophos
Methfuroxam	Methidathion	Methiocarb
Methomyl	Methoprene	Methoprotryne
Methoxychlor	Methoxyfenozide	Methyldymron
Metobromuron	Metofluthrin	Metolachlor
Metolcarb	Metominostrobin	Metoxuron
Metrafenone	Metribuzin	Metsulfuron methyl
Mevinphos	Mexacarbate	MGK 264
MGK-326	Mirex	Molinate
Momfluorothrin	Monalide	Monocrotophos
Moxidectin	Myclobutanil	Naftalofos
Naled	Naphthalene	Naphthaleneacetamide
Naphthalic anhydride	Naproanilide	Napropamide
Naptalam	Neburon	Nicotine
Nitenpyram	Nitralin	Nitrapyrin
Nitrofen	Nitrothal-isopropyl	Norea
Norflurazon	Novaluron	Noviflumuron
Nuarimol	Octhilinone	Octyldiphenyl PO_4
Ofurace	Orbencarb	Orysastrobin
Oryzalin	Ovex	Oxabetrinil
Oxadiazon	Oxadixyl	Oxamyl
Oxathiapiprolin	Oxpoconazole	Oxydemeton-methyl
Oxydeprofos	Oxyfluorfen	Oxythioquinox
Paclobutrazol	Parathion	Parathion methyl
PCBs (selected congeners)	Pebulate	Penconazole
Pencycuron	Pendimethalin	Penflufen
Pentachlorophenol[1]	Pentanochlor	Penthiopyrad
Pentoxazone	Permethrin	Perthane
Pethoxamid	Phenkapton	Phenmedipham
Phenol	Phenothiazine	Phenothrin
Phenthoate	o-Phenylphenol	Phorate
Phosalone	Phosfolan	Phosmet
Phosphamidon	Phoxim	Phthalide
Picloram[1]	Picloram methyl ester	Picolinafen
Picoxystrobin	Pindone	Pinoxaden
Piperalin	Piperonyl butoxide	Piperophos
Pirimicarb	Pirimiphos ethyl	Pirimiphos methyl
Plifenate	Potasan	Prallethrin

Pesticides		
Pretilachlor	Probenazole	Prochloraz
Procymidone	Prodiamine	Profenofos
Profluralin	Profoxydim	Prohydrojasmon
Promecarb	Prometon	Prometryn
Pronamide	Propachlor	Propamocarb
Propanil	Propaphos	Propaquizafop
Propargite	Propazine	Propetamphos
Propham	Propiconazole	Propisochlor
Propoxur	Propoxycarbazone	Proquinazid
Prosulfocarb	Prothioconazole	Prothiofos
Prothoate	Prynachlor	Pydiflumetofen
Pymetrozine	Pyracarbolid	Pyraclofos
Pyraclostrobin	Pyraflufen ethyl	Pyrazon
Pyrazophos	Pyrazoxyfen	Pyrene
Pyrethrins	Pyribencarb	Pyributicarb
Pyridaben	Pyridalyl	Pyridaphenthion
Pyridate	Pyridinitril	Pyrifenox
Pyrifluquinazon	Pyriftalid	Pyrimethanil
Pyrimidifen	Pyriminobac-methyl	Pyriofenone
Pyriproxyfen	Pyroquilon	Pyroxasulfone
Quinalphos	Quinclorac[1]	Quinoclamine
Quinoxyfen	Quintozene	Quizalofop[1]
Quizalofop ethyl ester	Rabenzazole	Resmethrin
Ronnel	Rotenone	Saflufenacil
Salithion	Schradan	Sebuthylazine
Secbumeton	Sedaxane	Sethoxydim
Siduron	Silafluofen	Silthiofam
Silvex	Silvex methyl ester	Simazine
Simeconazole	Simetryne	Spinetoram
Spinosad	Spirodiclofen	Spiromesifen
Spirotetramat	Spiroxamine	Sulfallate
Sulfentrazone	Sulfluramid	Sulfotepp
Sulfoxaflor	Sulprofos	Swep
TCMTB	Tebuconazole	Tebufenozide
Tebufenpyrad	Tebupirimfos	Tebutam
Tebuthiuron	Tecnazene	Teflubenzuron
Tefluthrin	Temephos	TEPP
Tepraloxydim	Terbacil	Terbucarb
Terbufos	Terbumeton	Terbuthylazine
Terbutryn	Tetrachlorophenol	Tetraconazole
Tetradifon	Tetramethrin	Tetrasul
Thenylchor	Thiabendazole	Thiacloprid

Pesticides		
Thiamethoxam	Thiazopyr	Thidiazuron
Thifluzamide	Thiobencarb	Thiocyclam
Thiodicarb	Thiofanox	Thiometon
Thionazin	Thiophanate-methyl	Thioquinox
Tiadinil	Tiocarbazil	Tioxazafen
Tolclofos methyl	Tolfenpyrad	Tolpyralate
Tolyfluanid	Toxaphene	Tralkoxydim
Transfluthrin	Triadimefon	Triadimenol
Tri-allate	Triamiphos	Triapenthenol
Triazamate	Triazophos	Triazoxide
Tributoxy PO_4	Trichlamide	Trichlorfon
1,2,4-Trichlorobenzene	Trichloronat	Trichlorophenol
Triclopyr[1]	Triclopyr butoxyethyl ester	Triclosan
Tricyclazole	Tridemorph	Tridiphane
Trietazine	Trifenmorph	Trifloxystrobin
Trifloxysulfuron sodium salt	Triflumizole	Triflumuron
Trifluralin	Triflusulfuron methyl ester	Triforine
Trimethacarb	Triphenyl PO_4	Tris(1,3-dichloro-2-propyl) PO_4
Tris(beta-chloroethyl) PO_4	Tris(chloropropyl) PO_4	Triticonazole
Tycor	Uniconazole	Valifenalate
Vamidothion	Vernolate	Vinclozolin
XMC	Zoxamide	

[1]Acid herbicide included within the scope of the acid herbicides SRM.
[2]3,4-Dichloroanaline is a metabolite of multiple pesticides.
[3]3,5-Dichloroanaline is a metabolite of vinclozolin.
[4]BAM is a degradant of both fluopicolide and dichlobenil.
[5]Carbendazim is both a fungicide and a degradant of thiophanate methyl; it was reported under the category of thiophanate methyl in the 2015 and 2016 pesticide residue monitoring reports.
[6]Glyphosate and glufosinate are within the scope of the glyphosate SRM.

Appendix B. Analysis of Domestic Human Foods by Commodity Group in FY 2018

Commodity Group	Samples Analyzed (N)	Without Residues N (%)	Violative Samples N (%)	Over Tolerance Violations (N)	No Tolerance Violations (N)
Totals - All Domestic Samples	**1448**	**682 (47.1)**	**47 (3.2)**	**14**	**39**
Grains and Grain Products					
Barley and barley products	31	17 (54.8)	0	0	0
Corn and corn products	38	32 (84.2)	1 (2.6)	1	0
Oats and oat products	28	15 (53.6)	0	0	0
Rice and rice products	31	19 (61.3)	0	0	0
Soybeans and soybean products	34	24 (70.6)	0	0	0
Wheat and wheat products	26	9 (34.6)	0	0	0
Other grains and grain products	4	0	0	0	0
Group Subtotal	**192**	**116 (60.4)**	**1 (0.5)**	**1**	**0**
Milk/Dairy Products/Eggs					
Eggs	71	59 (83.1)	0	0	0
Milk, cream and cheese products	106	106 (100)	0	0	0
Group Subtotal	**177**	**165 (93.2)**	**0**	**0**	**0**
Fish/Shellfish/Other Aquatic Products					
Group Subtotal	**0**	**0**	**0**	**0**	**0**
Fruits					
Apple fruit/juice	20	1 (5.0)	0	0	0
Apricot fruit/juice	18	3 (16.7)	0	0	0
Blackberry fruit/juice	2	0	0	0	0
Blueberry fruit/juice	20	6 (30.0)	0	0	0
Cherry fruit/juice	17	0	1 (5.9)	0	1
Cranberry fruit/juice	1	1 (100)	0	0	0
Grapefruit fruit/juice	2	0	0	0	0
Grape fruit/juice, raisins	40	1 (2.5)	1 (2.5)	1	0
Nectarine fruit/juice	21	2 (9.5)	0	0	0
Orange fruit/juice	24	1 (4.2)	0	0	0
Peach fruit/juice	19	1 (5.3)	0	0	0
Pear fruit/juice	32	4 (12.5)	1 (3.1)	0	1
Plum fruit/juice, prunes	4	0	0	0	0
Raspberry fruit/juice	3	0	0	0	0
Strawberry fruit/juice	20	1 (5.0)	0	0	0
Other fruits/fruit products	38	12 (31.6)	0	0	0
Group Subtotal	**281**	**33 (11.7)**	**3 (1.1)**	**1**	**2**

Vegetables					
Asparagus	25	23 (92.0)	0	0	0
Cabbage	19	8 (42.1)	0	0	0
Celery	33	6 (18.2)	0	0	0
Cucumbers	18	6 (33.3)	0	0	0
Kale	33	10 (30.3)	6 (18.2)	0	6
Lettuce, head	25	10 (40.0)	0	0	0
Lettuce, leaf	40	9 (22.5)	3 (7.5)	0	3
Mushrooms and truffles	16	8 (50.0)	0	0	0
Okra	24	7 (29.2)	6 (25.0)	4	3
Onions/leeks/scallions/shallots	29	25 (86.2)	2 (6.9)	0	2
Peas (green/snow/sugar/sweet)	33	15 (45.5)	0	0	0
Peppers, hot	30	17 (56.7)	4 (13.3)	0	4
Peppers, sweet	28	8 (28.6)	1 (3.6)	0	1
Potatoes	23	9 (39.1)	0	0	0
Radishes	31	12 (38.7)	5 (16.1)	2	3
Red beets	1	0	0	0	0
Spinach	33	3 (9.1)	1 (3.0)	0	1
Squash	59	27 (45.8)	1 (1.7)	0	1
String beans (green/snap/pole/long)	34	15 (44.1)	6 (17.6)	5	6
Sweet potatoes	1	0	0	0	0
Tomatoes	32	15 (46.9)	0	0	0
Other bean and pea products	71	39 (54.9)	0	0	0
Other leaf and stem vegetables	21	2 (9.5)	4 (19.0)	0	4
Other root and tuber vegetables	23	11 (47.8)	1 (4.3)	1	0
Other vegetables/vegetable products	5	2 (40.0)	0	0	0
Group Subtotal	**687**	**287 (41.8)**	**40 (5.8)**	**12**	**34**
Other Food Products					
Edible seeds and seed products	17	13 (76.5)	2 (11.8)	0	2
Animal products/byproducts	11	9 (81.8)	0	0	0
Honey	36	30 (83.3)	0	0	0
Peanuts and peanut products	19	17 (89.5)	0	0	0
Refined oil	23	9 (39.1)	0	0	0
Miscellaneous foods	3	3 (100)	0	0	0
Spices	2	0	1 (50.0)	0	1
Group Subtotal	**111**	**81 (73.0)**	**3 (2.7)**	**0**	**3**

†Percentage of the number of samples analyzed per commodity group

*Total number of violative samples may not equal sum of samples with over tolerance and no tolerance violations because one sample can contain pesticide chemical residues of both violation types.

Appendix C. Analysis of Import Human Foods by Commodity Group in FY 2018

Commodity Group	Samples Analyzed (N)	Without Residues N (%)	Violative Samples N (%)	Over Tolerance Violations (N)	No Tolerance Violations (N)
Totals - All Import Samples	**2956**	**1395 (47.2)**	**382 (12.9)**	**59**	**364**
Grains and Grain Products					
Bakery products, doughs, crackers	7	6 (85.7)	1 (14.3)	0	1
Barley and barley products	24	14 (58.3)	2 (8.3)	0	2
Breakfast cereals	2	1 (50.0)	0	0	0
Corn and corn products	10	8 (80.0)	0	0	0
Macaroni and noodles	31	20 (64.5)	1 (3.2)	0	1
Oats and oat products	14	10 (71.4)	0	0	0
Rice and rice products	248	116 (46.8)	62 (25.0)	15	61
Soybeans and soybean products	6	3 (50.0)	0	0	0
Wheat and wheat products	35	24 (68.6)	1 (2.9)	0	1
Other grains and grain products	19	12 (63.2)	2 (10.5)	0	2
Group Subtotal	**396**	**214 (54)**	**69 (17.4)**	**15**	**68**
Milk/Dairy Products/Eggs					
Eggs	4	4 (100)	0	0	0
Milk, cream and cheese products	7	6 (85.7)	0	0	0
Group Subtotal	**11**	**10 (90.9)**	**0**	**0**	**0**
Fish/Shellfish/Other Aquatic Products					
Aquaculture seafood	78	64 (82.1)	0	0	0
Fish and fish products	41	34 (82.9)	3 (7.3)	0	3
Shellfish and crustaceans	17	17 (100)	0	0	0
Other aquatic animals and products	3	3 (100)	0	0	0
Group Subtotal	**139**	**118 (84.9)**	**3 (2.2)**	**0**	**3**
Fruits					
Ackees, lychees, longans	1	1 (100)	0	0	0
Apple fruit/juice	39	10 (25.6)	1 (2.6)	1	0
Apricot fruit/juice	23	2 (8.7)	2 (8.7)	0	2
Avocado fruit/juice	21	13 (61.9)	0	0	0
Bananas, plantains	8	7 (87.5)	0	0	0
Bitter melon	1	1 (100)	0	0	0
Blackberry fruit/juice	8	3 (37.5)	0	0	0
Blueberry fruit/juice	22	9 (40.9)	0	0	0
Breadfruit, jackfruit	12	11 (91.7)	1 (8.3)	0	1
Cantaloupe	1	0	0	0	0
Cherry fruit/juice	15	2 (13.3)	3 (20.0)	0	3

Commodity Group	Samples Analyzed (N)	Without Residues N (%)	Violative Samples N (%)	Over Tolerance Violations (N)	No Tolerance Violations (N)
Clementine fruit/juice	2	0	1 (50.0)	0	1
Cranberry fruit/juice	7	6 (85.7)	1 (14.3)	0	1
Currant fruit/juice	3	1 (33.3)	1 (33.3)	0	1
Date fruit/juice	31	25 (80.6)	3 (9.7)	2	2
Fig fruit/juice	7	7 (100)	0	0	0
Dragon fruit	21	10 (47.6)	6 (28.6)	0	6
Grapes fruit/juice, raisins	57	4 (7.0)	4 (7.0)	1	3
Guava fruit/juice	2	1 (50)	0	0	0
Honeydew melon	2	0	1 (50.0)	0	1
Fruit jams, jellies, preserves, syrups, toppings	14	8 (57.1)	0	0	0
Lemon fruit/juice	4	2 (50.0)	0	0	0
Lime fruit/juice	53	8 (15.1)	7 (13.2)	0	7
Mango fruit/juice	33	25 (75.8)	4 (12.1)	0	4
Nectarine fruit/juice	9	0	0	0	0
Olives	18	16 (88.9)	0	0	0
Orange fruit/juice	20	13 (65.0)	2 (10.0)	0	2
Papaya fruit/juice	32	7 (21.9)	3 (9.4)	0	3
Peach fruit/juice	29	2 (6.9)	1 (3.4)	0	1
Pear fruit/juice	19	8 (42.1)	2 (10.5)	0	2
Pineapple fruit/juice	17	10 (58.8)	1 (5.9)	0	1
Plum fruit/juice, prunes	12	4 (33.3)	2 (16.7)	0	2
Pomegranate fruit/juice	5	3 (60.0)	0	0	0
Prickly pear fruit/juice	10	4 (40.0)	3 (30.0)	0	3
Raspberry fruit/juice	18	8 (44.4)	1 (5.6)	0	1
Strawberry fruit/juice	48	9 (18.8)	3 (6.2)	1	3
Watermelon	6	3 (50.0)	0	0	0
Other berry fruit/juice	14	6 (42.9)	4 (28.6)	0	4
Other citrus fruit/juice	5	2 (40.0)	0	0	0
Other fruits and fruit products	26	16 (61.5)	6 (23.1)	1	6
Other melons/vine fruit/juice	1	0	0	0	0
Other stone fruit/juice	3	1 (33.3)	2 (66.7)	0	2
Other pome/core fruit/juice	1	1 (100)	0	0	0
Other sub-tropical fruit/juice	16	13 (81.2)	1 (6.2)	1	1
Group Subtotal	**696**	**282 (40.5)**	**66 (9.5)**	**7**	**63**
Vegetables					
Artichokes	6	3 (50.0)	0	0	0
Asparagus	58	46 (79.3)	0	0	0
Bamboo shoots	3	3 (100)	0	0	0
Bean sprouts and seeds	3	1 (33.3)	0	0	0
Bok choy and Chinese cabbage	9	2 (22.2)	0	0	0
Broccoli	20	13 (65.0)	0	0	0

Commodity Group	Samples Analyzed (N)	Without Residues N (%)	Violative Samples N (%)	Over Tolerance Violations (N)	No Tolerance Violations (N)
Brussels sprouts	17	4 (23.5)	2 (11.8)	0	2
Cabbage	31	17 (54.8)	1 (3.2)	0	1
Carrots	40	14 (35.0)	4 (10.0)	0	4
Cassava	3	3 (100)	0	0	0
Cauliflower	11	9 (81.8)	0	0	0
Celery	49	16 (32.7)	8 (16.3)	0	8
Choyote	13	5 (38.5)	1 (7.7)	0	1
Cilantro	89	5 (5.6)	40 (44.9)	4	39
Collards	3	1 (33.3)	0	0	0
Corn	20	20 (100)	0	0	0
Cucumbers	24	10 (41.7)	0	0	0
Eggplant	10	1 (10.0)	1 (10.0)	0	1
Garbanzo beans	26	16 (61.5)	1 (3.8)	0	1
Garlic	9	6 (66.7)	3 (33.3)	0	3
Ginger	20	18 (90.0)	1 (5.0)	0	1
Kale	26	6 (23.1)	1 (3.8)	1	1
Kidney beans	6	4 (66.7)	0	0	0
Lettuce, head	16	7 (43.8)	0	0	0
Lettuce, leaf	25	4 (16.0)	1 (4.0)	0	1
Mung beans	6	6 (100)	0	0	0
Mushrooms/truffles/fungi	32	26 (81.2)	4 (12.5)	0	4
Mustard greens	2	0	1 (50.0)	0	1
Okra	9	8 (88.9)	0	0	0
Onions/leeks/scallions/shallots	52	26 (50.0)	6 (11.5)	2	5
Peas (green/snow/sugar/sweet)	93	26 (28.0)	23 (24.7)	4	20
Peppers, hot	124	22 (17.7)	31 (25.0)	2	30
Peppers, sweet	39	5 (12.8)	4 (10.3)	0	4
Potatoes	32	4 (12.5)	1 (3.1)	0	1
Pumpkins	4	4 (100)	0	0	0
Radishes	55	24 (43.6)	19 (34.5)	8	18
Soybeans	7	2 (28.6)	0	0	0
Spinach	36	12 (33.3)	4 (11.1)	1	3
Squash	81	26 (32.1)	1 (1.2)	0	1
String beans (green/snap/pole/long)	55	24 (43.6)	7 (12.7)	3	6
Sweet potatoes	17	9 (52.9)	4 (23.5)	3	4
Taro/dasheen	14	7 (50.0)	6 (42.9)	0	6
Tomatoes/tomatillos	65	14 (21.5)	3 (4.6)	0	3
Turnips	2	1 (50.0)	0	0	0
Vegetable juice/drinks	3	2 (66.7)	0	0	0
Vegetables, breaded, or with sauce	1	1 (100)	0	0	0
Vegetables, other, or mixed	22	13 (59.1)	7 (31.8)	3	4

Commodity Group	Samples Analyzed (N)	Without Residues N (%)	Violative Samples N (%)	Over Tolerance Violations (N)	No Tolerance Violations (N)
Other bean/pea vegetables/products	58	28 (48.3)	3 (5.2)	0	3
Other leaf and stem vegetables	67	33 (49.3)	22 (32.8)	3	21
Other root and tuber vegetables	22	12 (54.5)	4 (18.2)	0	4
Group Subtotal	**1435**	**569 (39.7)**	**214 (14.9)**	**34**	**201**
Other Food Products					
Animal products and byproducts	1	1 (100)	0	0	0
Baby foods/formula	1	1 (100)	0	0	0
Beverages and beverage bases	5	3 (60.0)	1 (20.0)	0	1
Candy, confections, chocolate, cocoa products	2	1 (50)	0	0	0
Coconut and coconut products	7	7 (100)	0	0	0
Condiments and dressings	6	2 (33.3)	4 (66.7)	0	4
Dietary supplement, botanical/herbal	5	3 (60.0)	2 (40.0)	0	2
Dietary supplement, other	5	2 (40.0)	2 (40.0)	0	2
Food sweeteners, not honey	3	3 (100)	0	0	0
Honey and honey products	40	38 (95.0)	0	0	0
Multi-ingredient foods (dinners, sauces, specialties)	3	0	0	0	0
Nuts, almonds	3	3 (100)	0	0	0
Nuts, cashews	4	4 (100)	0	0	0
Nuts, other nuts and nut products	17	12 (70.6)	1 (5.9)	1	1
Nuts, peanuts and peanut products	2	1 (50.0)	0	0	0
Nuts, pecans	10	10 (100)	0	0	0
Oil, olive	43	29 (67.4)	5 (11.6)	0	5
Oil, vegetable	7	4 (57.1)	0	0	0
Seeds, edible and seed products	81	62 (76.5)	5 (6.2)	0	5
Spices	22	9 (40.9)	7 (31.8)	2	6
Other food products	12	7 (58.3)	3 (25.0)	0	3
Group Subtotal	**279**	**202 (72.4)**	**30 (10.8)**	**3**	**29**

†Percentage of the number of samples analyzed per commodity group.
*Total number of violative samples may not equal sum of samples with over tolerance and no tolerance violations because one sample can contain pesticide chemical residues of both violation types.