Pesticide Monitoring Program

2010 Pesticide Report

U.S. Food and Drug Administration

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Foreword

This document is the 22nd report summarizing the results of the U.S. Food and Drug Administration's (FDA or the Agency) pesticide residue monitoring program. Eight of the twenty-one previous reports were published in the *Journal of the Association of Official Analytical Chemists and the Journal of AOAC International*; these presented results from fiscal years (FY) 1987 through 1994. Results from FY 1995 through FY 2009 were published on FDA's website at http://www.fda.gov/Food/FoodborneIllnessContaminants/Pesticides/default.htm. This report includes findings obtained during FY 2010 (October 1, 2009 through September 30, 2010) under regulatory monitoring along with selected Total Diet Study (TDS) findings.

In the early 1990s, FDA conducted comprehensive incidence and level monitoring studies of four major foods and published the results [1, 2]. Due to resource constraints, incidence and level monitoring for pesticide residues conducted by FDA's field laboratories, which was typically non-regulatory in nature, has been replaced in recent years by regulatory-based "focused sampling." Incidence and level pesticide residue data are, however, provided by FDA's TDS program. The TDS program analyzes market baskets of about 300 foods four times per year.

Results in this and earlier reports continue to demonstrate that levels of pesticide residues in the U.S. food supply are generally in compliance with EPA's permitted pesticide uses and tolerances.

FDA Monitoring Program

Three federal government agencies share responsibility for the regulation of pesticides. The U. S. Environmental Protection Agency (EPA) registers (*i.e.*, approves) the use of pesticides and establishes tolerances (the maximum amounts of residues that are permitted in or on a food) [3]. Except for meat, poultry, and certain egg products, for which the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) is responsible, FDA is charged with enforcing tolerances in both imported foods and in domestic foods shipped in interstate commerce. FDA also acquires data on particular commodity and pesticide combinations by carrying out market basket surveys under the TDS. Since 1991, USDA's Agricultural Marketing Service (AMS) has carried out a pesticide residue testing program, called the Pesticide Data Program (PDP), directed at raw agricultural products and various processed foods through contracts with states to perform the sampling and analyses. FSIS and AMS report their pesticide residue data independently. Information about the PDP is available at http://www.ams.usda.gov/science/pdp/index.htm.

Regulatory Monitoring

FDA samples individual lots of domestically produced and imported foods and analyzes them for pesticide residues to enforce the tolerances established by EPA. Domestic samples are typically collected close to the point of production in the distribution system, i.e., growers, packers, and distributors. Import samples are collected at the point of entry into U.S. commerce. Although processed foods are also included, the emphasis is on the raw agricultural product, which is typically analyzed as the unwashed, whole (unpeeled), raw commodity. If illegal residues are found at levels above EPA tolerances or FDA Action Levels (guideline levels for unavoidable residues of cancelled pesticides that persist in the environment), or residues at a level of regulatory significance for which EPA has established no tolerance for a given food are found in domestic foods, the lot of food, as available, will be removed from commerce. FDA can also issue Warning Letters to the responsible growers and invoke other sanctions such as seizure or injunction to correct the cause of the violation. Imported shipments with illegal residues are refused entry into U.S. commerce. Firms may be placed under an Import Alert (a listing is available at http://www.accessdata.fda.gov/cms_ia/ialist.html)and "Detention Without Physical Examination," or DWPE may be invoked for future imported lots of the commodity based on the finding of a single violative shipment. Congress has authorized FDA to refuse admission of regulated articles based on information, other than the results of examination of entries per se, that causes an article to appear to violate the Federal Food Drug and Cosmetic Act (FFDCA). Entries of imported foods which are suspected of containing illegal pesticide residues because of the results obtained from previous examinations of the same foods may be considered to appear to violate the FFDCA. DWPE can be applied to product from specific growers, manufacturers, or shippers, or 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 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 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 can have their product(s) removed from an FDA Import Alert by providing evidence establishing that the conditions that gave rise to the appearance of a violation have been resolved and that there is sufficient basis for the Agency to have confidence that future entries will be in compliance with the FD&C Act. Additionally, a minimum of five consecutive non-violative commercial shipments, as demonstrated by providing FDA with acceptable reports of private laboratory analyses, is required to remove a grower's, manufacturer's, or shipper's product from 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(ies) in question.

Factors considered by FDA in planning the types and origin of commodities to sample include the following: analysis of past problem areas; commodity/pesticide findings from recently generated state, USDA, and FDA analyses; available foreign pesticide usage data and regional intelligence on pesticide use; dietary significance of the food; volume of individual commodities of domestic food produced and entered into interstate commerce and of imported food offered for entry into the U.S.; the origin of imported food; and chemical characteristics and toxicity of the pesticide(s) used.

Analytical Methods and Pesticide Coverage

To analyze the large numbers of samples whose pesticide treatment history is usually unknown, FDA uses analytical methods capable of simultaneously determining multiple pesticide residues. These multi-residue methods (MRMs) can determine the majority of the approximately 400 pesticides with EPA tolerances, and many others that have no tolerances. The most commonly used MRMs can also detect many metabolites, impurities, and alteration products of pesticides [4].

Selective or single residue methods (SRMs) are also used to determine targeted pesticide residues in foods; a SRM determines one pesticide or a small number of selected pesticides and/or chemically related residues. SRMs are more resource intensive per

residue and therefore employed more judiciously. A suspicion of a violation or a need to acquire residue data in select commodities will usually trigger use of these methods.

The lower limit of residue measurement in FDA's determination of a specific pesticide is usually well below tolerance levels. Tolerance levels generally range from 0.1 to 50 parts per million (ppm). Residues present at 0.01 ppm and above are usually measurable; however, for individual pesticides, this limit may range from 0.005 to 1 ppm. Trace levels of pesticide residues are also reported. The term “trace” is used to indicate residues that are detected and positively identified at levels greater than, or equal to, the limit of detection (LOD) and below the residue’s limit of quantitation (LOQ) for the method employed.

FDA conducts ongoing research to update its pesticide 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. In recent years, newer extraction procedures and detection techniques have increasingly replaced older methods, allowing for a greater level of pesticide coverage.

FDA-State Cooperation

FDA field offices interact with their counterparts in many states to enhance the effectiveness of the Agency’s pesticide monitoring program. Memoranda of Understanding (MOU) and Partnership Agreements 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 imported and domestic products.

Animal Feeds

In addition to monitoring foods for human consumption, FDA also samples and analyzes domestic and imported animal feeds for pesticide residues. FDA's Center for Veterinary Medicine (CVM) directs this portion of the Agency's monitoring via its Feed Contaminants Compliance Program. Although animal feeds containing violative pesticide residues may present a potential hazard to a number of different categories of animals (e.g., laboratory animals, pets, wildlife, etc.), CVM's monitoring focuses on feeds for livestock and poultry animals that ultimately become or produce foods for human consumption.

International Activities

FDA pesticide residue monitoring activities are a part of the Agency’s overall food safety programs. As such, they are subject to the responsibilities FDA has under international

trade agreements to which the United States is signatory. The 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 some of our monitoring is conducted.

FDA, as a part of the U.S. Government, is subject to the obligations placed on countries by the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). Pesticide residue tolerances and monitoring activities are included as sanitary measures under the SPS Agreement. FDA's obligations under this agreement include the requirement that standards are based on an assessment appropriate to the circumstances of the risk to human and animal health, and on international standards except when a more stringent standard can be scientifically supported. The standards must also be applied equally to domestic and imported products unless there is scientifically based justification for doing otherwise.

Similarly, FDA, as part of the U.S. Government, is subject to obligations arising from several free trade agreements, the most notable of which is the North America Free Trade Agreement (NAFTA). These bilateral or multilateral free trade agreements contain provisions on sanitary measures that are consistent with the provisions of the WTO SPS Agreement. As with the WTO SPS Agreement, the sanitary provisions of these agreements include provisions relating to pesticide residues.

FDA maintains a number of arrangements with counterpart agencies in foreign governments. Such arrangements include MOU, Confidentiality Agreements, and Exchanges of Letters. These arrangements most often contain information-sharing provisions that include the ability to share analytical findings about pesticide residues. Several of the MOUs have specific provisions relating to pesticide residue information sharing or cooperative efforts relating to pesticide residues.

FDA also participates in meetings with counterpart food safety agencies of foreign governments. For example, FDA participates in the work of the quadrilateral discussions on food safety, comprising senior food safety officials from Australia, Canada, New Zealand, and the United States. FDA also carries out bilateral discussions on food safety with several countries, including Canada and Mexico, and meets regularly with the European Commission. Pesticide control programs and pesticide residue issues can be subjects for discussion at these meetings.

FDA participates in the work of international standards-setting organizations, particularly the work of the Codex Alimentarius Commission (Codex). Within Codex, FDA is an active participant in the work of the Codex Committee on Pesticide Residues.

Focused Sampling

FDA's pesticide monitoring program frequently includes what this report describes as "focused sampling." This approach is primarily regulatory in nature, with the necessary protocols followed to ensure enforcement action can be pursued if a violation is detected.

Focused sampling is generally used to follow-up on suspected problem areas or to acquire residue data on select commodities not usually covered during regulatory monitoring. Focused sampling is carried out by short-term field assignments that require collection of specific commodities to be analyzed for pesticide residues using routine MRMs, or targeted residues of interest using SRMs.

Focused sampling differs from what was previously described in FDA's pesticide program as incidence and level monitoring. Incidence and level monitoring to obtain pesticide residue data generally consisted of non-regulatory analyses of selected samples of commodities of interest. Incidence and level monitoring typically required a follow-up collection and analysis of a regulatory sample to confirm a violation before an FDA enforcement action could ensue. However, due to resource constraints, incidence and level monitoring as done in the past by FDA has been replaced by focused sampling, with the exception noted below for samples collected as part of FDA's Total Diet Study (TDS) program.

FDA Total Diet Study

The TDS is distinct from regulatory monitoring in that it determines pesticide residues not in the raw commodity, but in foods that are prepared table-ready for consumption [5]. The sampled foods are washed, peeled, and/or cooked before analysis, simulating typical consumer handling. Residues found in the TDS program are not regulatory in nature but considered incidence and level monitoring.

TDS foods are sampled as "market baskets," with each market basket comprising samples of about 300 different foods that represent the average U.S. consumer's diet. Four regional market baskets are planned for each year and for each market basket, and samples are collected in three different cities within each region. The three samples of each food are combined to form a single composite prior to analysis. In addition to being analyzed for pesticide residues, TDS foods are also selectively analyzed for toxic and nutrient elements, industrial chemicals, and other chemical contaminants. Additional information about the history and design of the TDS as well as analytical results can be found in several FDA publications [5,6,7,8,9,10,11] and on FDA's website (http://www.fda.gov/Food/FoodScienceResearch/TotalDietStudy/default.htm).

Another distinction from FDA's pesticide residue regulatory monitoring is that the TDS foods are analyzed using methods that are modified to permit enhanced measurement of residues, generally at levels up to 10–100 times more sensitive than regulatory monitoring procedures. TDS residue levels as low as 0.1 parts per billion are routinely reported.

FDA Pesticide Program Sampling Design

The goal of FDA's pesticide monitoring program is to carry out selective monitoring to achieve an adequate level of consumer protection. Most of the FDA samples are of the surveillance type; that is, there is no specific prior knowledge or evidence that a particular food shipment contains illegal residues. However, FDA's monitoring is not random because some bias is introduced primarily by emphasizing sampling of commodities and places of origin with a past history of violations, and to a lesser extent emphasizing larger-sized shipments.

For FY 2010, the import violation rate was 4.9 percent and the domestic violation rate was 1.9 percent. The FY 2010 violation rates are in-line with annual violation rates over the past dozen years which have ranged between 2.6–6.2 percent for imports and 0.7–2.4 percent for domestic foods.

In FY 1991, FDA contracted with the Research Triangle Institute (RTI) to design a statistical approach to conduct a residue study. The resulting report was entitled "Monitoring Pesticide Residues in Fresh Produce: A Probabilistic Approach." The report acknowledged that the program in 1991 (which was similar to FDA's current program except that sample totals were two to three times higher) was not a probability-based approach since it was not free of selection bias. A probabilistic approach described in the report would need to account for, among other elements, a high degree of consumption coverage (coverage of a significant portion of the commodity population), and seasonal and geographical representation. Also, to achieve a meaningful certainty level of confidence of about 95 percent, 800 data points, i.e., samples, of each import or domestic commodity would be necessary.

In FYs 1992 and 1994, FDA conducted "statistically-based" studies of four commodities [1, 2], adhering to as many of the tenets of the RTI report as was practical within available resources. The commodities tested were apples, pears, rice, and tomatoes. Domestically grown and imported products were separately tested. The conclusions of the studies corroborated the premise that when compared to a statistically based study, FDA's monitoring program provides a reasonably reliable estimate of pesticide residues in the U.S. food supply, especially when the data are viewed over many years, and that the levels of residues found are generally well below U.S. tolerances. However, because sampling levels and bias for particular imported or domestic commodities can vary significantly from year to year, FDA does not infer statistical significance to results within a fiscal year.

An important complement to FDA's pesticide program is its TDS previously discussed in this report. By its design, the TDS serves as an early warning system, capable of detecting many more pesticide residues and at much greater sensitivity when compared to FDA's regulatory program (FDA's regulatory program is designed to detect residues in violation of EPA tolerances).

Considering the above and coupled with available Agency resources, FDA has not attempted to develop a monitoring program that would be statistically based. However, it is FDA's opinion that the current sampling levels, coupled with broad-based enforcement strategies for imports, are sufficient for FDA to achieve the program's main objective, i.e., adequate consumer protection by selective enforcement. As described previously, import enforcement strategies that are available to the Agency are placement on Import Alert with DWPE for future entries of commodity/grower combinations that are found in violation of U.S pesticide tolerances, (i.e, residue level exceeds the established tolerance level for a specific residue/item combination, or residues were found at a level of regulatory significance in a food for which no tolerance has been established), and country-wide Import Alert and DWPE of particular commodities if the violations are numerous and from multiple growers within any given country. Once a problem is identified, FDA can achieve broad enforcement by employing these strategies and detaining at their entry points the suspect imported foods. This procedure places the burden of demonstrating product compliance with U.S. residue tolerances on the importer before the entry can be released into domestic commerce.

Identification of Imports (Products or Countries) Requiring Special Attention or Additional Studies

Addressing products and countries that warrant special attention is best carried out by providing specific guidance to the Agency field offices and laboratories to conduct increased sampling, both surveillance and focused, by means of field assignments under FDA's "Pesticides and Industrial Chemicals in Domestic and Imported Foods Compliance Program." FDA's sampling strategy of focusing on products that have a history of recurring violations will continue to be applied to future program coverage. Though specifics are provided in this report regarding import commodities and countries of origin that, based on FY 2010 data, may warrant special attention, FDA's sampling guidance provided to its field districts is typically based on multi-year data. FDA also utilizes available foreign pesticide usage data and data from USDA's PDP to develop sampling guidance. However, meaningful violative episodes that do occur are addressed in real-time as much as possible through use of the Import Alert system or enhanced sampling.

When attempting to compare FDA's import pesticide residue data, by product or by country, against its domestic data several factors should be considered:

- The import violation rate has typically been three to four times that of domestic foods. Therefore, it is expected that many imported food products in this report have a violation rate exceeding that of domestic products, and that many foreign countries have a violation rate exceeding that of the U.S.

- The data analysis by commodity in this report was compiled according to FDA product codes (i.e., distinct commodities). For FY 2010, 727 different import food commodities and 212 different domestic food commodities were tested.

- FDA's pesticide residue monitoring program should not be viewed as random or statistical, rather it is focused towards products and countries of origin that have a history of violations or are suspected of violations based on available intelligence.

Review by Commodity

Considering the above factors, the following criteria were applied to the FY 2010 data to select import commodities that may warrant special attention (this is the same criteria applied to the data and report for FY 2008 and FY 2009):

- Commodities with at least 20 samples analyzed OR with a minimum of 3 violations
- AND a violation rate of 10 percent or higher

Table 1 lists the import commodities that meet the criteria. The commodities are sorted by violation rate and include the total number of samples analyzed for FY 2010. Commodities reported under non-specific product codes (e.g., leaf and stem vegetables, not elsewhere classified) were excluded.

Table 1. Import Commodities That May Warrant Special Attention Based on FY 2010 Sampling Results

Commodity	Samples Analyzed (#)	Violation Rate (%)
Berries	5	60.0
Basil	19	47.4
Ginseng*	31	35.5
Raisins	10	30.0
Capsicums, ground spice	14	28.6
Capsicums, whole spice	24	20.8
Papaya	45	20.0
Peppers	46	19.6
Spinach*	36	19.4
Grapes	36	16.7
Peppers, Serrano	33	15.2
Okra	27	14.8
Tomatillo	29	13.8
Beet	23	13.0
Herbal and botanical teas	36	11.1

*Commodity was on the FY 2009 table of import commodities warranting special attention.

Review by Country of Origin

Table 2 lists countries of origin with a minimum of 50 samples analyzed and a 7 percent or greater violation rate for FY 2010.

Table 2. Countries of Origin That May Warrant Special Attention Based on FY 2010 Sampling Results

Country	Samples Analyzed (#)	Violation Rate (%)
India	160	10.6
Peru	83	8.4

Note: Samples from Mexico continue to make up the greatest portion of FDA's import pesticide sampling. In FY 2010, 1979 samples from Mexico were analyzed. The violation rate for Mexican samples was 4.4 percent, just below the 4.9 percent average for all import samples. Continued high coverage of Mexican foods is warranted due to the large volume of foods imported from Mexico. Additionally, 995 samples from China (mainland) were analyzed. The violation rate for samples from China was 4.2 percent. Continued high coverage of foods from China is also warranted based both on import volume and high violation rates.

Acknowledgments

This report was compiled through the efforts of the following FDA personnel: Laurie A. Bates, Sara K. Egan, Nathaniel R. Esaw, Delores A. Flenoury, Michael H. Wehr, and Xuhui Zhao, in the Center for Food Safety and Applied Nutrition; Krisztina Z. Atkinson and Randall Lovell, in the Center for Veterinary Medicine; and Chris A. Sack, in the Office of Regulatory Affairs.

The database containing the FY 2010 data from which this report was derived is also available from FDA web at http://www.fda.gov/Food/FoodborneIllnessContaminants/Pesticides/default.htm. The 1996 through 2009 reports and databases are available on the same website. FDA pesticide monitoring data collected under the regulatory monitoring approach in 1992, 1993, 1994, and 1995 are available on personal computer diskettes and may be purchased from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161; (telephone 1-800-553-6847); or at http://www.ntis.gov. Order numbers are: 1992, PB94-500899; 1993, PB94-501681; 1994, PB95-503132; and 1995, PB96-503156.

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[3](3) Code of Federal Regulations (2003) Title 40, U.S. Government Printing Office, Washington, DC, Parts 180, 185, and 186.

[4] Pesticide Analytical Manual Volume I (3rd Ed., 1994 and subsequent revisions), available from FDA's website at http://www.cfsan.fda.gov; Volume II (1971 and subsequent revisions) available from National Technical Information Service, Springfield, VA 22161.

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Results and Discussion

Regulatory Monitoring

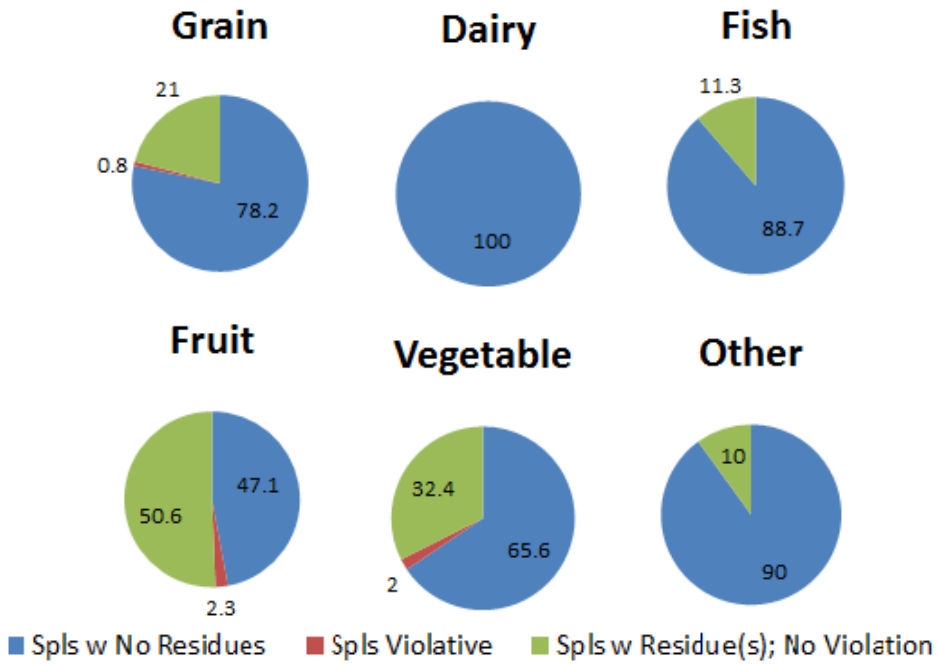
Discussion

Under regulatory monitoring, 6,535 samples were analyzed. Of these, 1,449 were domestic foods and 5,086 were imported foods.

Figure 1 shows the percentage of the domestic samples by commodity group with "No Residues Found," "Residues Found; No Violation," and "Violative" (a violative residue is defined in this report as a residue which exceeds an EPA tolerance or FDA Action Level, or a residue at a level of regulatory significance for which no tolerance has been established in the sampled food.)

Domestic Sample Totals: Grains & Grain Products 124; Milk/Dairy/Eggs 9; Fish/Shellfish 62; Fruit 433; Vegetables 781; Other Foods 40.

Figure 1 - % Results of Domestic Samples by Commodity Group for FY 2010



In FY 2010, 98.1 percent of all domestic foods analyzed by FDA were in compliance (i.e., no residues found or residues found but no violation). The compliance rate for domestic foods for FYs 1996 to 2009 was between 97.6 percent and 99.3 percent. As in earlier years, fruits and vegetables accounted for the largest proportion of the domestic

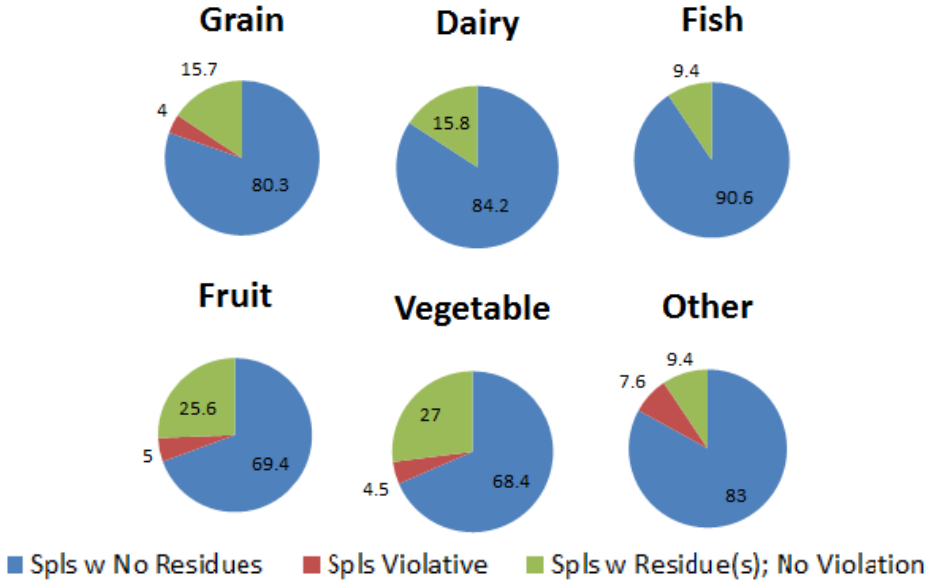
commodities analyzed in FY 2010, comprising 84 percent of the total number of domestic samples.

Appendix A contains more detailed data on domestic monitoring findings by commodity, including the total number of samples analyzed, the percent samples with no residues detected, and the percent of violative samples including the nature of the violation (over-tolerance vs. no-tolerance). Of the 1,449 domestic samples, 63.0 percent had no detectable residues and 1.9 percent had violative residues. In the largest commodity groups, fruits and vegetables, 47.1 percent and 65.6 percent of the samples, respectively, had no residues detected; 2.3 percent of the fruit samples and 2.0 percent of the vegetable samples contained violative residues (figure 1). In the grains and grain products group, 78.2 percent of the samples had no residues detected, and 0.8 percent had violative residues. In the fish/shellfish/other aquatic products group, 88.7 percent had no detectable residues and there were no samples with violative residues. In the milk/dairy products/eggs group three samples were analyzed and all had no detectable residues. In the "Other" foods group that covers nuts, seeds, snack foods, and spices among other foods, 90.0 percent of the 40 samples analyzed had no detectable residues, and none were violative.

Findings by commodity group for the 5,086 import samples are shown in figure 2. Overall for all imported foods, 95.1 percent of the samples analyzed in FY 2010 were in compliance (i.e., no residues found or residues found but no violation). This compares with a compliance rate for imported foods for FYs 1996 through 2008 of 94–98 percent. Fruits and vegetables accounted for 76 percent of import samples.

Import Sample Totals: Grains & Grain Products 198; Milk/Dairy/Eggs 19; Fish/Shellfish 224; Fruit 1,117; Vegetables 2,762; Other Foods 766.

Figure 2 - % Results of Import Samples by Commodity Group FY 2010



Appendix B contains detailed data on import samples. Of the 5,086 import samples analyzed, 72.3 percent had no residues detected, while 4.9 percent had violative residues. No residues were detected in 69.4 percent of imported fruit samples and 5.0 percent samples contained violative residues. Of the vegetable samples 68.4 percent of samples had no residues detected and 4.5 percent samples had violative residues. No residues were found in 94.2 percent of samples of the imported milk/dairy products/eggs group and no violations were detected. No residues were found in 90.6 percent of the imported fish/shellfish group and no violations were found in this food group. In the imported grains and grain products group, 80.3 percent had no detectable residues, and 4.0 percent contained violative residues. In the "Other" foods group consisting largely of nuts, seeds, oils, honey, candy, spices, multiple food products, and dietary supplements, 83.0 percent of the samples analyzed had no residues detected, while 7.6 percent of the samples (mostly dietary supplements and spices) contained violative residues.

Pesticide monitoring data collected under FDA's regulatory monitoring approach in FY 2010 are available to the public as a computer database. This database summarizes FDA 2010 regulatory monitoring coverage and findings by country/commodity/pesticide combination. The database also includes monitoring data by individual sample from which the summary information was compiled. Information on how to obtain this database as well as those for 1992–2009 is provided in the acknowledgements section of this report.

Geographic Coverage

Domestic: A total of 1,449 domestic samples were collected in FY 2010 from 42 states, Guam, and the District of Columbia. Table 1 lists the number of domestic samples from each state and territory, in descending order.

Table 1. Domestic Samples Collected and Analyzed by State Origin

California	201	Maryland	35	Utah	19	New Mexico	5
Washington	126	Wisconsin	31	North Dakota	15	Alabama	3
Minnesota	116	Idaho	30	Iowa	14	South Carolina	3
Oregon	108	Texas	28	Kentucky	14	Delaware	3
Florida	99	Colorado	26	Ohio	13	Hawaii	3
New York	76	Missouri	24	Kansas	12	Rhode Island	3
Michigan	69	Wyoming	24	Mississippi	8	Connecticut	2
Virginia	69	Pennsylvania	21	North Carolina	8	Nebraska	2
Arizona	61	Georgia	21	Indiana	7	New Hampshire	2
Louisiana	60	Montana	21	Alaska	6	District of Columbia	1
Illinois	35	Massachusetts	19	Guam	5	New Jersey	1

No samples were collected from the states of Arkansas, Maine, Nevada, Oklahoma, South Dakota, Tennessee, Vermont, and West Virginia.

Imports: A total of 5,086 samples representing food shipments from 103 countries (excluding U.S. goods sampled in import status) were collected in FY 2010. Table 2 lists the number of samples and country from which 10, or more samples, were collected. Mexico, as in the past, was the source of the largest number (1979) of samples, reflecting the volume and diversity of commodities imported from that country, especially during the winter months. Table 2A lists the countries of origin that had less than ten samples collected in FY 2010.

Table 2. Import Samples Collected and Analyzed by Country of Origin

Mexico	1979	Italy	38	Malaysia	17
China	995	Colombia	35	Spain	16
Canada	412	Pakistan	34	El Salvador	15
India	160	Argentina	31	Belgium	14
Guatemala	143	Egypt	31	South Africa	13
Chile	125	Costa Rica	28	Greece	12
Thailand	87	Ecuador	27	United Kingdom	12
Peru	83	Brazil	27	Mauritius	12
Turkey	62	Lebanon	24	Jamaica	12
United States*	54	Netherlands	24	New Zealand	11
Vietnam	53	Germany	22	Israel	11
Poland	53	Philippines	22	Nicaragua	10
Dominican Republic	47	Honduras	20	Australia	10
South Korea	43	France	19	Iran	10
Taiwan	41	Hong Kong	18		

*Foods reported sampled in import status but of U.S origin, including U.S. goods returned (U.S. products originally exported and subsequently returned).

Table 2a. Fewer Than Ten Samples Were Collected and Analyzed From the Following Countries

Afghanistan	Ireland	Russia
Algeria	Ivory Coast	Senegal
Armenia	Japan	Serbia
Azerbaijan	Jordan	Singapore
Bangladesh	Kenya	Sri Lanka
Belize	Lithuania	Surinam
Bolivia	Macedonia	Switzerland
Bosnia-Hercegovina	Madagascar	Syrian Arab Republic
Bulgaria	Malawi	Tanzania
Cambodia	Moldova	Togo
Cameroon	Morocco	Tonga
Denmark	Mozambique	Trinidad & Tobago
Dominica	Namibia	Tunisia
Ethiopia	Nigeria	Ukraine
Fiji	Northern Mariana Islands	United Arab Emirates
Ghana	Norway	Uruguay
Guinea	Oman	Uzbekistan
Guyana	Panama	Vanuatu
Hungary	Portugal	Venezuela
Indonesia	Romania	

Domestic/Import Violation Rate Comparison for FY 2010

In FY 2010, 1,449 domestic and 5,086 import samples were collected and analyzed. Pesticide residues were detected in 37.0 percent of the domestic samples and in 27.7 percent of the import samples. Violative residues were found in 1.9 percent of the domestic samples and 4.9 percent of the import samples. Among grains and grain products, the violation rate was 0.8 percent for domestic samples and 4.0 percent for imports. No violations were found in the milk/dairy products/eggs group or the fish/shellfish/other aquatic products/aquaculture seafood group for either domestic or import samples. In fruit samples 2.3 percent contained violative residues while 5.0 percent of imports did. For vegetables, 2.0 percent of domestic samples and 4.5 percent of import samples contained violative residues. In the category "Other" (mostly nuts, seeds, oils, honey, candy, spices, multiple food products, and dietary supplements), no violations were found domestic samples and 7.6 percent of import samples contained violative residues. Imported dietary supplements, particularly ginseng, accounted for most of the samples with violative residues for the import "Other" foods group.

Of the 27 domestic violative samples, 21 were found to contain pesticide residues that have no published EPA tolerance, i.e. "no-tolerance" violation. Six samples had pesticide residues that exceeded a tolerance, i.e. "over-tolerance" violation. Of the 250 violative

import samples, there were 233 no-tolerance and 17 exceeds tolerance violations. FDA enforcement actions for products found in violation of EPA tolerances are described in the regulatory monitoring section of this report.

Pesticide Coverage

Table 3 lists the 462 pesticides that were detectable or found by the methods used in FY 2010; each of the 164 pesticides that were actually found is indicated by an asterisk (*). Residues not previously looked for or detected, are noted by a "ǂ".

Table 3. Pesticides Detectable, New and Found

2,6-DIPN*	3,4-dichloroaniline	4-(dichloroacetyl)-1-oxa-4-azapiro 4.5 decane
Abamectin	Acephate*	Acetamiprid*
Acetochlor	Acibenzolar-S-methyl	Acrinathrin
Alachlor	Alanycarb	Aldicarb
Aldrin*	Allethrin	Alpha cypermethrin
Ametryn	Aminocarb	Amitraz*
Anilazine	Aramite	Atrazine*
Azinphos ethyl	Azinphos-methyl*	Azoxystrobin*
Benalaxyl*	Bendiocarb*	Benfluralin*
Benfuracarb	Benodanil	Benomyl*
Benoxacor	Bensulide	Bentazon
Benzoximate	Benzoylprop ethyl	BHC*
Bifenazate*	Bifenox	Bifenthrin*
Biphenyl*	Bitertanol*	Boscalid*
Bromacil	Bromophos	Bromophos-ethyl
Bromopropylate*	Bromuconazole	Bufencarb
Bulan	Bupirimate	Buprofezin*
Butachlor	Butafenacil	Butocarboxim
Butoxycarboxim	Butralin	Butylate
Cadusafos	Captafol	Captan*
Carbaryl*	Carbendazim*	Carbetamide
Carbofuran*	Carbophenothion	Carbosulfan
Carboxin	Carfentrazone ethyl ester	Chlorantraniliprole
Chlorbenside	Chlorbromuron	Chlorbufam
Chlordane*	Chlordecone	Chlordimeform*
Chlorethoxyfos	Chlorfenapyr*	Chlorfenvinphos*
Chlorfluazuron*	Chlorflurecol methyl	Chlormephos
Chlornitrofen	Chlorobenzilate	Chloroneb
Chloropropylate	Chlorothalonil*	Chlorotoluron
Chloroxuron	Chlorpropham*	Chlorpyrifos methyl*
Chlorpyrifos*	Chlorthiophos	Clethodim
Clodinafop-propargyl	Clofentezine	Clomazone

Cloquintocet-mexyl	Clothianidin*	Compound K
Coumaphos	Crotoxyphos	Crufomate
Cyanazine	Cyanofenphos	Cyanophos
Cyazofamid*	Cyclanilide	Cycloate*
Cycluron	Cyflufenamid	Cyfluthrin*
Cyhalofop butyl ester	Cymoxanil*	Cypermethrin*
Cyprazine	Cyproconazole*	Cyprodinil*
Cyromazine*	DCPA*	DDT*
DEF	Deltamethrin*	Demeton
Desmedipham	Desmetryn	Dialifor
Diallate	Diazinon*	Dichlobenil
Dichlofenthion	Dichlofluanid*	Dichlone
Dichlormid	Dichlorvos*	Diclobutrazol
Diclofop	Dicloran*	Dicofol*
Dicrotophos	Dieldrin*	Diethatyl-ethyl
Diethofencarb*	Difenoconazole*	Diflubenzuron*
Dilan	Dimethachlor	Dimethametryn
Dimethenamid	Dimethipin	Dimethoate*
Dimethomorph*	Dimoxystrobin	Dinitramine
Dinobuton	Dinotefuran*	Dioxacarb
Dioxathion	Diphenamid	Diphenylamine*
Disulfoton	Diuron*	Doramectin
Edifenphos	Emamectin benzoate	Endosulfan*
Endrin*	EPN	Epoxiconazole*
Eprinomectin	EPTC	Esfenvalerate*
Etaconazole	Ethaboxam	Ethalfluralin
Ethephon	Ethiofencarb	Ethiolate*
Ethion*	Ethiprole	Ethirimol
Ethofumesate*	Ethoprop*	Ethoxyquin*
Etofenprox*	Etoxazole*	Etridiazole
Etrimfos	Famoxadone*	Famphur
Fenamidone*	Fenamiphos*	Fenarimol*
Fenazaquin*	Fenbuconazole*	Fenfuram
Fenhexamid*	Fenitrothion*	Fenobucarb(BPMC)
Fenoxaprop-ethyl	Fenoxycarb	Fenpropathrin*
Fenpropimorph	Fenpyroximate, e-	Fensulfothion
Fenthion	Fenuron	Fenvalerate*
Fipronil*	Flamprop-methyl	Flamprop-m-isopropyl
Flonicamid*	Fluazifop butyl ester	Fluazinam
Flubendiamide	Fluchloralin	Flucythrinate
Fludioxonil*	Flufenacet	Flufenoxuron*
Fluometuron	Fluopicolide*ǂ	Fluoxastrobin
Fluquinconazole*	Fluridone	Flusilazole*
Flutolanil*	Flutriafol	Fluvalinate
Folpet*	Fonofos	Forchlorfenuron

Formetanate	Formothion	Fosthiazate
Fuberidazole	Furathiocarb	Furilazole
Gardona	Halofenozide	Heptachlor*
Heptenophos	Hexachlorobenzene*	Hexaconazole
Hexaflumuron	Hexazinone*	Hexythiazox*
Hydramethylnon	IBP	Imazalil*
Imazamethabenz methyl	Imidacloprid*	Indoxacarb*
Ipconazole	Iprodione*	Iprovalicarb
Isazofos	Isocarbamid*	Isocarbophos*ǂ
Isofenphos	Isoprocarb*	Isopropalin
Isoprothiolane*	Isoproturon	Isoxaflutole
Ivermectin	Kresoxim-methyl*	Lactofen
Lambda-cyhalothrin*	Lenacil	Leptophos
Lindane*	Linuron*	Lufenuron*
Malathion*	Mandipropamid	Mecarbam
Mepanipyrim	Mephosfolan	Merphos
Mesotrione	Metaflumizone*	Metalaxyl*
Metaldehyde*	Metazachlor	Metconazole
Methabenzthiazuron	Methamidophos*	Methidathion*
Methiocarb	Methomyl*	Methoprene*ǂ
Methoprotryne	Methoxychlor	Methoxyfenozide*
Metobromuron	Metolachlor*	Metolcarb
Metribuzin*	Mevinphos	Mexacarbate*
MGK 264	Mirex	Molinate
Monocrotophos*	Moxidectin	Myclobutanil*
Naled	Napropamide	Naptalam*ǂ
Neburon	Nicotine*ǂ	Nitenpyram
Nitralin	Nitrapyrin	Nitrofen
Nitrofluorfen	Nitrothal-isopropyl	Norea
Norflurazon	Novaluron*	Nuarimol
Octhilinone	Octyldiphenyl PO4	Ofurace
Omethoate*	Ovex	Oxadiazon
Oxadixyl*	Oxamyl*	Oxydemeton-methyl
Oxyfluorfen	Oxythioquinox	Paclobutrazol*
Parathion methyl*	Parathion*	PCBs
Pebulate	Penconazole*	Pencycuron
Pendimethalin*	Permethrin*	Perthane
Phenmedipham	Phenothrin	Phenthoate
Phenylphenol, o-*	Phorate	Phosalone*
Phosmet*	Phosphamidon	Phoxim
Picoxystrobin	Piperonyl butoxide*	Piperophos
Pirimicarb	Pirimiphos ethyl	Pirimiphos methyl*
Pretilachlor*	Prochloraz*	Procyazine

Procymidone*	Profenofos*	Profluralin
Prolan	Promecarb	Prometon
Prometryn*	Pronamide*	Propachlor
Propamocarb*	Propanil*	Propargite*
Propazine	Propetamphos	Propham
Propiconazole*	Propoxur	Prothiofos
Prothoate	Pymetrozine	Pyracarbolid
Pyraclostrobin*	Pyrazon	Pyrazophos
Pyrethrins*	Pyridaben*	Pyridaphenthion
Pyrifenox	Pyrimethanil*	Pyriproxyfen*
Quinalphos	Quinoxyfen*	Quintozene*
Quizalofop ethyl	Resmethrin	Ronnel
Rotenone*	Salithion	Schradan
Secbumeton*	Sethoxydim	Siduron
Simazine	Simetryne	Spinetoram
Spinosad*	Spirodiclofen*	Spiromesifen*
Spirotetramat	Spiroxamine	Strobane
Sulfallate	Sulfentrazone	Sulfotepp
Sulfur*ǂ	Sulphenone	Sulprofos
TCNA	Tebuconazole*	Tebufenozide*
Tebufenpyrad*	Tebupirimfos	Tebutam
Tebuthiuron	Tecnazene*	Teflubenzuron
Tefluthrin	Temephos	TEPP
Terbacil	Terbufos	Terbumeton
Terbuthylazine	Terbutryn	Tetraconazole*
Tetradifon*	Tetraiodoethylene	Tetramethrin*
Tetrasul	Thiabendazole*	Thiacloprid*
Thiamethoxam*	Thiazopyr	Thidiazuron
Thiobencarb	Thiometon	Thionazin
Thiophanate-methyl*	Tolclofos methyl	Tolylfluanid
Toxaphene	Tralkoxydim	Tralomethrin
Tranid	Triadimefon*	Triadimenol*
Tri-allate	Triazophos*	Tributoxy PO4*
Trichlorfon*	Tricyclazole*	Tridiphane
Trietazine	Trifloxystrobin*	Triflumizole*
Triflumuron	Trifluralin*	Triflusulfuron methyl ester
Trimethacarb	Triphenyl PO4*	Triticonazole*
Vamidothion	Vernolate	Vinclozolin*
XMC	Zoxamide	

Animal Feeds

In FY 2010 a total of 374 animal feed samples (229 domestic and 145 import) were analyzed for pesticides by the FDA (Table 4). Of the 229 domestic surveillance samples, 177 (77.3%) contained no detectable residues, 49 (21.4%) contained one or more detectable residues, but not violative, and 3 (1.3%) contained a violative residue (a violative residue is defined in this report as a residue which exceeded an EPA tolerance or FDA Action Level, or a residue at a level of regulatory significance for which no tolerance has been established in the sampled feed). Of the 145 import samples, 114 (78.6%) contained no detectable residues, 27 (18.6%) contained one or more detectable residues, but not violative, and 4 (2.8%) contained a violative residue.

During FY 2010, the following samples were found to contain one or more violative residues. A domestic surveillance sample of whole feed corn from Kansas contained 0.921 ppm chlorpyrifos methyl, for which no tolerance has been established for this commodity. A sample of white corn screenings from Texas was found to contain 32.8 ppm pirimiphos-methyl, exceeding the tolerance of 20.0 ppm. A sample of pistachio shells from California contained five different pesticide residues, two of which were violative, i.e., the concentration of 0.12 ppm of difenoconazole exceeded the 0.03 ppm limit in pistachios and 0.02 ppm trifluralin, for which no tolerance has been established for this commodity.

A sample of sudan hay imported from Mexico had 0.026 ppm dacthal (DCPA), for which no tolerance has been established for this commodity. A shipment of psyllium seed husk from India was found to contain 0.266 ppm malathion and 0.158 ppm cyfluthrin; neither pesticide has an established tolerance in this commodity. A sample of sweet potato dog treats from China contained 0.261 ppm phorate sulfone in addition to traces of phorate and phorate sulfoxide. No tolerance has been established for phorate in sweet potato; however, a tolerance of 0.2 ppm has been established for potatoes. A shipment of the calf supplement “Biopect” from Denmark had carbendazim at 0.017 ppm, and since this fungicide is not registered with the EPA, the product is violative.

Table 4. Summary of the 374 Animal Feed Samples (229 Domestic and 145 Imported) Analyzed for Pesticides

Type of Feed	Samples Analyzed #	Samples with No Pesticide Residues #	Samples with No Pesticide Residues %	Violative Samples #	Violative Samples %
Whole/Ground Grains	140	130	92.9	1	0.7
Mixed Feed Rations	94	46	48.9	0	0
Plant By-product	90	73	81.1	4	4.4
Supplements/Misc.	26	22	84.6	1	3.8
Hay/Hay Products	17	14	82.4	1	5.9
Animal By-products	7	6	85.7	0	0
TOTAL	374	291	77.8	7	1.9

Of the 52 domestic surveillance samples with positive results, a total of 78 residues were detected (77 quantifiable, one trace); whereas among the imports, 31 samples contained 44 residues (30 quantifiable, 14 trace). Ethoxyquin and malathion were the most frequently found and together accounted for 54.1% of all residues detected (Table 5).

Table 5. Pesticides Most Commonly Reported in Samples of Animal Feeds

Pesticide	Total # of Samples	Quantifiable Samples	Range* (ppm)	Median* (ppm)
Ethoxyquin	47	46	0.010 – 384	0.53
Malathion	19	19	0.011 – 5.46	0.073
Diphenylamine	4	0	-	-
Piperonyl butoxide	4	4	0.004 – 0.122	0.049
Boscalid	3	3	0.039 – 0.40	0.08
p,p'-DDE	3	3	0.001 – 0.070	0.005
Pirimiphos-methyl	3	3	0.246 – 32.8	1.63
Chlorpyrifos	2	2	0.068 – 0.30	0.18
Lambda cyhalothrin	2	2	0.007 – 0.030	0.019
DCPA	2	1	0.026	0.026
Permethrin	2	2	0.006 – 0.038	0.022
Propargite	2	2	0.028 – 0.080	0.054
Trifluralin	2	2	0.003 – 0.020	0.012

**For samples containing quantifiable levels of pesticides. An additional 25 contaminants not listed were identified in a single sample.*

Focused Sampling

As previously described, FDA conducts "focused sampling" by means of short-term, regulatory based, field assignments. However, during FY 2010 FDA did not issue any pesticide-related field assignments. Focused sampling is planned for FY 2011.

Total Diet Study

Of the more than 300 chemicals that can be detected by the analytical methods used in FDA's TDS, residues of 150 individual compounds were found in the foods analyzed in the four market baskets reported for FY 2010 (Market Baskets 09-4, 10-1, 10-2, and 10-3). The 150 individual compounds consisted of parent pesticides and related compounds (e.g., isomers, metabolites, degradation products) that are added to the parent pesticide for reporting and enforcement purposes.

Table 6 lists the most frequently found residues in the TDS foods other than infant and toddler foods (those found in 2% or more of the samples), the total number of findings, and the percent occurrence in the four market baskets analyzed in FY 2010 (915 total samples). The five most frequently observed chemicals were DDT, malathion, chlorpyrifos-methyl, endosulfan, and dieldrin; these 5 pesticides are the same as those observed for the past several years.

Table 6. Pesticide Residues Occurring in Foods, Other Than in Infant Formula and Toddler Foods, Under the Total Diet Study in FY 2010[1]

Pesticide[2]	Findings #	Occurrence %	Range ppm
DDT	175	19	0.0001-0.038
Malathion	119	13	0.0001-0.090
Chlorpyrifos methyl	93	10	0.0002-0.034
Endosulfan	89	10	0.0001-0.167
Dieldrin	71	8	0.0001-0.008
Carbaryl[3]	68	7	0.0001-0.102
Chlorpyrifos	68	7	0.0001-0.047
Chlorpropham	63	7	0.0004-2.211
Piperonyl butoxide	50	5	0.0001-0.074
Thiabendazole[4]	40	4	0.0001-0.350
Quintozene	32	3	0.0001-0.0032
Permethrin	30	3	0.0005-3.710
Hexachlorobenzene	28	3	0.0001-0.0006
Pyrimethanil	27	3	0.0002-1.260
Bifenthrin	26	3	0.001-0.130
Boscalid	26	3	0.0005-0.098
Phenylphenol, o-	24	3	0.001-0.166
Azoxystrobin	23	3	0.0002-0.320
Cypermethrin	19	2	0.001-0.344
Acephate	18	2	0.001-0.115
Methoxyfenozide	17	2	0.0002-0.073
Pyraclostrobin	16	2	0.0001-0.036
Pirimiphos methyl	15	2	0.0004-0.013
Acetamiprid	15	2	0.0002-0.040
Aldicarb[3]	15	2	0.0001-0.010
Linuron[5]	14	2	0.0001-0.015
DCPA	14	2	0.0001-0.006
Captan	14	2	0.0002-0.530

[1] Based upon 4 market baskets consisting of 915 total items.
[2] Isomers, metabolites, and related compounds are included with the 'parent' pesticide
[3] Reflects overall incidence; however, for MBs 09-4, 10-1 and 10-2 only 81-82 selected foods per market basket (i.e. 245 items total) were analyzed for N-methylcarbamates.
[4] Reflects overall incidence; however, for MBs 09-4, 10-1 and 10-2 only 66-67 selected foods per market basket (i.e. 200 items total) were analyzed for Benzimidazole fungicides.
[5] Reflects overall incidence; however, for MBs 09-4, 10-1 and 10-2 only 29 selected foods per market basket (i.e. 87 items total) were analyzed for Phenylurea herbicides.

The TDS program also collects and analyzes infant and toddler foods. Table 7 provides the frequency of occurrence of the pesticide residues that were found in 2 percent or more of these samples in the four collections of infant and toddler foods (179 samples total) in FY 2010 and the range of levels found. The results for FY 2010 are very consistent with those from FY 2009 and similar to those from earlier years.

Table 7. Pesticide Residues Occurring in Infant and Toddler Foods Under the Total Diet Study in FY 2010 [1]

Pesticide[2]	Findings #	Occurrence %	Range ppm
Carbaryl[3]	39	22	0.0001-0.050
Chlorpyrifos	24	13	0.0002-0.006
Ethylenethiourea[4]	19	11	0.003-0.024
DDT	18	10	0.0001-0.010
Captan	16	9	0.001-0.216
Piperonyl butoxide	16	9	0.0002-0.040
Thiabendazole[5]	15	8	0.0003-0.095
Endosulfan	13	7	0.0001-0.0016
Pyrimethanil	12	7	0.0002-0.073
Acetamiprid	12	7	0.0008-0.007
Chlorpropham	12	7	0.0006-0.050
Dieldrin	11	6	0.0002-0.0004
Methoxyfenozide	11	6	0.0001-0.003
Carbendazim	11	6	0.0007-0.066
Thiacloprid	10	6	0.0003-0.004
Permethrin	10	6	0.0005-0.007
Malathion	8	4	0.002-0.087
Chlorantraniliprole	8	4	0.0004-0.009
Lambda-cyhalothrin	8	4	0.001-0.005
Fenvalerate	7	4	0.002-0.007
Imidacloprid	7	4	0.0004-0.003
Boscalid	7	4	0.0008-0.006
Diphenylamine	6	3	0.001-0.011
Chlorpyrifos methyl	6	3	0.0006-0.012
Phenylphenol, o-	5	3	0.002-0.011
Tebuconazole	5	3	0.0001-0.003
Clothianidin	4	2	0.0001-0.001
Cyprodinil	4	2	0.0004-0.006
Bifenthrin	4	2	0.002-0.032
Benomyl[5]	4	2	0.020-0.078
Propiconazole	4	2	0.0003-0.004
Dicloran	3	2	0.0008-0.002
Hexythiazox	3	2	0.001-0.003
Iprodione	3	2	0.001-0.002
Pyraclostrobin	3	2	0.0002-0.0003
Trifloxystrobin	3	2	0.0002-0.0003
Bifenazate	3	2	0.0001-0.0004
Biphenyl	3	2	0.006-0.016
Indoxacarb	3	2	0.0003-0.002

[1] Based upon 4 market baskets consisting of 179 total items.
[2] Isomers, metabolites, and related compounds are included with the 'parent' pesticide.
[3] Reflects overall incidence; however, only 34 selected foods per market basket (i.e. 136 items total) were

analyzed for N-methylcarbamates.
[4] Reflects overall incidence; however, only 29 selected foods per market basket (i.e. 116 items total) were analyzed for Ethylenethiourea.
[5] Reflects overall incidence; however, only 34 selected foods per market basket (i.e. 136 items total) were analyzed for Benzimidazole fungicides.

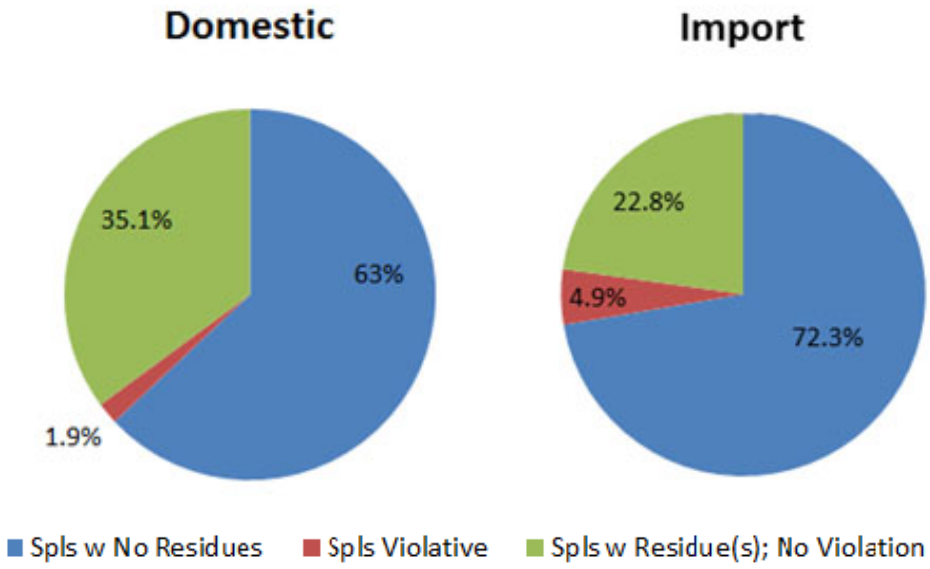
Summary

Regulatory Monitoring – FY 2010

A total of 6,535 samples of both domestically produced and imported food from 104 countries were analyzed for pesticide residues in FY 2010. No residues were found in 63.0 percent of domestic and 72.3 percent of import samples (figure 3) analyzed under FDA's regulatory monitoring approach in FY 2010. Only 1.9 percent of domestic and 4.9 percent of import samples had residue levels that were violative. The findings for FY 2010 demonstrate that pesticide residue levels in foods are generally well below EPA tolerances, corroborating results presented in earlier reports.

FDA also collected and analyzed 229 domestic and 145 imported animal feed samples for pesticides. No residues were found in 77.3 percent of the domestic feed samples and in 78.6 percent of the import feed samples. Three domestic feed samples and four imported feed samples had residue findings for which no EPA or FDA acceptable levels have been established.

Figure 3. Summary of Results of Domestic vs. Import Samples (Spls)



Total Diet Study

In FY 2010, the types of pesticide residues found and their frequency of occurrence in TDS were generally consistent with those given in previous FDA reports. The pesticide residue levels found were well below regulatory standards. Results of baby foods tested

in FY 2010 (and earlier years) also provide evidence of only low levels of pesticide residues in these foods.

Appendices

A. Analysis of Domestic Samples by Commodity Group in 2010

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Over Tolerance (#)	No Tolerance (#)
Grains and Grain Products					
Barley & barley products	5	80.0	0.0	0	0
Corn & corn products	24	91.7	0.0	0	0
Oats & oat products	4	50.0	0.0	0	0
Rice & rice products	10	80.0	0.0	0	0
Wheat & wheat products	68	72.1	1.5	1	0
Soybeans and soybean grain products	6	83.3	0.0	0	0
Other grains & grain products	0	0.0	0.0	0	0
Macaroni & noodles	0	0.0	0.0	0	0
Breakfast cereals	4	100.0	0.0	0	0
Bakery products, crackers, etc.	3	100.0	0.0	0	0
Subtotal	**124**	**78.2**	**0.8**	**1**	**0**
Milk/Dairy Products/Eggs					
Cheese & cheese products	0	0.0	0.0	0	0
Eggs	0	0.0	0.0	0	0
Milk/cream & milk products	9	100.0	0.0	0	0
Subtotal	**9**	**100.0**	**0.0**	**0**	**0**
Fish/Shellfish/Other Aquatic Products					
Fish and Fish Products	43	88.4	0.0	0	0
Shellfish & Crustaceans	3	100.0	0.0	0	0
Aquaculture seafood	16	87.5	0.0	0	0
Other Aquatic Animals & Products	0	0.0	0.0	0	0
Subtotal	**62**	**88.7**	**0.0**	**0**	**0**
Fruits					
Blackberries	3	66.7	0.0	0	0
Blueberries	8	75.0	0.0	0	0
Cranberries	21	81.0	0.0	0	0
Grapes, raisins	8	50.0	0.0	0	0
Raspberries	9	33.3	11.1	0	1
Strawberries	35	34.3	5.7	0	2

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Violative Samples And Types: Over Tolerance (#)	Violative Samples And Types: No Tolerance (#)
Grapefruit	6	16.7	0.0	0	0
Lemons	3	0.0	0.0	0	0
Oranges	29	34.5	0.0	0	0
Other citrus fruit	9	44.4	0.0	0	0
Apples	129	48.1	0.8	0	0
Pears	19	31.6	0.0	0	0
Other pome fruit	0	0.0	0.0	0	0
Apricots	2	50.0	0.0	0	0
Avocadoes	8	87.5	0.0	0	0
Cherries	9	44.4	0.0	0	0
Nectarines	12	25.0	0.0	0	0
Peaches	45	28.9	13.3	1	5
Plums/prunes	11	63.6	0.0	0	0
Papaya	1	0.0	0.0	0	0
Pineapple	0	0.0	0.0	0	0
Other sub-tropical fruit	4	75.0	0.0	0	0
Cantaloupe	6	66.7	0.0	0	0
Watermelon	2	50.0	0.0	0	0
Other melons	3	66.7	0.0	0	0
Other fruits/fruit products	13	46.2	0.0	0	0
Apple juice	20	75.0	0.0	0	0
Citrus juice	2	100.0	0.0	0	0
Other fruit juices	7	71.4	0.0	0	0
Processed fruit (jellies, toppings, fillings)	9	44.4	0.0	0	0
Subtotal	**433**	**47.1**	**2.3**	**1**	**8**
Vegetables					
Corn	35	100.0	0.0	0	0
Bean sprouts	0	0.0	0.0	0	0
Peas (green/snow/sugar/sweet)	16	87.5	0.0	0	0
String beans (green/snap/pole/long)	37	51.4	5.4	1	1
Other beans & peas & products	51	90.2	0.0	0	0
Cucumbers	13	38.5	0.0	0	0
Eggplant	20	85.0	0.0	0	0
Okra	4	75.0	0.0	0	0
Peppers, hot	3	66.7	0.0	0	0
Peppers, sweet	16	50.0	0.0	0	0
Pumpkins	2	100.0	0.0	0	0
Squash	55	74.5	0.0	0	0

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Over Tolerance (#)	No Tolerance (#)
Tomatoes	39	66.7	0.0	0	0
Asparagus	6	100.0	0.0	0	0
Bok choy	3	0.0	0.0	0	0
Broccoli	13	92.3	0.0	0	0
Cabbage	30	83.3	0.0	0	0
Cauliflower	7	85.7	0.0	0	0
Celery	6	66.7	0.0	0	0
Collards	3	66.7	0.0	0	0
Endive	0	0.0	0.0	0	0
Kale	21	38.1	19.0	0	4
Lettuce, head	26	19.2	0.0	0	0
Lettuce, leaf	35	37.1	0.0	0	0
Mustard greens	2	100.0	0.0	0	0
Spinach	25	32.0	4.0	0	1
Swiss chard	6	33.3	33.3	0	2
Watercress	0	0.0	0.0	0	0
Other leaf & stem vegetables	49	38.8	4.1	0	2
Mushrooms and Truffles	25	80.0	0.0	0	0
Carrots	28	57.1	3.6	0	1
Onions/leeks/scallions/shallots	13	84.6	0.0	0	0
Parsnips	7	71.4	0.0	0	0
Potatoes	75	54.7	4.0	3	1
Radishes	8	62.5	0.0	0	0
Red beets	8	75.0	0.0	0	0
Sweet potatoes	21	85.7	0.0	0	0
Turnips	4	100.0	0.0	0	0
Other root & tuber vegetables	6	66.7	16.7	0	1
Other vegetables/vegetable products	63	82.5	0.0	0	0
Subtotal	**781**	**65.6**	**2.0**	**4**	**13**
Other					
Peanuts & peanut products	4	100.0	0.0	0	0
Almonds	15	100.0	0.0	0	0
Coconut	0	0.0	0.0	0	0
Other nuts	7	100.0	0.0	0	0
Refined oil	1	100.0	0.0	0	0
Edible seeds & seed products	2	100.0	0.0	0	0
Basil	0	0.0	0.0	0	0

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Violative Samples And Types: Over Tolerance (#)	Violative Samples And Types: No Tolerance (#)
Other spices	1	0.0	0.0	0	0
Water & ice	3	33.3	0.0	0	0
Beverages & beverage base	0	0.0	0.0	0	0
Honey	2	100.0	0.0	0	0
Confections	0	0.0	0.0	0	0
Miscellaneous foods	5	80.0	0.0	0	0
Feed/Animal Byproducts	0	0.0	0.0	0	0
Other products	0	0.0	0.0	0	0
Subtotal	**40**	**90.0**	**0.0**	**0**	**0**
Totals - All Domestic Samples	**1449**	**63.0**	**1.9**	**6**	**21**

B. Analysis of Import Samples by Commodity Group in 2010

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Over Tolerance (#)	No Tolerance (#)
Grains and Grain Products					
Barley & barley products	8	87.5	0.0	0	0
Corn & corn products	18	94.4	0.0	0	0
Oats & oat products	3	100.0	0.0	0	0
Rice & rice products	39	74.4	7.7	0	3
Wheat & wheat products	18	83.3	5.6	1	0
Soybeans & soybean products	0	0.0	0.0	0	0
Other grains & grain products	25	84.0	8.0	1	2
Macaroni & noodles	30	93.3	0.0	0	0
Bakery products, doughs, crackers	44	68.2	2.3	0	1
Breakfast cereals	9	88.9	11.1	0	1
Snack foods	4	25.0	0.0	0	0
Subtotal	**198**	**80.3**	**4.0**	**2**	**7**
Milk/Dairy Products/Eggs					
Cheese & cheese products	10	90.0	0.0	0	0
Eggs (includes duck & quail)	1	100.0	0.0	0	0
Milk/cream & milk products	8	75.0	0.0	0	0
Subtotal	**19**	**84.2**	**0.0**	**0**	**0**
Fish/Shellfish/Other Aquatic Products					
Fish and fish products	110	87.3	0.0	0	0
Shellfish & crustaceans	35	94.3	0.0	0	0
Aquaculture seafood	78	93.6	0.0	0	0
Other aquatic animals & products	1	100.0	0.0	0	0
Subtotal	**224**	**90.6**	**0.0**	**0**	**0**
Fruits					
Blackberries	54	50.0	5.6	0	3
Blueberries	61	63.9	1.6	0	1
Cranberries	10	100.0	0.0	0	0
Currants	7	71.4	14.3	0	1
Grapes, raisins	57	33.3	19.3	1	10
Raspberries	35	68.6	2.9	0	1
Strawberries	83	33.7	2.4	0	2
Other berries	14	64.3	14.3	0	2
Clementines	4	25.0	0.0	0	0

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types		
			Samples (%)	Over Tolerance (#)	No Tolerance (#)
Grapefruit	0	0.0	0.0	0	0
Lemons	1	100.0	0.0	0	0
Limes	9	77.8	0.0	0	0
Oranges	69	87.0	0.0	0	0
Other citrus fruit	9	100.0	0.0	0	0
Apples	34	50.0	2.9	0	0
Pears	13	61.5	0.0	0	0
Prickle pear	18	83.3	5.6	0	1
Other pome/core fruit	6	83.3	0.0	0	0
Apricots	8	100.0	0.0	0	0
Avocadoes	46	95.7	2.2	0	1
Cherries	19	52.6	0.0	0	0
Dates	20	75.0	10.0	1	1
Nectarines	3	0.0	0.0	0	0
Olives	26	96.2	0.0	0	0
Peaches	13	61.5	0.0	0	0
Plums/Prunes	11	72.7	9.1	0	1
Other pit fruit	1	100.0	0.0	0	0
Ackees, lychees, longans	8	87.5	12.5	0	1
Bananas, plantains	24	58.3	0.0	0	0
Breadfruit, jackfruit	6	100.0	0.0	0	0
Figs	15	86.7	0.0	0	0
Guavas	8	87.5	12.5	0	1
Kiwi fruit	5	60.0	0.0	0	0
Mangoes	48	87.5	2.1	0	1
Papaya	48	52.1	18.8	0	9
Pineapple	23	47.8	4.3	0	1
Pepinos	2	50.0	0.0	0	0
Other sub-tropical fruit	21	66.7	19.0	0	4
Bitter melon	8	62.5	0.0	0	0
Cantaloupe	8	62.5	12.5	0	1
Honeydew	3	100.0	0.0	0	0
Watermelon	8	87.5	0.0	0	0
Other melons/vine fruit	3	66.7	0.0	0	0
Pomegranate	0	0.0	0.0	0	0
Mixed fruits	3	33.3	0.0	0	0
Berry juice	14	71.4	7.1	0	1
Citrus juice	16	81.3	0.0	0	0

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Violative Samples And Types: Over Tolerance (#)	Violative Samples And Types: No Tolerance (#)
Apple juice	20	90.0	0.0	0	0
Pear juice	8	75.0	0.0	0	0
Stone fruit juice	11	90.9	0.0	0	0
Subtropical juice/milk/nectar	37	97.3	0.0	0	0
Mixed fruit juice	9	77.8	0.0	0	0
Pomegranate juice	6	100.0	0.0	0	0
Other fruit juices	6	100.0	0.0	0	0
Berry fruit jams, jellies, preserves, syrups, toppings	41	82.9	4.9	0	2
Citrus fruit jams, jellies, preserves, syrups, toppings	2	100.0	0.0	0	0
Core fruit jams, jellies, preserves, syrups, toppings	7	71.4	14.3	0	1
Pit fruit jams, jellies, preserves, syrups, toppings	14	92.9	0.0	0	0
Subtropical/tropical fruit jams, jellies, preserves, syrups, toppings	2	100.0	0.0	0	0
Other fruit jams, jellies, preserves, syrups, toppings	18	72.2	11.1	0	2
Other fruits and fruit products	33	72.7	15.2	0	5
Subtotal	**1117**	**69.4**	**5.0**	**2**	**53**
Vegetables					
Corn	44	97.7	0.0	0	0
Peas (green/snow/sweet)	101	77.2	4.0	1	3
Sugar snap peas	34	85.3	5.9	0	2
String beans (green/snap/pole)	133	65.4	2.3	0	3
Garbanzo beans	30	96.7	0.0	0	0
Kidney beans	57	98.2	0.0	0	0
Mung beans	53	92.5	0.0	0	0
Soybeans	96	82.3	3.1	1	2
Bean sprouts and seeds	8	75.0	0.0	0	0
Other beans & pea products	152	85.5	2.0	0	3
Peppers, hot	341	54.0	10.0	0	34
Peppers, pimiento	7	14.3	28.6	1	1
Peppers, sweet	112	51.8	6.3	0	7
Tomatoes/tomatillos	158	64.6	3.8	2	4
Eggplant	30	80.0	3.3	0	1
Okra	30	80.0	16.7	0	5

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types		
			Samples (%)	Over Tolerance (#)	No Tolerance (#)
Other fruiting vegetables	0	0.0	0.0	0	0
Cucumbers	139	46.0	2.9	0	4
Pumpkins	5	40.0	0.0	0	0
Squash	123	61.8	3.3	1	4
Choyote	12	83.3	0.0	0	0
Other cucurbit vegetables	2	100.0	0.0	0	0
Artichokes	7	85.7	14.3	1	1
Asparagus	68	91.2	1.5	1	0
Bamboo shoots	4	75.0	0.0	0	0
Bok choy & Chinese cabbage	6	50.0	0.0	0	0
Broccoli	63	76.2	3.2	1	1
Brussels sprouts	28	53.6	3.6	0	1
Cabbage	14	85.7	0.0	0	0
Cauliflower	14	92.9	0.0	0	0
Celery	16	50.0	0.0	0	0
Cilantro	16	12.5	6.3	0	1
Collards	2	0.0	0.0	0	0
Kale	14	14.3	7.1	0	1
Lettuce, head	12	75.0	0.0	0	0
Lettuce, leaf	22	54.5	0.0	0	0
Mustard greens	6	100.0	0.0	0	0
Spinach	37	54.1	18.9	0	7
Endive	0	0.0	0.0	0	0
Swiss Chard	7	14.3	28.6	0	2
Watercress	0	0.0	0.0	0	0
Other leaf & stem vegetables	137	65.7	10.2	0	14
Carrots	45	73.3	2.2	0	1
Cassava	12	100.0	0.0	0	0
Garlic	11	81.8	9.1	0	1
Ginger	20	85.0	0.0	0	0
Leeks	21	57.1	9.5	0	2
Onions	28	92.9	0.0	0	0
Potatoes	40	45.0	5.0	1	1
Radishes	40	35.0	0.0	0	0
Red beets	24	62.5	12.5	0	3
Scallions & shallots	144	70.1	0.7	0	1
Sweet potatoes	17	76.5	11.8	1	1
Taro/dasheen	11	90.9	0.0	0	0

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Over Tolerance (#)	No Tolerance (#)
Turnips	5	80.0	0.0	0	0
Water chestnuts	7	85.7	0.0	0	0
Parsnips	3	33.3	0.0	0	0
Other root & tuber vegetables	19	84.2	0.0	0	0
Mushrooms/truffles/fungi	24	83.3	4.2	0	1
Vegetables, other, mixed	117	78.6	4.3	0	5
Vegetable juice/drinks	12	100.0	0.0	0	0
Vegetables with sauce	20	65.0	0.0	0	0
Vegetables, breaded	2	50.0	0.0	0	0
Subtotal	**2762**	**68.4**	**4.5**	**11**	**117**
Other					
Cashews	33	87.9	6.1	0	2
Coconut & coconut products	4	100.0	0.0	0	0
Peanuts & peanut product	37	94.6	0.0	0	0
Pecans	24	95.8	0.0	0	0
Pistachios	4	75.0	0.0	0	0
Almonds	7	100.0	0.0	0	0
Other nuts & nut products	13	92.3	7.7	0	1
Pumpkin seeds	13	92.3	0.0	0	0
Sesame seeds	19	94.7	5.3	0	1
Sesame paste (tahina)	3	66.7	0.0	0	0
Soybeans, edible	9	77.8	0.0	0	0
Sunflower seeds	5	80.0	0.0	0	0
Other edible seeds & seed products	18	88.9	0.0	0	0
Vegetable oil, crude	6	100.0	0.0	0	0
Vegetable oil, refined	23	78.3	4.3	0	1
Oil seed stock	1	100.0	0.0	0	0
Other vegetable oil products	2	100.0	0.0	0	0
Basil	19	36.8	47.4	1	8
Capsicums	38	57.9	23.7	1	8
Paprika	8	12.5	37.5	0	3
Spices, other	62	87.1	8.1	0	5
Pepper sauce	19	78.9	5.3	0	1
Water & ice	5	100.0	0.0	0	0
Beverage and beverage bases	25	88.0	0.0	0	0
Beer	0	0.0	0.0	0	0
Coffee	6	100.0	0.0	0	0

Commodity Group	Samples Analyzed (#)	Without Residues (%)	Violative Samples And Types: Samples (%)	Over Tolerance (#)	No Tolerance (#)
Tea	21	81.0	9.5	0	2
Coffee/tea substitutes	5	80.0	20.0	0	1
Astragalus, dietary supplement	6	100.0	0.0	0	0
Enchinacea, dietary supplement	5	80.0	20.0	0	1
Ginseng, dietary supplement/tea	2	50.0	0.0	0	0
Kava, dietary supplement/tea	1	100.0	0.0	0	0
Senna, dietary supplement/tea	1	0.0	0.0	0	0
Other botanical/herbal teas	41	82.9	9.8	0	4
Other botanical/herbal dietary supplements, not teas	123	74.0	14.6	0	18
Other dietary supplements, not botanicals/herbals or teas	30	96.7	0.0	0	0
Honey & honey products	18	100.0	0.0	0	0
Food sweeteners, not honey	20	100.0	0.0	0	0
Candy, confections, chocolate, cocoa products	16	93.8	0.0	0	0
Condiments & dressings	1	100.0	0.0	0	0
Flavorings and extracts	7	100.0	0.0	0	0
Multi-ingredient foods (dinners, sauces, specialties)	41	87.8	0.0	0	0
Baby foods/formula	1	100.0	0.0	0	0
Food additives/colors	0	0.0	0.0	0	0
Other food products	12	66.7	0.0	0	0
Feed/animal byproducts	4	100.0	0.0	0	0
Other nonfood items	7	100.0	0.0	0	0
Subtotal	**766**	**83.0**	**7.6**	**2**	**56**
Totals - All Import Samples	**5086**	**72.3**	**4.9**	**17**	**233**

[a] Whole food commodities include dried, paste, pulp, and puree forms, as well as foods similarly classified by EPA for residue tolerance enforcement, e.g., eggplant includes Chinese/Thai eggplant; radishes include daikon or Chinese/Oriental radishes.

Note: "Over-tolerance" violations include residue findings that exceeded tolerances for pesticides approved for use in establishments where food products are held, processed, or prepared.