Food and Drug Administration
Pesticide Program

Residue Monitoring 1996

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This is the tenth annual report summarizing the results of the Food and Drug Administration's (FDA) pesticide residue monitoring program. The nine previous reports, eight of which were published in the *Journal of the Association of Official Analytical Chemists/Journal of AOAC International*, presented results from Fiscal Years (FY) 1987 through 1994, and the ninth, which was published on FDA's World Wide Web site, presented the results from FY 1995. This current report includes findings obtained during FY1996 (October 1, 1995 through September 30, 1996) under regulatory and incidence/level monitoring. Selected Total Diet Study findings for 1996 are also presented. Results in this and earlier reports continue to demonstrate that levels of pesticide residues in the U.S. food supply are well below established safety standards.

FDA Monitoring Program

Three federal government agencies share responsibility for the regulation of pesticides (1). The Environmental Protection Agency (EPA) registers (i.e., approves) the use of pesticides and sets tolerances (the maximum amount of a residue that is permitted in or on a food) if use of that particular pesticide may result in residues in or on food (2). 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 imported foods and in domestically produced foods shipped in interstate commerce. FDA also acquires incidence/level data on particular commodity/pesticide combinations and carries out its market basket survey, the Total Diet Study. For six years, USDA's Agricultural Marketing Service (AMS), through contracts with participating states, has carried out a residue testing program directed primarily at raw agricultural products. FSIS and AMS report their pesticide residue data independently.

Regulatory Monitoring

Under this approach to pesticide residue monitoring, FDA samples individual lots of domestically produced and imported foods and analyzes them for pesticide residues to enforce the tolerances set by EPA. Domestic samples are collected as close as possible to the point of production in the distribution system; import samples are collected at the point of entry into U.S. commerce. Emphasis is on the raw agricultural product, which is analyzed as the unwashed, whole (unpeeled), raw commodity. Processed foods are also included. If illegal residues (above EPA tolerance or no tolerance for that particular food/pesticide combination) are found in domestic samples, FDA can invoke various sanctions, such as a seizure or injunction. For imports, shipments may be stopped at the port of entry when illegal residues are found. "Detention without physical examination" (previously called automatic detention) may be invoked for imports based on the finding of one violative shipment if there is reason to believe that the same situation will exist in future lots during the same shipping season for a specific shipper, grower, geographic area, or country.

Domestic and import food samples collected are classified as either "surveillance" or "compliance". Most samples collected by FDA are the surveillance type; that is, there is no prior knowledge or evidence that a specific food shipment contains illegal pesticide residues. Compliance samples are taken as follow-up to the finding of an illegal residue or when other evidence indicates that a pesticide residue problem may exist.

Factors considered by FDA in planning the types and numbers of samples to collect include review of recently generated state and FDA residue data, regional intelligence on pesticide use, dietary importance of the food, information on the amount of domestic food that enters interstate commerce and of imported food, chemical characteristics and toxicity of the pesticide, and production volume/pesticide usage patterns.

Analytical Methods

To analyze the large numbers of samples whose pesticide treatment history is usually unknown, FDA uses analytical methods capable of simultaneously determining a number of pesticide residues. These multiresidue methods (MRMs) can determine about half 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 (3).

Single residue methods (SRMs) or selective MRMs are used to determine some pesticide residues in foods (3). An SRM usually determines one pesticide; a selective MRM measures a relatively small number of chemically related pesticides. These types of methods are usually more resource-intensive per residue. Therefore, they are much less cost effective than MRMs.

The lower limit of residue measurement in FDA's determination of a specific pesticide is usually well below tolerance levels, which 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. In this report, the term "trace" is used to indicate residues detected, but at levels below the limit of quantitation (LQ).

FDA/State Cooperation

Personnel in FDA field offices interact with their counterparts in many states to increase FDA's effectiveness in pesticide residue monitoring. In many cases, Memoranda of Understanding or more formal Partnership Agreements have been established between FDA and various state agencies. These agreements provide for more efficient monitoring by broadening coverage and eliminating duplication of effort, thereby maximizing federal and state resources allocated for pesticide activities. These arrangements vary from data sharing, joint planning, and state collection of samples for FDA examination, to FDA/State division of collection, analytical, and enforcement follow-up responsibilities for individual commodities or products of particular origin (i.e., imported vs. domestic products).

FDA also acquires and uses state-generated pesticide residue data to complement its own and other federally sponsored residue programs. Through 1996, FDA supported a contract with Mississippi State University (MSU) for the "Foodcontam" database, a compilation of state-collected residue data.

Animal Feeds

In addition to monitoring foods for human consumption, FDA also samples and analyzes domestic and imported 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.), the major focus of CVM's monitoring is on feeds for livestock and poultry, animals that ultimately become, or produce, foods for human consumption.

International Activities

FDA participates in several international agreements in an effort to minimize incidents of violative residues and remove trade barriers. A standing request for information from foreign governments on pesticides used on their food exported to the U.S. exists, a provision of the Pesticide Monitoring Improvements Act. FDA annually supplies foreign countries with reports on FDA's regulatory monitoring coverage and the findings in foods imported from their respective countries, as well as a personal computer database in which coverage and findings are summarized by country/commodity/pesticide combination.

Under the auspices of the North American Free Trade Agreement (NAFTA), the United States, Mexico, and Canada have established a NAFTA Technical Working Group on Pesticides (TWG). The NAFTA Pesticide

TWG now serves as the focal point for all pesticide issues that arise among the three NAFTA countries. The TWG reports directly to the NAFTA Sanitary and Phytosanitary Committee.

One of the major goals of the TWG is to ensure that pesticide registrations and tolerances/maximum residue limits in the three countries are harmonized to the extent practical, while strengthening protection of public health and the environment. A number of projects have been undertaken by the TWG to identify differing residue limits in the NAFTA countries and to determine what steps might be taken to harmonize the limits. While this is a difficult process, the TWG envisions eventual movement toward a "North America" pesticide registration and tolerance system so that citizens of all three countries can be assured of the safety and legality of foods produced in any one of the NAFTA countries. FDA's activities on the TWG complement its ongoing bilateral cooperation with its counterparts in Mexico and Canada.

Beyond the North American agreements, FDA continues to collaborate with New Zealand to implement a "residue compliance assurance program." New Zealand, historically having excellent compliance with U.S. pesticide tolerances, is implementing a plan whereby their government would provide assurances that selected commodities exported to the United States would be in full compliance with U.S. tolerances.

Incidence/Level Monitoring

A complementary approach to regulatory monitoring, incidence/level monitoring is used to increase FDA's knowledge about particular pesticide/commodity combinations by analyzing certain foods to determine the presence and levels of selected pesticides. In 1996, a survey of triazine herbicides in various commodities, which had been initiated in 1995, was completed.

Results of the statistically based monitoring survey for fresh apples and processed rice, which was initiated in 1994, has been published (4). This is the second of two FDA surveys of this type; the first covered domestic and imported pears and tomatoes (5). These statistically based surveys were initiated to determine whether FDA data acquired under regulatory monitoring are statistically representative of the overall residue situation for a particular pesticide, commodity, or place of origin. In FDA's surveillance sampling for pesticide residues, sampling bias may occur by weighting sampling toward such factors as commodity or place of origin with a past history of violations or large volume of import shipments. In addition, the total number of samples of a given commodity analyzed for a particular pesticide each year may not be sufficient to draw specific conclusions about the residue situation for the whole volume of that commodity in commerce. Therefore, the objective of these statistically based surveys is to determine whether violation rates, frequency of occurrence of residues, and residue levels obtained from such a sampling regimen differ from those obtained through FDA's traditional surveillance approach.

Total Diet Study

The Total Diet Study is another major element of FDA's pesticide residue monitoring program (6). In its previous annual pesticide reports, FDA provided Total Diet Study findings for 1987-1995 (7a, 7b). More detailed information, including estimated dietary intakes of pesticide residues covering June 1984-April 1986 (8) and July 1986-April 1991 (9), has been published. In September 1991, FDA implemented revisions to the Total Diet Study that were formulated in 1990 (10). These revisions primarily consisted of collection and analysis of an updated and expanded number (to 261) of food items, addition of six age/sex groups (for a total of 14), and revised analytical coverage. Details of that revision are published (11, 12).

In conducting the Total Diet Study, FDA personnel purchase foods from supermarkets or grocery stores four times per year, once from each of four geographic regions of the country. The 261 foods that comprise each market basket represent over 3500 different foods reported in USDA food consumption surveys; for example, apple pie represents all fruit pies and fruit pastries. Each collection is a composite of like foods purchased in three cities in a given region. The foods are prepared table-ready and then analyzed for pesticide residues (as well as radionuclides, industrial chemicals, toxic elements, trace and macro elements, vitamin B6, and folic acid). The levels of pesticides found are used in conjunction with USDA food consumption data to estimate the dietary intakes of the pesticide residues.

Results and Discussion

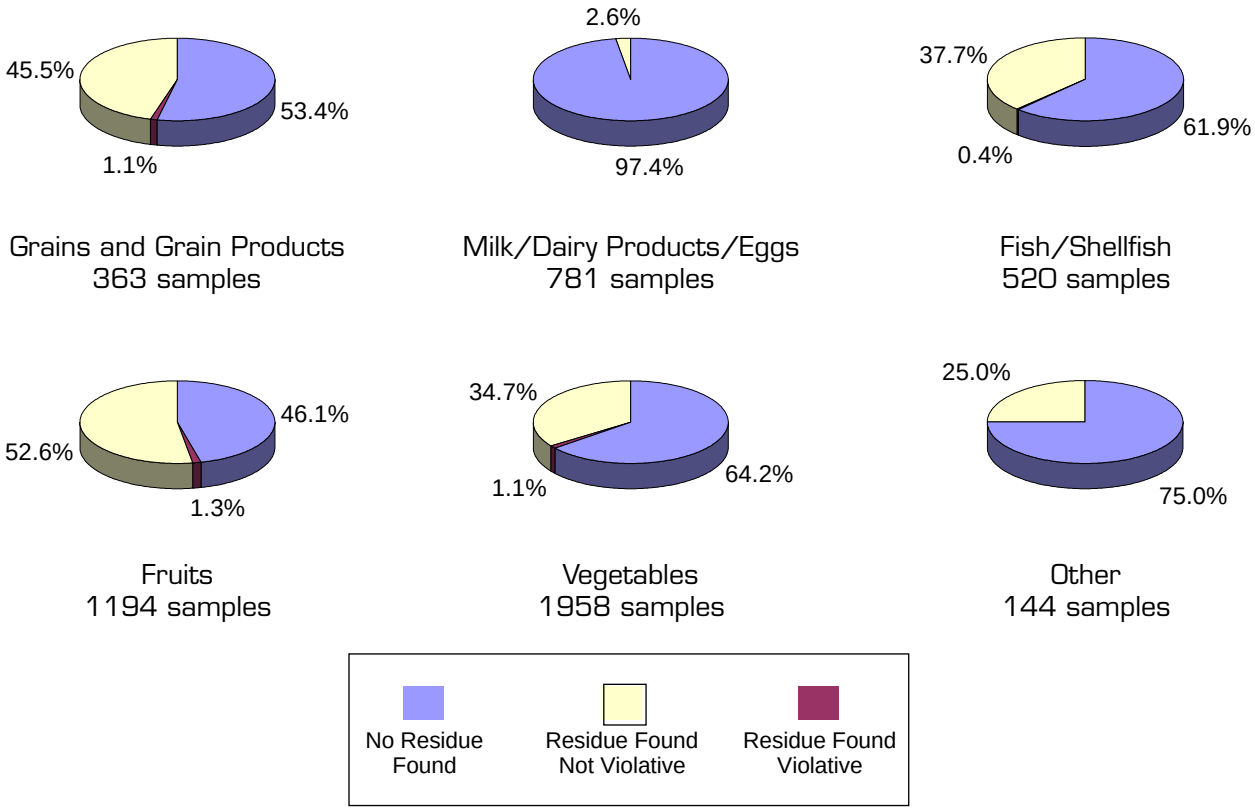
Regulatory Monitoring

In 1996, 10,374 samples (9,881 surveillance and 493 compliance) were analyzed under regulatory monitoring. Of these, 5,062 were domestic and 5,312 were imports.

Figure 1 shows the percentage of the 4960 domestic surveillance samples by commodity group with no residues found, nonviolative residues found, and violative residues found. (A violative residue is defined in this report as a residue which exceeds a tolerance or a residue at a level of regulatory significance for which no tolerance has been established in the sampled food.) As in earlier years, fruits and vegetables accounted for the largest proportion of the commodities analyzed in 1996; those two commodity groups comprised 63.5% of the total number of domestic surveillance samples. In 1996, no violative residues were found in more than 99% of all domestic surveillance samples (a similar percentage to those of the past several years).

Appendix A contains more detailed data on domestic surveillance monitoring findings by commodity, including the total number of samples analyzed, the percent samples with no residues found, and the percent violative samples. Of the 4960 domestic surveillance samples, 64.4% had no detectable residues and less than 1% had violative residues. In the largest commodity groups, fruits and vegetables, 46.1% and 64.2% of the samples, respectively, had no residues detected. 1.3% of the fruit samples and 1.1% of the vegetable samples contained violative residues (Figure 1). In the milk/dairy products/eggs group, 97.4% of the samples had no residues detected, and no violative residues were found. Forty-four samples of baby foods/formula were analyzed (see category Other). This included 28 vegetable, 10 cereal, 2 fruit juice, and 4 formula samples. None of the samples had violative residues.

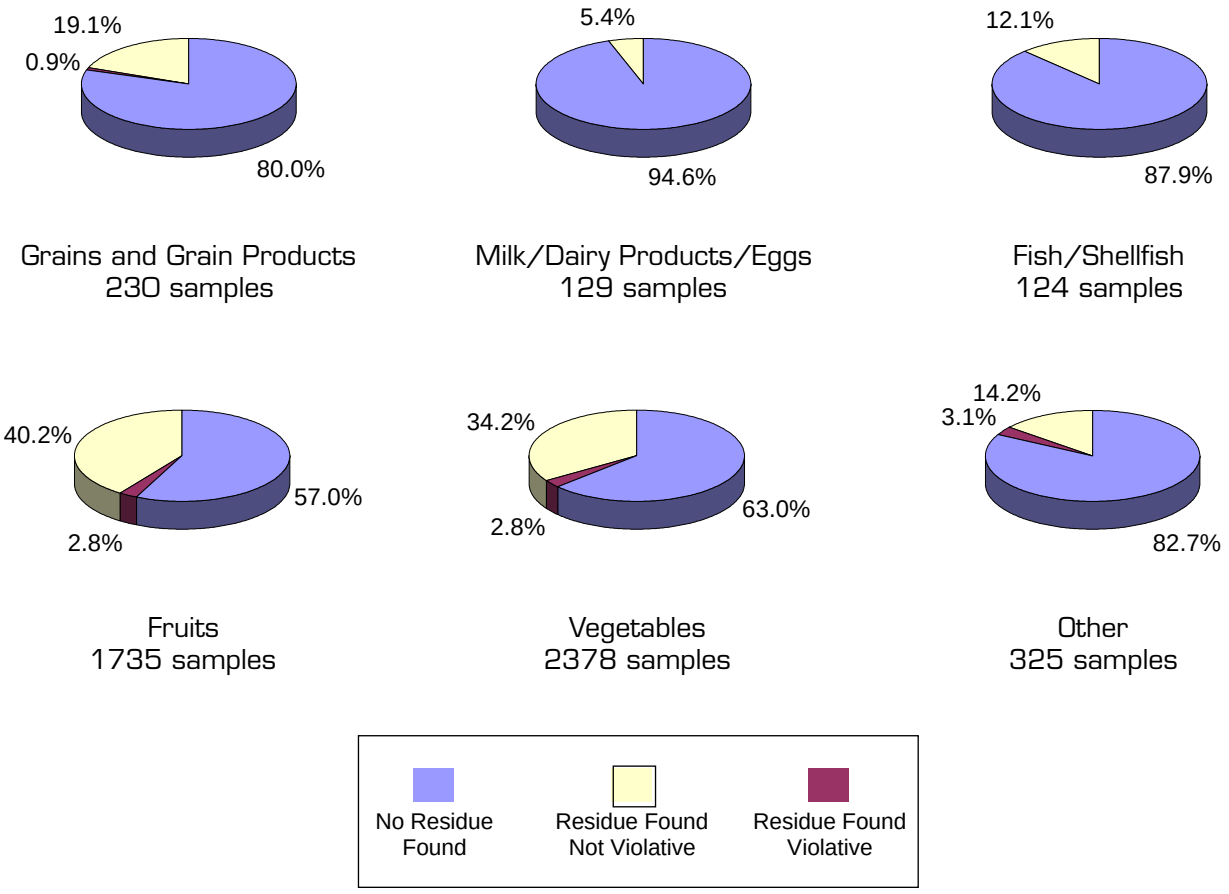
Figure 1. Summary of Results of Domestic Surveillance Samples by Commodity



Findings by commodity group for the 4921 import surveillance samples are shown in Figure 2. Fruits and vegetables accounted for 83.6% of these samples. Overall, no violative residues were found in 97.4% of the import surveillance samples (96.5% in 1994 and 96.8% in 1995).

Appendix B contains detailed data on the import surveillance samples. Of the 4921 samples analyzed, 64.4% had no residues detected, and less than 3% violative residues. Fruits and vegetables had 57.0 and 63.0%, respectively, with no residues detected. The fruit group and the vegetable group had less than 3% each with violative residues. No residues were found in 94.6% of the dairy products/eggs group and 87.9% of the fish/shellfish group, and no violative residues were found in either of those groups.

Figure 2. Summary of Results of Import Surveillance Samples by Commodity



Pesticide monitoring data collected under FDA's regulatory monitoring approach in 1996 are available to the public as a computer database. This database summarizes FDA 1996 regulatory monitoring coverage and findings by country/commodity/pesticide combination. The database also includes the 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, 1993, 1994, and 1995 is provided at the end of this report.

Geographic Coverage

Domestic. In 1996, domestic surveillance samples were collected from all 50 states, the District of Columbia, Puerto Rico and American Samoa. The largest numbers of samples were collected from the states in which agriculture is a major industry.

Import. Samples representing food shipments from 91 countries were collected. (Origin of some additional samples was unspecified.) Table 1 lists numbers of samples (surveillance and compliance) collected from each country. Mexico, as usual, was the source of the largest number of samples, reflecting the volume and diversity of commodities imported from that country, especially during the winter months.

Table 1. Foreign Countries and Number of Samples[a] Collected and Analyzed in 1996

Mexico	1752	Taiwan (Formosa)	44
Chile	409	Philippines	42
Canada	329	Unspecified	37
Netherlands (Holland)	238	Japan	36
Guatemala	186	France	35
Thailand	175	Argentina	30
China, Peoples Rep.	172	Australia	29
Italy	164	Brazil	27
Costa Rica	141	Jamaica	27
India	123	Hong Kong	24
Spain (inc. Canary Islands)	123	Germany, Federal Rep	22
Dominican Republic	107	United Kingdom	21
Ecuador	91	Lebanon	20
Peru	79	South Africa	20
Israel	70	Poland	18
Colombia	67	Venezuela	18
Panama	67	Morocco	17
Turkey	59	El Salvador	15
Indonesia	51	Pakistan	15
Greece	49	Nicaragua	13
Korea, Rep. Of (South Korea)	49	Denmark	12
Honduras	47	Trinidad & Tobago	11
Belgium	44	Viet-Nam, Rep. Of	11
New Zealand	44		

Ten or fewer samples collected from the following:

Afghanistan	Ghana	Nigeria	Sweden
Algeria	Grenada	Norway	Switzerland
Austria	Guyana	Oman	United Arab Emirates
Bahamas	Haiti	Papua New Guinea	Uruguay
Belize	Hungary	Portugal (inc. Azores)	Yugoslavia
Bermuda	Ireland	Russia	Zambia
Bolivia	Ivory Coast	Saudi Arabia	
Br. Virgin Is.	Kenya	Sierra Leone	
Bulgaria	Korea, Dem. Peoples	Singapore	
Czech Republic	Malagasy Rep.	Slovenia	
Egypt	Malawi	Sri Lanka (Ceylon)	
Fiji	Malaysia	St. Lucia	
Finland	Moldova	Surinam	

[a] Surveillance plus compliance samples.

Surveillance/Compliance Violation Rate Comparison

In 1996, 102 domestic and 391 import compliance samples were collected and analyzed (Table 2). Because compliance samples are collected when a pesticide residue problem is known or suspected, violation rates are expectedly higher than those for surveillance samples: 7.8% for domestic (12% in 1995) and 11.5% for imports (11% in 1995). The corresponding violation rates for surveillance samples were 0.9% for domestic and 2.6% for imports.

Most of the 1996 compliance samples were collected as follow-up to violative surveillance samples. These included follow-up samples from the same shipment as the violative surveillance sample, follow-up samples of the same commodity from the same grower or shipper, and audit samples from shipments presented for entry into the United States with a certificate of analysis (i.e., shipments subject to detention without physical examination).

Table 2. Compliance Samples by Commodity Group in 1996

Commodity Group	Total No. of Samples	Samples without Residues, %	Samples Violative, %
Domestic			
Grains and Grain Products	6	50.0	0.0
Milk/Dairy Products/Eggs	6	100.0	0.0
Fish/Shellfish	8	62.5	0.0
Fruits	33	30.3	12.1
Vegetables	41	43.9	9.8
Other	8	100.0	0.0
Total	**102**	**49.0**	**7.8**
Import			
Grains and Grain Products	74	59.5	0.0
Milk/Dairy Products/Eggs	4	75.0	0.0
Fish/Shellfish	9	88.9	0.0
Fruits	118	57.6	22.0
Vegetables	128	57.8	14.1
Other	58	87.9	1.7
Total	**391**	**63.4**	**11.5**

Pesticide Coverage

Table 3 lists the 397 pesticides that were detectable by the methods used; the 92 pesticides that were actually found are indicated.

FDA conducts ongoing research to expand the pesticide coverage of its monitoring program. This research includes testing the behavior of new or previously untested pesticides through existing analytical methods, and development of new methods to cover pesticides that cannot be determined by methods currently used by FDA. The research encompasses both U.S.-registered pesticides and foreign-use pesticides that are not registered in the United States. The list of pesticides detectable for 1996 (Table 3) reflects the addition of a number of pesticides whose recovery through the analytical methods used was demonstrated as a result of ongoing research.

Table 3. Pesticides Detectable and Found (*) by Methods Used in 1996 Regulatory Monitoring[a,b]

Acephate*
Acetochlor
Acrinathrin
Alachlor
Aldicarb*
Aldrin
Allethrin
Allidochlor
Alpha-cypermethrin
Ametryn
Aminocarb
Amitraz
Anilazine
Aramite
Atrazine
Azinphos-ethyl
Azinphos-methyl*
Bendiocarb
Benfluralin
Benodanil
Benomyl/carbendazim[c]
Benoxacor
Bensulide
Benzoylprop-ethyl
6-Benzyladenine
BHC*
Bifenox
Bifenthrin*
Binapacryl
S-Bioallethrin
Biphenyl*
Bitertanol*
Bromacil
Bromophos
Bromophos-ethyl
Bromopropylate
Bromoxynil
Bufencarb
Bulan
Bupirimate
Butachlor
Butralin
Butylate
Cadusafos
Captafol*
Captan*
Carbaryl*
Carbofuran*
Carbophenothion
Carbosulfan
Carboxin
Chlorbenside
Chlorbromuron
Chlorbufam
Chlordane*
Chlordecone
Chlordimeform*
Chlorethoxyfos
Chlorfenapyr
Chlorfenvinphos
Chlorflurecol methyl ester
Chlorimuron ethyl ester
Chlornitrofen
Chlorobenzilate
3-Chloro-5-methyl-4-nitro-1H-pyrazole
Chloroneb
Chloropicrin*
Chloropropylate
Chlorothalonil*
Chloroxuron
Chlorpropham*
Chlorpyrifos*
Chlorpyrifos-methyl*
Chlorthiophos
Clomazone
Coumaphos
Crotoxyphos
Crufomate
Cyanazine
Cyanofenphos
Cyanophos
Cycloate
Cycluron
Cyfluthrin
Cymoxanil
Cypermethrin*
Cyprazine
Cyproconazole
DCPA*
DDT*
Deltamethrin
Deltamethrin, trans
Demeton*
Desmetryn
Dialifor
Di-allate
N,N-Diallyl-dichloro=acetamide
Diazinon*
Dichlobenil
Dichlofenthion
Dichlofluanid
Dichlone
4-(Dichloroacetyl)-1-oxa-4-azapiro[4.5]decane
2,6-Dichlorobenzamide
Dichlorvos*
Diclobutrazol
Diclofop-methyl
Dicloran*
Dicofol*
Dicrotophos
Dieldrin*
Diethatyl-ethyl
Dilan
Dimethachlor
Dimethametryn
Dimethipin
Dimethoate*
Dinitramine
Dinobuton
Dinocap
Dioxabenzofos
Dioxacarb
Dioxathion
Diphenamid
Diphenylamine*
Dipropetryn
Disulfoton
Diuron
Edifenphos
Endosulfan*
Endrin*
EPN*
Esfenvalerate*
Etaconazole
Ethalfluralin
Ethephon
Ethiofencarb
Ethion*
Ethofumesate
Ethoprop
Ethoxyquin*
Ethylenebisdithio=carbamates*[d]
Etridiazole
Etrimfos
Famphur
Fenamiphos
Fenarimol
Fenbuconazole
Fenfuram
Fenitrothion*
Fenoxaprop ethyl ester
Fenoxycarb
Fenpropathrin*
Fenpropimorph
Fenson
Fensulfothion
Fenthion
Fenvalerate*
Fipronil
Flamprop-M-isopropyl
Flamprop-methyl
Fluazifop butyl ester
Fluchloralin

[a] The list of pesticides detectable is expressed in terms of the parent pesticide. However, monitoring coverage and findings may have included metabolites, impurities, and alteration products.
[b] Some of these pesticides are no longer manufactured or registered for use in the United States.
[c] The analytical methodology determines carbendazim, which may result from use of benomyl or carbendazim.
[d] Such as maneb.

Table 3 (continued)

Flucythrinate
Flusilazole
Fluvalinate
Folpet*
Fonofos*
Formothion
Fosthiazate
Fuberidazole
Furilazole
Gardona
Heptachlor*
Heptenophos
Hexachlorobenzene*
Hexaconazole*
Hexazinone
Hexythiazox
Imazalil*
Imazamethabenz methyl ester
Iprobenfos
Iprodione*
Iprodione metabolite isomer*
Isazofos
Isocarbamid
Isofenphos
Isoprocarb
Isopropalin
Isoprothiolane
Isoxaben
Isoxaflutole
Lactofen
Lambda-cyhalothrin
Lenacil
Leptophos
Lindane*
Linuron*
Malathion*
Mecarbam*
Mephosfolan
Merphos
Metalaxyl*
Metaldehyde*
Metasystox thiol
Metazachlor
Methabenzthiazuron
Methamidophos*
Methidathion*
Methiocarb*
Methomyl*
Methoprotryne
Methoxychlor*
2-Methoxy-5,6-trichloropyridine
Metobromuron
Metolachlor
Metolcarb
Metribuzin
Mevinphos*
Mirex
Monocrotophos*
Monolinuron
Monuron
Myclobutanil*
Naled*
Napropamide
Neburon
Nitralin
Nitrapyrin
Nitrofen
Nitrofluorfen
Nitrothal-isopropyl
Norea
Norflurazon
Nuarimol
Octhilinone
Ofurace
Omethoate*
Ovex
Oxadiazon
Oxadixyl
Oxamyl*
Oxydemeton-methyl
Oxyfluorfen
Oxythioquinox
Paclobutrazol
Paraquat*
Parathion*
Parathion-methyl*
Pebulate
Penconazole
Pendimethalin
Pentachlorobenzene*
Pentachlorobenzonitrile
Pentachlorophenyl methyl ether*
Permethrin*
Perthane
Phenothrin
Phenthoate*
Phenylphenol, ortho-*
Phorate*
Phosalone*
Phosmet*
Phosphamidon*
Phoxim oxygen analog
Piperonyl butoxide*
Piperophos
Pirimicarb
Pirimiphos-ethyl
Pirimiphos-methyl*
Pretilachlor
Probenazole
Prochloraz
Procyazine
Procymidone*
Prodiamine
Profenofos*
Profluralin
Prolan
Promecarb
Prometryn
Pronamide
Propachlor
Propanil
Propargite*
Propazine
Propetamphos
Propham
Propiconazole
Propoxur
Prothiofos
Prothoate
Pyracarbolid
Pyrazon
Pyrazophos*
Pyrethrins
Pyridaphenthion
Pyrimethanil
Quinalphos*
Quintozene*
Quizalofop ethyl ester
Ronnel
Schradan
Secbumeton
Simazine*
Simetryn
Strobane
Sulfallate
Sulfotep
Sulphenone
Sulprofos
TCMTB
Tebuconazole
Tebupirimfos
Tecnazene
TEPP
Terbacil
Terbufos
Terbumeton
Terbuthylazine
Terbutryn
Tetradifon
Tetraiodoethylene
Tetrasul
Thiabendazole*
Thiazopyr
Thiodicarb
Thiometon
Thionazin
Thiophanate-methyl
THPI*
Tolylfluanid
Toxaphene
Tralomethrin
Traloxydim
Triadimefon*
Triadimenol*
Tri-allate
Triazamate
Triazophos
Tribufos*
Trichlorfon
Tricyclazole
Tridiphane
Trietazine
Triflumizole
Trifluralin*
Triflusulfuron methyl ester
Trimethacarb
Vamidothion sulfone
Vernolate
Vinclozolin*
XMC

Foodcontam Data

In 1996, 10 states contributed data to the Foodcontam program. Wisconsin, which had participated during 1995, did not participate in 1996, resulting in one fewer state. These 10 states submitted data on 6,520 samples from their regulatory food quality programs, down 3,955 compared to the number in 1995. Table 4 lists the 10 states, the number of samples for each, and the number and percentage of samples with positive and "significant" findings. In this program, a significant finding indicates a residue that exceeds federal or state regulatory limits, is not covered by a tolerance for the particular chemical/commodity combination, or denotes some unusual finding(s). For the 6,520 samples reported, 1.9% (126 samples) contained significant residues.

The 1996 Foodcontam report was the final one. The contract under which FDA has supported the data compilation for 10 years has been completed and will not continue in the future.

Table 4. Summary of Foodcontam Findings for 1996

State	Total # Samples	# Positive	% Positive	# Significant	% Significant
Arkansas	277	10	3.6	0	0.0
California	3210	1008	31.4	39	1.2
Florida	634	223	35.2	67	10.6
Georgia	534	111	20.8	6	1.1
Indiana	142	112	78.9	0	0.0
North Carolina	321	106	33.0	5	1.6
New York	416	6	1.4	2	0.5
Oregon	178	6	3.4	1	0.6
Pennsylvania	534	97	18.2	4	0.7
Virginia	274	23	8.4	2	0.7
Total	**6520**	**1702**	**26.1**	**126**	**1.9**

Animal Feeds

In 1996, FDA collected and analyzed 513 domestic feed samples (506 surveillance, 7 compliance) and 86 import feed samples (76 surveillance, 10 compliance) for pesticides. Of the 506 domestic surveillance samples, 308 (60.9%) had no pesticide residues detected and 5 (1.0%) contained violative residues (Table 5). The latter involved two samples with pirimiphos-methyl and one sample each with dieldrin, chlorpyrifos, and chlorpyrifos-methyl. Of 76 import surveillance samples, 57 (75.0%) had no pesticide residues detected and 4 (5.3%) contained violative residues of chlorpyrifos, malathion, and/or captan.

Table 5. Summary of 1996 Domestic Surveillance Feed Samples

Type of Feed	Total. # Samples	Without residues #	Without residues %	Violative Samples #	Violative Samples %
Whole/ground grains	207	133	64.3	2	1.0
Animal by-products	94	63	67.0	0	0.0
Plant by-products	89	54	60.7	3	3.4
Mixed feed rations	77	23	29.9	0	0.0
Hay & hay products	39	35	89.7	0	0.0
Total	**506**	**308**	**60.9**	**5**	**1.0**

In the 198 domestic surveillance feed samples in which one or more pesticides were detected, a total of 290 residues were detected (221 quantifiable and 69 trace). Malathion, chlorpyrifos-methyl, diazinon, chlorpyrifos, and pirimiphos-methyl were the most frequently found and accounted for 90.0% of all residues detected. The findings in samples with quantifiable residues are displayed in Table 6.

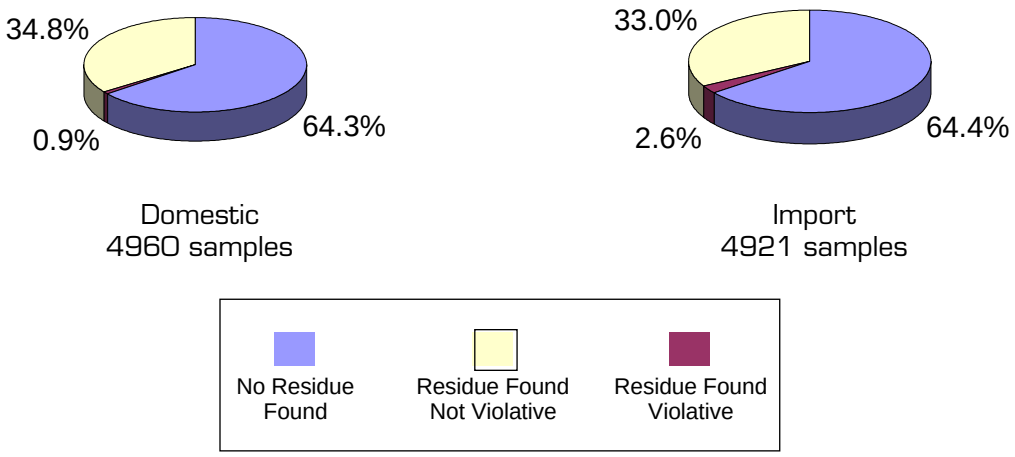
Table 6. Residues Most Frequently Found in Feeds

Pesticide	No. of Samples with Quantifiable Residues	Residue Found, ppm Range	Median
malathion	115	0.010-5.22	0.100
chlorpyrifos-methyl	38	0.010-0.909	0.044
diazinon	19	0.010-0.447	0.033
chlorpyrifos	17	0.010-3.40	0.059
pirimiphos-methyl	9	0.014-2.16	0.070
all others	23	0.007-2.50	0.043

Summary: Regulatory Monitoring

In summary, no residues were found in over 64% of both domestic and import surveillance samples (Figure 3) analyzed under FDA's regulatory monitoring approach in 1996. Less than 1% of domestic and less than 3% of import surveillance samples had residue levels that were violative. The findings for 1996 demonstrate that pesticide residue levels in foods are generally well below EPA tolerances, corroborating results presented in earlier reports (7a, 7b). Ten states contributed data on 6,520 samples to the Foodcontam database. Among these, 26.1% contained measurable residues and 1.9% contained significant residues. Animal feed samples (513 domestic, 86 import) were analyzed. Over 60% of the domestic surveillance samples and 75% of the import surveillance samples contained no residues.

Figure 3. Summary of Results of Domestic vs. Import Surveillance Samples



Incidence/Level Monitoring

Triazine Herbicides

The triazines are one of the most widely used classes of herbicides, and EPA has established tolerances for them on many commodities. Interest in triazines has increased recently because of potential leaching of the herbicides and their degradation products into ground and surface water. Residues of these chemicals have rarely been detected in foods, although FDA has routinely looked for the parent compounds.

Recently, FDA's Southeast Regional Laboratory in Atlanta developed a method capable of determining 19 triazine herbicides and 4 metabolites (13). Average recoveries ranged from 81 to 106% for the parent herbicides and 60 to 88% for the metabolites. The method was validated by the Minneapolis District Laboratory (14) and used to analyze a number of food samples in 1995 and 1996. In 1996, this method was used to analyze 103 samples (56 domestic samples from 9 states and 47 import samples from 9 countries) (Table 7). Residues were found in six domestic samples, all of simazine in oranges. Four samples had trace amounts and two samples had 0.03 and 0.01 ppm, respectively. None was violative. No triazine residues were detected in the import samples.

Table 7. Commodity Targeted Monitoring of Domestic and Imported Foods for Triazine Herbicides Conducted in 1996

	Number of Samples Analyzed	
Commodity	Domestic	Import
Apples	17	3
Bananas	2	18
Grapes	6	14
Oranges	18	2
Pears	10	10
Plums	3	—
Total	**56**	**47**

Statistically Based Survey

Apples. The original goal of the project was to collect 1600 samples of apples (800 domestic and 800 import). Actually, 769 domestic and 1062 imported samples were collected and analyzed using both MRMs and SRMs. (These numbers are not included in the counts under Fruits in Appendixes A and B.) The incidence of residues was 85% for domestic and 86% for imported apples. Benomyl, a widely used fungicide, was found with greatest frequency in domestic apples, while diphenylamine was found most often in imported apples. One domestic and 4 imported samples contained violative residues of pesticides for which there are no U.S. tolerances on apples. The statistically weighted violation rates for domestic and imported apples were 0.30% (0.13 unweighted) and 0.41% (0.38 unweighted), respectively (4).

Rice. About 575 domestic and 800 imported samples were scheduled for collection. A total of 598 domestic and 612 imported samples were collected and analyzed using both MRMs and SRMs. (Numbers are not included in Appendixes A and B.) The incidence of residues was 56% in domestic and 12% in imported rice. Malathion had the greatest frequency of occurrence in both groups of rice. Eight domestic and nine imported samples were violative, all as a result of the use of pesticides for which there are no U.S. tolerances on rice. The statistically weighted violation rates for domestic and imported rice were 0.43% (1.3 unweighted) and 1.1% (1.5 unweighted), respectively (4).

Although there may be specific differences between results obtained from regulatory monitoring and statistically based monitoring of domestic and imported apples and rice, in general, the results are in agreement, as was the case in similar monitoring of domestic and imported pears and tomatoes (5). These two studies of four commodities corroborate the low levels of pesticide residues found in FDA's regulatory monitoring and demonstrate that FDA's regulatory monitoring provides a reasonably reliable estimate of pesticide residues in the U.S. food supply.

Summary: Incidence/Level Monitoring

A survey of triazine herbicides in various commodities was carried out. Few residues were found, and none were violative. Results of the statistically based study for apples and rice show that, as in FDA's regulatory monitoring, the levels of most pesticide residues found in these two commodities are generally well below U.S. tolerances, and few violative residues are found.

Total Diet Study

The Total Diet Study is unique in that it determines pesticide residues in foods prepared for consumption (6). Of the nearly 300 chemicals that can be determined by the analytical methods used, 99 pesticide and pesticide-related chemicals were found in the foods analyzed in the three collections reported here. To measure the low levels of pesticides found in the Total Diet Study foods, the analytical methods used are modified to permit measurement at levels 5-10 times lower than those normally used in regulatory monitoring. In general, residues present at or above 1 part per billion can be measured.

Table 8 lists the 20 most frequently found residues (those found in >2% of the samples), the total number of findings, and the percent occurrence in the three market baskets (778 food items) analyzed in 1996. The three most frequently observed chemicals, p,p'-DDE, malathion, and chlorpyrifos-methyl, repeat a pattern observed for the past several years. The levels of these pesticides, as well as the others listed in Table 8, were well below regulatory limits.

Table 8. Frequency of Occurrence of Pesticide Residues Found in Total Diet Study Foods in 1996[a]

Pesticide[b]	Total No. of Findings	Occurrence, %
DDT	140	18
Malathion	136	17
Chlorpyrifos-methyl	122	16
Endosulfan	87	11
Dieldrin	76	10
Chlorpyrifos	72	9
Chlorpropham	45	6
Iprodione	36	5
Carbaryl[c]	33	4
Methamidophos	32	4
Dicloran	27	3
Thiabendazole[d]	27	3
Permethrin	23	3.0
Dimethoate	22	2.8
Acephate	21	2.7
Dicofol	21	2.7
Lindane	21	2.7
Diazinon	19	2.4
BHC	18	2.3
Toxaphene	18	2.3

[a] Based on 3 market baskets analyzed in 1996 consisting of 778 items. Only those found in >2% of the samples are shown.
[b] Isomers, metabolites, and related compounds are not listed separately; they are covered under the "parent" pesticide from which they arise.
[c] Reflects overall incidence; however, only 93-95 selected foods per market basket (i.e., 283 items total) were analyzed for N- methylcarbamates.
[d] Reflects overall incidence; however, only 65-67 selected foods per market basket (i.e., 199 items total) were analyzed for thiabendazole and benomyl.

Information obtained through the Total Diet Study is used to estimate dietary intakes of pesticides; these intakes are then compared with established standards. Food consumption data to be used in estimating dietary intakes for the revised food list have only recently been finalized. Therefore, dietary intake information for the market baskets collected since 1991 will be reported separately.

For several years, FDA has collected and analyzed a number of baby foods in addition to those covered under the Total Diet Study. Between 1991 and 1996, this adjunct to the Total Diet Study included 23 different food items (14 fruit juices or fruits, 4 fruit desserts, 4 grain products, and 1 vegetable). Table 9 lists the 18 most frequently found pesticide residues in three collections of these 23 foods (69 samples total) in 1996. Levels found were in the low part per billion (ppb) range.

Table 9. Frequency of Occurrence of Pesticide Residues Found in Selected Baby Foods in 1996[a]

Pesticide[b]	Total No. of Findings	Occurrence, %	Range, ppm
Dimethoate	22	32	0.0002–0.007
Iprodione	18	26	0.001–0.095
Carbaryl[c]	15	22	0.002–0.024
Endosulfan	11	16	0.0014–0.020
Chlorpyrifos	10	14	0.0004–0.015
Omethoate	9	13	0.001–0.005
Permethrin	8	12	0.002–0.054
Malathion	6	9	0.001–0.010
Chlorpyrifos-methyl	5	7	0.004–0.010
Dicloran	5	7	0.0009–0.002
Parathion-methyl	5	7	0.0006–0.005
Ethylenethiourea[d]	4	6	0.004–0.011
Thiabendazole[e]	4	6	0.046–0.076
Acephate	2	3	0.002 (both)
Benomyl[e]	2	3	0.036–0.044
Dicofol	2	3	0.002 (both)
Esfenvalerate	2	3	0.004–0.021
Propargite[f]	2	3	0.013–0.088

[a] Based on 3 collections consisting of 69 total items. Only those found in >2% of the samples are shown.
[b] Isomers, metabolites, and related compounds are not listed separately; they are covered under the "parent" pesticide from which they arise.
[c] Reflects overall incidence; however, only 17 selected foods per collection (i.e., 51 items total) were analyzed for N- methylcarbamates.
[d] Reflects overall incidence; however, only 13 selected items (i.e., 39 items total) were analyzed for ethylenethiourea.
[e] Reflects overall incidence; however, only 16 selected items (i.e., 48 items total) were analyzed for the benzimidazole fungicides (thiabendazole and benomyl).
[f] Reflects overall incidence; however, only 17 selected foods per collection (i.e., 51 items total) were analyzed for this sulfur-containing compound.

Summary: Total Diet Study

In 1996, the types of pesticide residues found and their frequency of occurrence in the Total Diet Study were generally consistent with those given in previous FDA reports (7a, 7b). The pesticide residue levels found were well below regulatory standards. An adjunct survey of baby foods in 1991-1996 also provided evidence of only small amounts of pesticide residues in those foods.

Summary

A total of 10,374 samples of domestically produced food and imported food from 92 countries was analyzed for pesticide residues in 1996. Of these, 9,881 were surveillance samples, which are collected when there is no evidence of a pesticide problem. No residues were found in 64.4% of both domestic surveillance and import surveillance samples. The higher violation rates in the 493 compliance samples reflect the fact that they are collected and analyzed when a pesticide problem is suspected.

In the final year during which state residue data were collected in the Foodcontam database, 10 states contributed data on 6,520 samples. Among these, 26.1% contained measurable residues and 1.9% contained significant residues. FDA collected and analyzed animal feed samples (513 domestic, 86 import) for pesticides. Over 60% of the domestic surveillance samples and 75% of the import surveillance samples contained no residues.

A survey of fruits analyzed for residues of triazine herbicides was performed. Few residues were found, and none were violative. Results of the statistically based study for apples and rice show that, as in FDA's regulatory monitoring, the levels of most pesticide residues found in these two commodities are generally well below U.S. tolerances, and few violative residues are found.

Most of the Total Diet Study findings for 1996 were generally similar to those found in earlier periods; details of findings will be published separately. An adjunct survey of baby foods in 1991-1996 also provided evidence of only small amounts of pesticide residues in those foods.

This report was compiled through the efforts of the following FDA personnel: Bernadette M. McMahon, Mark S. Wirtz, and Charles H. Parfitt (Division of Pesticides and Industrial Chemicals), Byron O. Bohannon and Young H. Lee (Division of Programs and Enforcement Policy), Office of Plant and Dairy Foods and Beverages; Sharon A. Macuci (Division of Information Resources Management), Office of Management Systems, Center for Food Safety and Applied Nutrition, Washington, DC., Randall Lovell, Center for Veterinary Medicine, Rockville, MD, Sheila K. Egan, James L. Daft, and David Graham, Kansas City District, Lenexa, KS.

The database containing the data from which this report was derived is also available from FDA's World Wide Web site, at http://www.cfsan.fda.gov. FDA pesticide monitoring data collected under the regulatory monitoring approach in 1992, 1993, 1994, and 1995 are available for purchase on personal computer diskettes from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161 (telephone 703-487-4650); order numbers are: 1992, PB94-500899; 1993, PB94-501681; 1994, PB95-503132; and 1995, PB96-503156.

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Appendix A. Analysis of Domestic Surveillance Samples by Commodity Group in 1996

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
A. Grains and Grain Products					
Corn & corn products	29	51.7	3.5	1	
Oats & oat products	27	74.1	7.4		2
Rice & rice products	47	80.8	2.1		1
Soybeans & soybean products	27	77.8	0.0		
Wheat & wheat products	185	40.0	0.0		
Other grains & grain products	13	38.5	0.0		
Breakfast cereals	29	65.5	0.0		
Bakery products, crackers, etc.	6	33.3	0.0		
Total	**363**	**53.4**	**1.1**		
B. Milk/Dairy Products/Eggs					
Cheese & cheese products	53	86.8	0.0		
Eggs	210	97.6	0.0		
Milk/cream & milk products	518	98.5	0.0		
Total	**781**	**97.4**	**0.0**		
C. Fish/Shellfish					
Fish	377	53.6	0.5		2
Shellfish	141	83.7	0.0		
Other	2	100.0	0.0		
Total	**520**	**61.9**	**0.4**		
D. Fruits					
Blackberries	7	42.9	0.0		
Blueberries	39	76.9	5.1	1	1
Cranberries	13	30.8	0.0		
Grapes, raisins	91	65.9	0.0		
Raspberries	21	19.1	0.0		
Strawberries	98	9.2	2.0	2	
Grapefruit	16	50.0	0.0		
Lemons	22	63.6	0.0		
Oranges	79	32.9	0.0		
Other citrus fruit	4	0.0	0.0		
Apples	207	30.9	1.9		4
Pears	59	54.2	0.0		
Apricots	9	33.3	0.0		
Avocadoes	1	100.0	0.0		
Cherries	22	27.3	0.0		
Nectarines	31	16.1	0.0		
Peaches	124	16.9	0.0		

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.

Appendix A. (continued)

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
Plums	21	66.7	0.0		
Bananas, plantains	7	100.0	0.0		
Guavas	7	0.0	85.7		6
Kiwi fruit	11	100.0	0.0		
Mangoes	2	100.0	0.0		
Cantaloupe	74	55.4	2.7		2
Honeydew	18	50.0	0.0		
Watermelon	89	88.8	0.0		
Other fruits	1	100.0	0.0		
Apple juice	56	91.1	0.0		
Citrus juice	14	100.0	0.0		
Other fruit juices	24	66.7	0.0		
Fruit jams/jellies/pastes/toppings	27	59.3	0.0		
Total	**1194**	**46.1**	**1.3**		
E. Vegetables					
Corn	95	100.0	0.0		
Mung beans and bean sprouts	7	85.7	0.0		
Peas (green/snow/sugar/sweet)	78	83.3	0.0		
String beans (green/snap/pole/long)	117	65.0	0.0		
Other beans & peas & products	28	85.7	3.6		1
Cucumbers	78	69.2	1.3		1
Eggplant	21	66.7	0.0		
Okra	9	88.9	11.1		1
Peppers, hot	20	70.0	0.0		
Peppers, sweet	77	42.9	0.0		
Squash/pumpkins	85	56.5	3.5	1[b]	2
Tomatoes	225	58.2	0.4		1
Other fruiting vegetables	3	66.7	0.0		
Artichokes	5	100.0	0.0		
Asparagus	15	93.3	0.0		
Bok choy & Chinese cabbage	28	82.1	3.6		1
Broccoli	26	92.3	0.0		
Cabbage	72	87.5	0.0		
Cauliflower	23	95.7	0.0		
Celery	28	17.9	0.0		
Collards	22	54.5	4.5		1
Endive	21	61.9	9.5		2
Lettuce, head	136	46.3	3.7		5
Lettuce, leaf	78	35.9	2.6	1	1
Spinach	46	45.6	0.0		
Other leaf & stem vegetables	46	67.4	2.2	1[b]	

[b] Residue in sample exceeded an action level rather than a tolerance.

Appendix A. (continued)

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
Mushrooms	14	78.6	0.0		
Carrots	115	60.0	0.0		
Onions/leeks/scallions/shallots	44	90.9	0.0		
Potatoes	226	50.4	0.0		
Sweet potatoes	34	79.4	0.0		
Other root & tuber vegetables	64	70.3	1.6		1
Vegetables with sauce	12	91.7	0.0		
Vegetables, dried or paste	28	82.1	3.6		1
Other vegetables/vegetable products	32	71.9	0.0		
Total	**1958**	**64.2**	**1.1**		
F. Other					
Cashews	1	100.0	0.0		
Peanuts & peanut products	38	68.4	0.0		
Other nuts & nut products	4	100.0	0.0		
Vegetable oil, crude	11	100.0	0.0		
Spices & condiments & flavors	7	71.4	0.0		
Beverages & water	3	100.0	0.0		
Beverage bases	16	18.8	0.0		
Honey & other sweeteners	17	100.0	0.0		
Baby foods/formula	44	81.8	0.0		
Other food products, incl. prepared foods	3	66.7	0.0		
Total	**144**	**75.0**	**0.0**		
A–F Total	**4960**	**64.4**	**0.9**		

Appendix B. Analysis of Import Surveillance Samples by Commodity Group in 1996

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
A. Grains and Grain Products					
Corn & corn products	8	87.5	0.0		
Oats & oat products	5	60.0	0.0		
Rice & rice products	57	86.0	1.8	1[b]	
Soybeans & soybean products	3	100.0	0.0		
Wheat & wheat products	13	38.5	0.0		
Other grains & grain products	16	87.5	6.2	1[b]	
Breakfast cereals	15	100.0	0.0		
Bakery products, crackers, etc.	36	83.3	0.0		
Pasta and noodles	77	75.3	0.0		
Total	**230**	**80.0**	**0.9**		
B. Milk/Dairy Products/Eggs					
Butter	2	100.0	0.0		
Cheese & cheese products	99	99.0	0.0		
Eggs	27	77.8	0.0		
Milk/cream & milk products	1	100.0	0.0		
Total	**129**	**94.6**	**0.0**		
C. Fish/Shellfish					
Fish	86	86.0	0.0		
Shellfish	36	94.4	0.0		
Other	2	50.0	0.0		
Total	**124**	**87.9**	**0.0**		
D. Fruits					
Blackberries	50	36.0	4.0		2
Blueberries	37	86.5	0.0		
Grapes, raisins	169	35.5	1.2		2
Raspberries	71	23.9	2.8		2
Strawberries	46	10.9	6.5		3
Other berries	5	80.0	0.0		
Grapefruit	4	25.0	0.0		
Lemons	9	77.8	0.0		
Limes	21	81.0	4.8		1
Oranges	28	85.7	0.0		
Other citrus fruit	16	75.0	6.2		1
Apples	57	45.6	0.0		
Pears	61	44.3	1.6	1	
Other pome fruit	6	100.0	0.0		
Apricots	9	66.7	0.0		

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.

[b] Residue in sample exceeded an action level rather than a tolerance.

Appendix B (continued)

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
Avocadoes	14	92.9	0.0		
Cherries	21	66.7	0.0		
Nectarines	13	38.5	0.0		
Olives	66	97.0	0.0		
Peaches	40	45.0	7.5		3
Plums	30	33.3	0.0		
Other pit fruit	2	100.0	0.0		
Bananas, plantains	268	49.2	0.0		
Guavas	3	100.0	0.0		
Kiwi fruit	4	100.0	0.0		
Mangoes	75	94.7	1.3		1
Papaya	75	78.7	9.3		7
Pineapple	83	85.5	2.4	2	
Other sub-tropical fruit	44	90.9	6.8		3
Cantaloupe	94	20.2	5.3		5
Honeydew	59	8.5	0.0		
Watermelon	39	66.7	0.0		
Other melons	16	62.5	6.2		1
Other fruits	13	92.3	0.0		
Apple juice	18	88.9	5.6		1
Citrus juice	8	87.5	0.0		
Other fruit juices	53	92.5	0.0		
Fruit jams/jellies/pastes/toppings	108	71.3	12.0		13
Total	**1735**	**57.0**	**2.8**		
E. Vegetables					
Corn	36	100.0	0.0		
Mung beans and bean sprouts	18	77.8	0.0		
Peas (green/snow/sugar/sweet)	103	52.4	16.5	1	16
String beans (green/snap/pole/long)	58	31.0	5.2		3
Other beans & peas & products	47	76.6	2.1		1
Cucumbers	72	43.1	0.0		
Eggplant	25	60.0	0.0		
Okra	21	76.2	9.5		2
Peppers, hot	256	41.4	3.1	3	5
Peppers, sweet	256	63.3	0.8	1	1
Squash/pumpkins	130	37.7	0.8		1
Tomatoes	342	56.1	1.2		4
Other fruiting vegetables	34	73.5	2.9		1
Artichokes	32	90.6	6.2		2
Asparagus	105	82.9	1.9	1	1
Bamboo shoots	18	100.0	0.0		
Bok choy & Chinese cabbage	22	45.5	13.6		3
Broccoli	35	60.0	0.0		

Appendix B (continued)

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
Cabbage	17	58.8	0.0		
Cauliflower	8	87.5	12.5		1
Celery	17	23.5	0.0		
Collards	1	100.0	0.0		
Endive	28	96.4	0.0		
Lettuce, head	15	60.0	0.0		
Lettuce, leaf	44	20.4	2.3		1
Radicchio	11	72.7	0.0		
Spinach	27	29.6	0.0		
Other leaf & stem vegetables	60	55.0	16.7	2	8
Mushrooms & mushroom products	77	93.5	0.0		
Carrots	36	66.7	0.0		
Cassava	21	100.0	0.0		
Onions/leeks/scallions/shallots	39	79.5	5.1		2
Potatoes	76	93.4	0.0		
Sweet potatoes	18	100.0	0.0		
Water chestnuts	27	92.6	0.0		
Other root & tuber vegetables	42	97.6	0.0		
Vegetables with sauce	10	100.0	0.0		
Vegetables, dried or paste	141	74.5	5.0	4[b]	3
Other vegetables/vegetable products	53	83.0	0.0		
Total	**2378**	**63.0**	**2.8**		
F. Other					
Cashews	32	68.8	3.1		1
Coconut & coconut products	8	100.0	0.0		
Peanuts & peanut products	21	71.4	0.0		
Other nuts & nut products	31	96.8	3.2		1
Edible seeds	28	92.9	3.6	1[b]	
Vegetable oil, crude	4	100.0	0.0		
Vegetable oil, refined	25	96.0	0.0		
Spices & condiments & flavors	48	72.9	6.2		3
Beverages & water	17	94.1	0.0		
Beverage bases	17	88.2	0.0		
Coffee/tea/wine	11	90.9	0.0		
Cocoa beans & chocolate products	13	92.3	0.0		
Honey & other sweeteners	51	76.5	3.9		2
Baby foods/formula	2	100.0	0.0		
Other food products, incl. prepared foods	11	72.7	0.0		
Nonfood items	6	50.0	33.3		2
Total	325	82.8	3.1		
A–F Total	**4921**	**64.4**	**2.6**