Food and Drug Administration

Pesticide Program
Residue Monitoring 2001

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This document is the fifteenth annual report summarizing the results of the Food and Drug Administration's (FDA) pesticide residue monitoring program. Eight of the fourteen previous reports were published in the *Journal of the Association of Official Analytical Chemists/Journal of AOAC International*; these presented results from Fiscal Years (FY) 1987 through 1994. Results from FY 1995 through FY 2000 were published on FDA's World Wide Web site. This report includes findings obtained during FY 2001 (October 1, 2000 through September 30, 2001) under regulatory and incidence/level monitoring. Selected Total Diet Study findings for 2001 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. The Environmental Protection Agency (EPA) registers (*i.e.,* approves) the use of pesticides and sets tolerances (the maximum amounts of residues that are permitted in or on a food) if use of a particular pesticide may result in residues in or on food (1). 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 domestic 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. Since 1991, USDA's Agricultural Marketing Service (AMS), through contracts with participating states, has carried out a residue testing program directed at raw agricultural products and various processed foods. FSIS and AMS report their pesticide residue data independently.

Regulatory 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 a given 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" 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.

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 (2).

Single residue methods (SRMs) or selective MRMs are used to determine some pesticide residues in foods (2). An SRM usually determines one pesticide; a selective MRM measures a relatively small number of chemically related pesticides. This type of methods is usually more resource-intensive per residue. Therefore, SRMs 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 (LOQ).

FDA/State Cooperation

FDA field offices interact with their counterparts in many states to increase FDA's effectiveness in pesticide residue monitoring. 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).

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.), CVM's monitoring focuses 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.

Under the auspices of the North American Free Trade Agreement (NAFTA), the U.S., 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 has 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 process is difficult, 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 trilateral 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 U.S. would be in full compliance with U.S. tolerances.




Incidence/Level Monitoring

FDA's pesticide program includes incidence/level monitoring to complement regulatory monitoring. This approach increases FDA's knowledge about particular pesticide/commodity combinations. This information is acquired by analyses of randomly selected samples to determine the presence and levels of selected pesticides. In 2001, FDA issued one special assignment, to measure the levels, at the lowest possible detectable limits, of organophosphate pesticides in fruits and vegetables for dietary risk assessment.

Total Diet Study

The Total Diet Study is the other major element of FDA's pesticide residue monitoring program (3). In its previous annual pesticide reports, FDA provided Total Diet Study findings for 1987-2000 (4a, 4b). More detailed information, including estimated dietary intakes of pesticide residues covering June 1984-April 1986 (5) and July 1986-April 1991 (6), has been published. In September 1991, FDA implemented revisions to the Total Diet Study that were formulated in 1990 (7). These revisions primarily consisted of collection and analysis of an updated and expanded number of food items, addition of six age/sex groups (for a total of 14), and revised analytical coverage. Details of that revision are published (8, 9).

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 257 or 258 foods that comprise each of the 4 market baskets represent over 3,500 different foods reported in USDA food consumption surveys; for example, apple pie represents all fruit pies and fruit pastries. Each market basket 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, 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

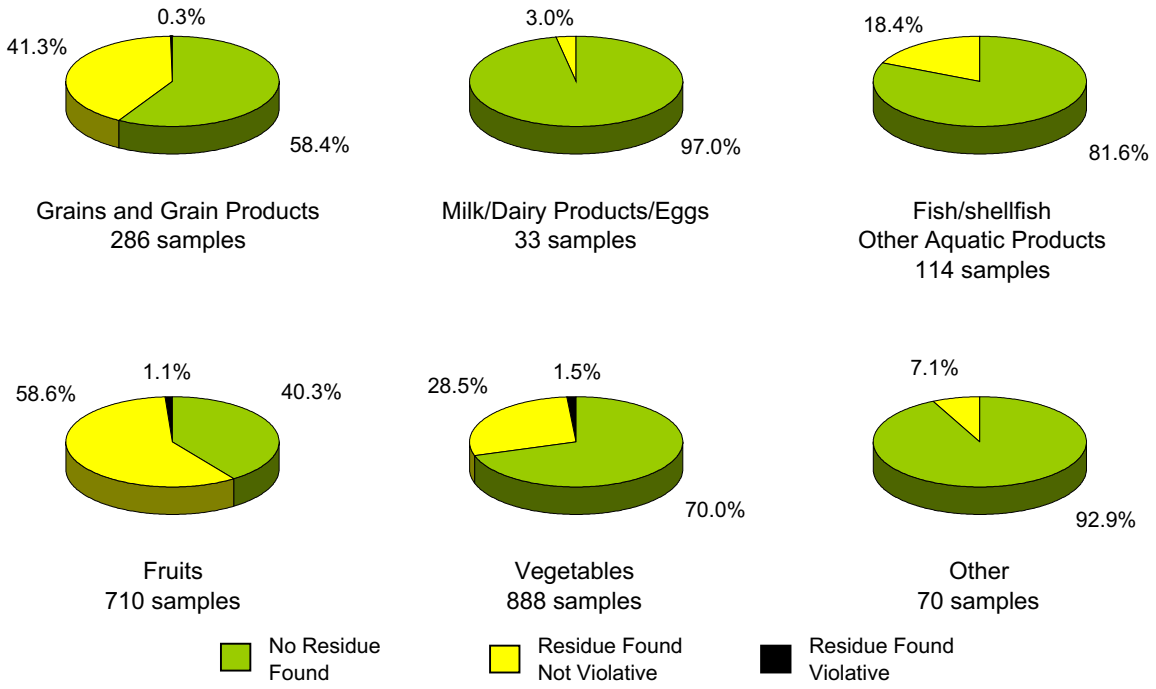
Under regulatory monitoring, 6,475 samples were analyzed. Of these 2,101 were domestic and 4,374 were imports.

Figure 1 shows the percentage of the 2,101 domestic 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 2001; those two commodity groups comprised 76.0% of the total number of domestic samples. In 2001, no violative residues were found in 98.9% of all domestic samples (99.1% in 1996, 98.8% in 1997, 99.2 % in 1998, 99.2% in 1999, 99.3% in 2000).

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 found, and the percent violative samples. Of the 2,101 domestic samples, 60.2% had no detectable residues and 1.1% had violative residues. In the largest commodity groups, fruits and vegetables, 40.3% and 70.0% of the samples, respectively, had no residues detected; 1.1% of the fruit samples and 1.5% of the vegetable samples contained violative residues (Figure 1). In the grains and grain products group, 58.4% of the samples had no residues detected, and 0.3% had violative residues. In the fish/shellfish/other aquatic products group, 81.6% had no detectable residues, and no violative residues were found. In the milk/dairy products/eggs group, 97.0% of the samples had no residues detected, and no violative residues were found. A total of 27 samples of baby foods or formula were analyzed (see category Other). This total included 6 vegetable, 7 cereal, and 6 fruit juice samples. None of the samples had violative residues.

Figure 1. Summary of Results of Domestic Samples by Commodity



Findings by commodity group for the 4,374 import samples are shown in Figure 2. Fruits and vegetables accounted for 84.8% of these samples. Overall, no violative residues were found in 95.2% of the import samples (97.4% in 1996, 98.4% in 1997, 97.0% in 1998, 96.9% in 1999, 96.2% in 2000).

Appendix B contains detailed data on the import samples. Of the 4,374 samples analyzed, 72.0% had no residues detected, and 4.8% had violative residues. Fruits and vegetables had 67.8% and 69.1%, respectively, with no residues detected. The fruit group and the vegetable group had 2.8% and 6.4%, respectively, with violative residues. No residues were found in any of the milk/dairy products/eggs group and in 94.2% of the fish/shellfish group, and 0.3% of the latter group had violative residues. In the grains and grain products group, 91.3% had no detectable residues, and none had violative residues.

Pesticide monitoring data collected under FDA's regulatory monitoring approach in 2001 are available to the public as a computer database. This database summarizes FDA 2001 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 1992–2000 is provided at the end of this report.

Geographic Coverage

Domestic. A total of 2,101 domestic samples was collected in 2001 from 41 states (no samples were collected from Alabama, Connecticut, Hawaii, Maine, Mississippi, Nevada, South Dakota, Tennessee, or Vermont) and from Puerto Rico. The largest numbers of samples were collected from those states that are the largest producers of fruits and vegetables. Table 1 lists numbers of domestic samples from each location, in order of descending numbers of samples.

Import. A total of 4,374 samples representing food shipments from 99 countries was collected. (The origin of some additional samples was unspecified.) Table 2 lists numbers of samples 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.

Figure 2. Summary of Results of Import Samples by Commodity

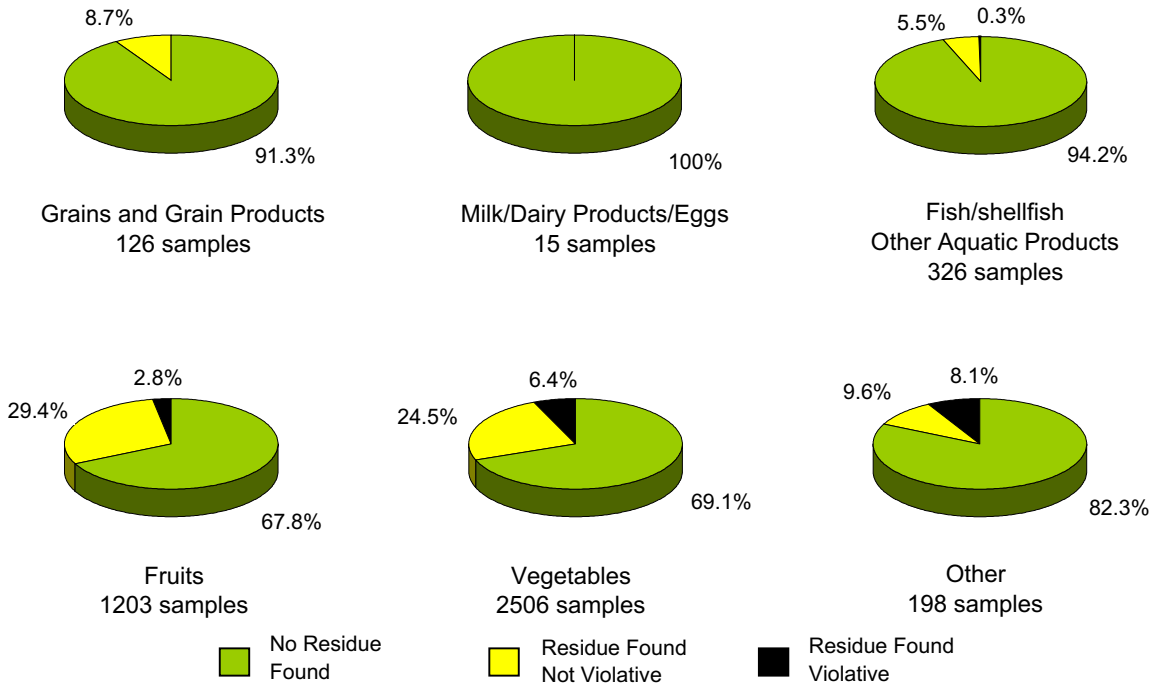


Table 1. Domestic Samples Collected and Analyzed, by State[a], in 2001

California	213	Iowa	72	North Carolina	29	North Dakota	18
Washington	195	Michigan	67	Pennsylvania	29	Maryland	15
Louisiana	171	Missouri	67	Georgia	27	Wyoming	15
Oregon	117	Florida	47	Colorado	26	Kentucky	13
Minnesota	114	Indiana	41	New Mexico	25	Nebraska	13
Wisconsin	110	Arizona	40	Delaware	22	Alaska	12
New York	102	Ohio	40	Kansas	22	South Carolina	11
Illinois	84	Virginia	37	Montana	21	Arkansas	9
Texas	80	New Jersey	31	Utah	20	West Virginia	8
Idaho	79	Rhode Island	31	Massachusetts	18	New Hampshire	5
						Oklahoma	4

[a]Other domestic samples: Puerto Rico, 1 sample.

Table 2. Foreign Countries and Number of Samples Collected and Analyzed in 2001

Mexico	1868	South Africa	30
Chile	267	Brazil	29
Netherlands (Holland)	193	Philippines	29
China, Peoples Rep.	176	Greece	28
Dominican Republic	125	Taiwan, Republic of	28
Spain (inc. Canary Is.)	119	Lebanon	23
Thailand	115	Pakistan	22
India	102	Unspecified	22
Guatemala	99	Indonesia	19
Costa Rica	87	Bulgaria	18
Canada	83	Poland	17
Korea, Rep. of (South)	70	United Kingdom	17
Israel	58	Germany, Federal Rep.	16
Viet-Nam, Rep. of	56	Jamaica	16
Peru	53	El Salvador	15
Ecuador	48	Russia	15
Turkey	47	Belgium	14
Colombia	46	Egypt	14
Argentina	45	Iran	14
Honduras	40	Panama	12
France	38	Australia	11
Italy	35	Japan	11
New Zealand	35	Nicaragua	11

Ten or fewer samples collected from the following:

Austria
Belize
Bolivia
Bosnia-Hercegovina
Cape Verde
Croatia
Czech Republic
Denmark
Ethiopia
Falkland Islands
Faroe Islands
Fiji
Ghana
Grenada
Guyana
Haiti
Hong Kong
Hungary
Iceland
Ireland
Jordan
Kazakhstan
Latvia
Madagascar
Malaysia
Mauritius
Morocco
Mozambique
Namibia
Nigeria
Norway
Oman
Papua New Guinea
Portugal (inc. Azores)
Romania
Saudi Arabia
Senegal
Singapore
Slovenia
Sweden
Switzerland
Syrian Arab Republic
Tanzania, United Republic of
Togo
Tonga
Trinidad & Tobago
Tunisia
United Arab Emirates
Uruguay
Venezuela
Western Samoa
Yugoslavia
Zambia
Zimbabwe

Domestic/Import Violation Rate Comparison

In 2001, a total of 2,101 domestic and 4,374 import samples was collected and analyzed. Pesticide residues were detected in 39.8% of the domestic samples and in 28.0% of the import samples. Only 1.1% of the domestic samples and only 4.8% of the import samples were violative. Among grains and grain products, the violation rate was 0.3% domestic *vs.* 0.0% import. No violations were found in the milk/dairy products/eggs group among either domestic or import samples. In the fish/shellfish/other aquatic products group, the violation rate was 0.0% domestic *vs.* 0.3% import. Of domestic fruits, 1.1% were violative; of import fruits, the violation rate was 2.8%. Of vegetables, 1.5% of domestic samples and 6.4% of import samples were violative. In the category "Other" the rates for domestic and import samples were, respectively, 0.0% and 8.1%. The overall rate of violations is approximately one domestic violation for four import violations. Of the violative samples, 11 of the domestic ones and 15 of the import ones contained pesticide residues at levels which exceeded the tolerance for the given chemical in the given commodity. The remainder of the violative samples contained pesticide residues which were not registered in the U.S. for use in the commodities in which they were found; 11 domestic samples and 196 import samples fell in this category.

Pesticide Coverage

Table 3 lists the 394 pesticides that were detectable by the methods used; each of the 113 pesticides that were actually found is indicated by an asterisk.

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 U.S. The list of pesticides detectable for 2001 (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.

Animal Feeds

In 2001, a total of 478 domestic and 67 import feed samples was collected and analyzed for residues. Of the 478 domestic samples, 316 (66.1%) contained no detectable pesticide residues, and 9 (1.9%) contained 11 findings of residues which exceeded regulatory guidance. Of the 67 import samples, 54 (80.6%) contained no detectable pesticide residues, and 2 (3.0%) contained 2 residues which exceeded regulatory guidance. Table 4 summarizes the combined findings in domestic and import samples.

The following 9 findings of residues in domestic samples were considered to have exceeded regulatory guidance because there is no tolerance or action level established for the pesticide-commodity combination: 0.310 ppm of parathion-methyl on a sample of dairy cattle supplement from Alabama, comprised primarily of animal protein products (collected by the Atlanta district); 0.050 ppm of imazalil on a timothy hay sample from Kentucky (collected by the Cincinnati district); 0.115 ppm of chlorpyrifos-methyl on a cottonseed meal sample from Arkansas (collected by the Dallas district); 0.026 ppm of chlorpyrifos-methyl on a corn sample from Missouri and 0.133 ppm of Gardona on another corn sample from Kansas (both collected by the Kansas City district); 0.031 ppm of o-phenylphenol and 0.028 ppm of biphenyl on a barley sample from Washington, and 0.040 ppm of o-phenylphenol and 0.033 ppm of biphenyl on a wheat sample from Washington (both collected by the Seattle district).

Two domestic samples contained residues that exceeded an EPA tolerance. Two samples of corn from the same dealer in Missouri and collected by the Kansas City district contained malathion at 9.10 ppm and at 10.00 ppm. This residue exceeded the 8 ppm tolerance for malathion on corn in 40 CFR 180.111.

Two import samples of canola fines from Canada, collected by the Seattle district, contained 2 pesticide residues that exceeded regulatory guidance. One of these samples contained 0.036 ppm of malathion, and the other sample contained 0.028 ppm of chlorpyrifos. No tolerances have been established for malathion or for chlorpyrifos on canola by the EPA.

In the 162 domestic samples and 13 import samples of feed in which one or more pesticides were detected, there were 254 residues (189 quantifiable and 65 trace). Malathion, chlorpyrifos-methyl, diazinon, and chlorpyrifos were the most frequently found and accounted for 60.2% of all residues detected (Table 5).

Table 3. Pesticides Detectable and Found (*) by Methods Used in 2001 Regulatory Monitoring[a,b]

2,3,5,6-tetrachloroaniline*
2,4-dichloro-6-nitroaniline
2,6-dichlorobenzamide*
2-methoxy-3,5,6- trichloropyridine
3-chloro-5-methyl-4-nitro-1H-pyrazole
4-(dichloroacetyl)-1-oxa-4-azaspiro[4.5]decane
4(phenylamino)phenol*
6-benzyladenine
acephate*
acetochlor
acibenzolar-S-methyl
acrinathrin
alachlor
aldicarb*
aldrin
allethrin
allidochlor
alpha-cypermethrin
ametryn
aminocarb
amitraz
ammonium nitrate*
anilazine
Aramite
atrazine
azinphos-ethyl
azinphos-methyl*
azoxystrobin*
bendiocarb
benfluralin
benodanil
benomyl/carbendazim[c]
benoxacor
bensulide
benzoylprop-ethyl
BHC*
bifenox
bifenthrin*
binapacryl
biphenyl*
bitertanol
bromacil
bromophos
bromophos-ethyl
bromopropylate*
bromoxynil
bromuconazole
bufencarb
Bulan
bupirimate
buprofezin
butachlor
butralin
butylate
cadusafos*
captafol
captan*
carbaryl*
carbofuran*
carbophenothion
carbosulfan
carboxin
carfentrazone ethyl ester
chlorbenside
chlorbromuron
chlorbufam
chlordane*
chlordecone
chlordimeform
chlorethoxyfos
chlorfenapyr
chlorfenvinphos
chlorflurecol methyl ester
chlorimuron ethyl ester
chlornitrofen
chlorobenzilate
chloroneb
chloropicrin
chloropropylate
chlorothalonil*
chloroxuron
chlorpropham*
chlorpyrifos*
chlorpyrifos-methyl*
chlorthiophos
clodinafop-propargyl
clomazone
clopyralid
cloquintocet-mexyl
coumaphos*
crotoxyphos
crufomate
cyanazine
cyanofenphos
cyanophos
cycloate
cycluron
cyfluthrin
cyhalofop butyl ester
cymoxanil
cypermethrin*
cyprazine
cyproconazole*
cyprodinil*
DCPA*
DDT*
deltamethrin*
deltamethrin, trans-
demeton*
des-isopropyl iprodione
desmedipham*
desmetryn
des N-isopropyl isofenphos
dialifor
di-allate
diazinon*
dichlobenil*
dichlofenthion
dichlofluanid*
dichlone
dichlorvos
diclobutrazol
diclofop-methyl
dicloran*
dicofol*
dicrotophos
dieldrin*
diethatyl-ethyl
Dilan
dimethachlor*
dimethametryn

[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)

dimethipin
dimethoate*
dinitramine
dinobuton
dinocap
dioxabenzofos
dioxacarb
dioxathion
diphenamid
diphenylamine*
dipropetryn
disulfoton
diuron
DPX-MP062
edifenphos
endosulfan*
endrin
EPN*
epoxiconazole
EPTC
esfenvalerate*
etaconazole
ethalfluralin
ethephon
ethiofencarb
ethion*
ethofumesate
ethoprop
ethoxyquin*
ethylenebisdithiocarbamates[d]
ethyl-p-toluene sulfonamide*
etridiazole*
etrimfos
famphur
fenamiphos
fenarimol*
fenbuconazole*
fenfuram
fenhexamid*
fenitrothion*
fenoxaprop ethyl ester
fenoxycarb
fenpropathrin*
fenpropimorph
fenson
fensulfothion
fenthion
fenvalerate*
fipronil
flamprop-M-isopropyl
flamprop-methyl
fluazifop butyl ester
fluazinam
fluchloralin
flucythrinate
fludioxinil*
flusilazole
fluvalinate
FOE 5043
folpet*
fonofos
formothion
fosthiazate
fuberidazole
furilazole
Gardona
glyphosate*
heptachlor*
heptenophos
hexabromobiphenyl*
hexachlorobenzene*
hexaconazole
hexazinone
hexythiazox
imazalil*
imazamethabenz methyl ester
iprobenfos
iprodione*
isazofos
isocarbamid
isofenphos
isoprocarb
isopropalin
isoprothiolane
isoxaben
isoxaflutole
kresoxim-methyl
lactofen
lambda-cyhalothrin*
lenacil
leptophos
lindane*
linuron*
malathion*
mecarbam
mephosfolan
merphos
metalaxyl*
metaldehyde*
metasystox thiol
metazachlor
methabenzthiazuron
methamidophos*
methidathion*
methiocarb*
methomyl*
methoprotryne
methoxychlor*
methyl chloride
metobromuron
metolachlor*
metolcarb
metribuzin
mevinphos*
MGK 264*
mirex
molinate
monocrotophos*
monolinuron
monuron
myclobutanil*
N,N-diallyl-dichloroacetamide
N-(3,5-dichlorophenyl)-3-(1-methylethyl)-2,4-dioxo-1-imidazolidinecarboxamide*
N-desmethyl flucarbazone
naled
napropamide
naptalam
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

Table 3 (continued)

penconazole
pendimethalin
pentachlorobenzene*
pentachlorobenzonitrile*
pentachlorophenyl methyl ether*
permethrin*
Perthane
phenmedipham
phenothrin
phenthoate
phenylphenol, ortho-*
phorate
phosalone*
phosmet*
phosphamidon
phoxim
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
pyraclostrobin
pyrazon
pyrazophos
pyrethrins
pyridaphenthion
pyrimethanil
pyriproxyfen
quinalphos*
quintozene*
quizalofop ethyl ester
ronnel
S-bioallethrin
schradan
secbumeton
simazine
simetryn
Strobane
sulfallate
sulfotep
Sulphenone
sulprofos
TCMTB
tebuconazole*
tebupirimfos
tecnazene*
tefluthrin
TEPP
terbacil
terbufos
terbumeton
terbuthylazine
terbutryn
tetradifon*
tetraiodoethylene
tetrasul
thiabendazole*
thiamethoxam
thiazopyr
thiobencarb
thiodicarb
thiometon
thionazin
thiophanate-methyl
THPI*
tolylfluanid*
toxaphene*
tralomethrin
tralkoxydim
triadimefon*
triadimenol*
tri-allate
triazamate
triazophos*
tribufos*
trichlorfon
tricyclazole
tridiphane
trietazine
triflumizole
trifluralin*
triflusulfuron methyl ester
trimethacarb
vamidothion sulfone
vernolate
vinclozolin*
XMC
zeta-cypermethrin
zoxamide

Table 4. Summary of 2001 Domestic and Import Feed Samples

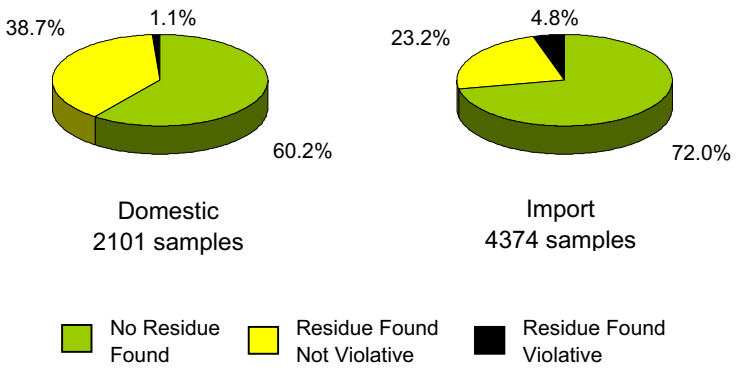
Type of Feed	Total # Samples	Without residues #	Without residues %	Exceeding Guidance #	Exceeding Guidance %
Whole/Ground Grains	232	174	75.0	6	2.6
Plant By-products	150	95	63.3	3	2.0
Mixed Feed Rations	75	39	52.0	0	0.0
Animal By-products	48	30	62.5	0	0.0
Hay & Hay Products	37	30	81.1	1	2.7
Supplements	3	2	66.7	1	33.3
Total	**545**	**370**	**67.9**	**11**	**2.0**

Table 5. Residues Found in Domestic and Import Feeds in 2001

Pesticide	# of Samples with Trace Amount[a]	# of Samples with Quantifiable Levels	Range[b] (ppm)	Median[b] (ppm)
malathion	23	75	0.010 - 10.00	0.090
chlorpyrifos-methyl	8	20	0.026 - 3.240	0.146
diazinon	1	13	0.010 - 0.366	0.057
chlorpyrifos	3	10	0.010 - 0.450	0.057
tribufos (DEF)	6	6	0.030 - 0.150	0.074
lindane	2	6	0.010 - 0.055	0.014
methoxychlor (p,p' + o,p')	4	3	0.035 - 0.179	0.096
ethion	4	3	0.029 - 0.140	0.047
iprodione + metabolite	0	6	0.010 - 1.300	0.400
imazalil	0	4	0.039 - 1.000	0.325
myclobutanil	0	4	0.010 - 0.600	0.175
phosmet	0	4	0.051 - 0.350	0.165
DDT + DDE + TDE (p,p' + o,p')	0	4	0.020 - 0.845	0.069
biphenyl	2	2	0.028 - 0.033	N/A
methidathion	0	3	0.026 - 4.910	0.160
endosulfan (I + II + sulfate)	0	3	0.010 - 0.020	0.017
permethrin	1	2	0.258 - 0.320	N/A
pirimiphos-methyl	3	0	N/A	N/A
all others[c]	8	21	0.010 - 125.0	0.150

[a] Residue found is below that normally quantifiable, but its presence and identity are known.
[b] In samples containing quantifiable levels.
[c] n=2 for bifenthrin, dichlobenil, dicofol, ethoxyquin, fenhexamid, parathion or its methyl homolog, o-phenylphenol, and vinclozolin; n=1 for benomyl, α-BHC, carbaryl, chlorpropham, dicloran, dimethoate, fenarimol, fludioxonil, Gardona, propiconazole, tebuconazole, thiabendazole, and tri-allate.

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



Summary: Regulatory Monitoring

No residues were found in 60.2% of domestic and in 72.0% of import samples (Figure 3) analyzed under FDA's regulatory monitoring approach in 2001. Only 1.1% of domestic and 4.8% of import samples had residue levels that were violative. The findings for 2001 demonstrate that pesticide residue levels in foods are generally well below EPA tolerances, corroborating results presented in earlier reports (4a, 4b). Animal feed samples (478 domestic, 67 import) were analyzed. No residues were found in 66.1% of the domestic samples and in 80.6% of the import samples.

Incidence/Level Monitoring

Special Surveys

As part of a collaborative effort with EPA, in August 2001, FDA initiated a project of measuring organophosphorous pesticides (OPs) in a selected variety of fruits and vegetables that are a significant part of children's diets. The objective of this interagency project is to obtain the residue data at the lowest possible detectable levels for dietary risk assessment. FDA has for many years provided pesticide residue data to EPA, but the Food Quality Protection Act requires reassessment of pesticide tolerances in foods and feeds. To meet this requirement, EPA needed data at levels lower than the regulatory levels routinely used in FDA monitoring and reported by FDA. EPA identified "top priority" and "high priority" lists of 28 parent OPs and their metabolites based on their degree and mechanism of toxicity. EPA also compiled a list of ten commodities based on their significance in the diets of children, and requested that FDA collect 1000 domestic and import samples of these commodities, 100 samples for each commodity, and analyze them for the presence of these OPs.

The commodities included apples, blackberries, carrots, cranberries, grapes, head lettuce, oranges, peaches, strawberries, and tomatoes. The numbers of domestic samples collected from the various regions were based on EPA's estimates of crop production, and those of import samples reflect a reasonable percentage of import volume of each commodity. All samples were to be analyzed for the selected OPs by a modification of a method in FDA's Pesticide Analytical Manual Volume I (PAM I). EPA modified the method by incorporating use of a pulsed flame photometric detector, which allows detection of residues at a much lower level (1 ppb) than those detected in regulatory monitoring (10, 11). Most FDA Districts participated in collecting the samples. Analyses were performed by the FDA's Pacific Regional Laboratory (PRL) - Southwest and PRL - Northwest. This project is still in progress.

Summary: Incidence/Level Monitoring

Results of the interagency project will be made available after its completion.

Total Diet Study

The Total Diet Study (TDS) is distinct from regulatory monitoring in that it determines pesticide residues in foods prepared for consumption (3). To measure the low levels of residues found in the TDS 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. Of the over 300 chemicals that can be determined for the analytical methods used, 107 individual residues were found in the foods analyzed in the four market baskets reported here (Market Baskets 00-4, 01-1, 01-2, and 01-3). Among these were 63 pesticides, including 15 which represent more than one related compound counted as a "total", 22 volatile organic compounds for which 70 TDS foods per market basket (MB) are now being examined, and 12 other organic compounds.

Table 6 lists the 19 most frequently found residues (those found in >2% of the samples), the total number of findings, and the percent occurrence in the four market baskets analyzed in 2001 (1030 food items). The five most frequently observed chemicals, DDT, chlorpyrifos-methyl, endosulfan, malathion, and dieldrin, are the same as those observed for the past several years. The levels of these residues, as well as the others listed in Table 6, are well below regulatory limits.

Table 6. Frequency of Occurrence of Pesticide Residues Found in Total Diet Study Foods in 2001[a]

Pesticide[b]	Total No. of Findings	Occurrence, %	Range, ppm
DDT	234	23	0.0001-0.031
chlorpyrifos-methyl	201	20	0.0001-0.537
endosulfan	185	18	0.0001-0.266
malathion	164	16	0.0007-0.080
dieldrin	152	15	0.0001-0.020
chlorpropham	73	7	0.0006-1.029
chlorpyrifos	71	7	0.0001-0.058
permethrin	60	6	0.0004-1.856
carbaryl[c]	55	5	0.0004-1.459
iprodione	39	4	0.0003-3.541
dicloran	36	3	0.0002-0.197
heptachlor	35	3	0.0001-0.0005
lindane	28	3	0.0001-0.002
hexachlorobenze	28	3	0.0001-0.002
thiabendazole[d]	27	3	0.015-0.524
methamidophos	25	2	0.001-0.243
acephate	24	2	0.002-0.505
methoxychlor	24	2	0.0002-0.020
quintozene	22	2	0.0001-0.0043

[a]Based on 4 market baskets analyzed in 2001 consisting of 1030 total items. Only those found in >2% of the samples are shown.
[b]Isomers, metabolites, and related compounds are included with the "parent" pesticide from which they arise.
[c]Reflects overall incidence; however, only 93-95 selected foods per market basket (*i.e.,* 377 items total) were analyzed for N-methylcarbamates.
[d]Reflects overall incidence; however, only 67 selected foods per market basket (*i.e.,* 268 items total) were analyzed for the benzimidazole fungicides thiabendazole and benomyl.

Information obtained through the TDS is used to estimate dietary intakes of pesticides; these intakes are then compared with established standards. Dietary intakes based on TDS samples collected through mid-1991 have been published previously (5, 6).

For several years, FDA has collected and analyzed a number of baby foods in addition to those covered under TDS. This adjunct to the TDS included 19 (MBs 01-2 and 01-3) or 20 (MBs 00-4 and 01-1) different food items in the four baskets represented here (7 fruit juices, 5 fruits, 4 fruit desserts, and 4 grain products). Table 7 lists the 17 pesticide residues found in four collections of these foods (78 samples total) in 2001, the percentage occurrence, and ranges of levels found.

Table 7. Frequency of Occurrence of Pesticide Residues Found in Selected Baby Foods in 2001[a]

Pesticide[b]	Total No. of Findings	Occurrence, %	Range, ppm
carbaryl[c]	16	21	0.002-0.035
endosulfan	10	13	0.0001-0.0035
chlorpyrifos-methyl	8	10	0.001-0.176
malathion	8	10	0.008-0.046
chlorpyrifos	7	9	0.0002-0.002
iprodione	7	9	0.0002-0.084
permethrin	7	9	0.0005-0.018
ethylenethiourea[d]	7	9	0.003-0.012
thiabendazole[e]	5	6	0.010-0.043
benomyl[e]	3	4	0.039-0.064
dicloran	2	3	0.0008-0.002
dimethoate	2	3	0.001-0.003
DDT	1	1	0.0006
esfenvalerate	1	1	0.007
methoxychlor	1	1	0.0005
dieldrin	1	1	0.0001
phosmet	1	1	0.011

[a]Based on 4 collections consisting of 78 total items.
[b]Isomers, metabolites, and related compounds are included with the "parent" pesticide from which they arise.
[c]Reflects overall incidence; however, only 12-14 selected foods per collection (*i.e.,* 53 items total) were analyzed for N-methylcarbamates.
[d]Reflects overall incidence; however, only 11-12 selected foods per collection (*i.e.,* 47 items total) were analyzed for ethylenethiourea.
[e]Reflects overall incidence; however, only 13-14 selected foods per collection (*i.e.,* 54 items total) were analyzed for the benzimidazole fungicides (thiabendazole and benomyl).

Summary: Total Diet Study

In 2001, the types of pesticide residues found and their frequency of occurrence in TDS were generally consistent with those given in previous FDA reports (4a, 4b). The pesticide residue levels found were well below regulatory standards. An adjunct survey of baby foods in 1991-2001 also provided evidence of only small amounts of pesticide residues in those foods.

Summary

A total of 6,475 samples of domestically produced food and imported food from 99 countries was analyzed for pesticide residues in 2001. FDA collected and analyzed animal feed samples (478 domestic, 67 import) for pesticides. No residues were found in 66.1% of the domestic samples and in 80.6% of the import samples. Total Diet Study findings for 2001 were generally similar to those found in earlier periods; details of findings will be published separately.

This report was compiled through the efforts of the following FDA personnel: Center for Food Safety and Applied Nutrition, Washington, DC: Office of Plant and Dairy Foods and Beverages: Carolyn M. Makovi, Mark S. Wirtz, and Marion Clower, Jr., Division of Pesticides and Industrial Chemicals; Young H. Lee, Division of Programs and Enforcement Policy; S. Kathleen Egan, Division of Risk Assessment; Office of Management Systems: Sharon A. Macuci, Division of Information Resources Management; Center for Veterinary Medicine, Rockville, MD: Randall Lovell; Kansas City District, Lenexa, KS: Chris A. Sack.

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. The 1996 through 2000 reports and databases are available at the same site. 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 1-800-553-6847); or from NTIS's website 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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Appendix A. Analysis of Domestic Samples by Commodity Group in 2001

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
A. Grains and Grain Products					
Barley & barley products	11	90.9	0.0		
Corn & corn products	64	50.0	0.0		
Oats & oat products	9	77.8	0.0		
Rice & rice products	44	65.9	2.3	1	
Soybeans & soybean products	25	84.0	0.0		
Wheat & wheat products	94	46.8	0.0		
Other grains & grain products	7	57.1	0.0		
Breakfast cereals	28	71.4	0.0		
Bakery products, crackers, etc.	4	0.0	0.0		
Total	**286**	**58.4**	**0.3**	**1**	**0**
B. Milk/Dairy Products/Eggs					
Cheese & cheese products	3	100.0	0.0		
Eggs	14	100.0	0.0		
Milk/cream & milk products	16	93.8	0.0		
Total	**33**	**97.0**	**0.0**	**0**	**0**
C. Fish/Shellfish/Other Aquatic Products					
Fish and Fish Products	92	77.2	0.0		
Shellfish & Crustaceans	19	100.0	0.0		
Other Aquatic Animals & Products	3	100.0	0.0		
Total	**114**	**81.6**	**0.0**	**0**	**0**
D. Fruits					
Blackberries	3	33.3	0.0		
Blueberries	17	64.7	0.0		
Cranberries	10	40.0	0.0		
Grapes, raisins	8	75.0	0.0		
Raspberries	3	33.3	0.0		
Strawberries	51	37.2	0.0		
Grapefruit	5	20.0	0.0		
Lemons	4	0.0	0.0		
Limes	1	100.0	0.0		
Oranges	42	35.7	0.0		
Other citrus fruit	11	45.5	0.0		
Apples	233	32.2	0.4		1
Pears	34	26.5	0.0		
Other pome fruit	3	66.7	0.0		

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.
[b] Residue in one or more samples 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
Apricots	8	25.0	12.5	1	
Avocadoes	2	100.0	0.0		
Cherries	46	32.6	2.2	1	
Nectarines	6	33.3	0.0		
Peaches	85	35.3	4.7	1	3
Plums	11	27.3	0.0		
Kiwi fruit	2	100.0	0.0		
Papaya	1	100.0	0.0		
Pineapple	1	100.0	0.0		
Cantaloupe	21	28.6	0.0		
Honeydew	1	0.0	0.0		
Watermelon	21	81.0	4.8		1
Other melons	7	71.4	0.0		
Apple juice	41	75.6	0.0		
Citrus juice	6	66.7	0.0		
Other fruit juices	13	53.9	0.0		
Fruit jams/jellies/pastes/toppings	13	61.5	0.0		
Total	**710**	**40.3**	**1.1**	**3**	**5**
E. Vegetables					
Corn	51	100.0	0.0		
Mung beans and bean sprouts	1	100.0	0.0		
Peas (green/snow/sugar/sweet)	37	86.5	0.0		
String beans (green/snap/pole/long)	76	77.6	2.6		2
Other beans & peas & products	35	91.4	0.0		
Cucumbers	38	63.2	0.0		
Eggplant	5	80.0	0.0		
Okra	6	100.0	0.0		
Peppers, hot	8	87.5	0.0		
Peppers, sweet	14	64.3	0.0		
Squash/pumpkins	43	72.1	0.0		
Tomatoes	44	75.0	0.0		
Other fruiting vegetables	2	50.0	0.0		
Asparagus	9	88.9	0.0		
Bok choy & Chinese cabbage	5	40.0	0.0		
Broccoli	24	75.0	8.3	1	1
Cabbage	35	82.9	2.9		1
Cauliflower	7	100.0	0.0		

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.
[b] Residue in one or more samples 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
Celery	18	16.7	0.0		
Collards	11	63.6	0.0		
Endive	6	33.3	16.7		1
Kale	4	50.0	0.0		
Lettuce, head	30	56.7	0.0		
Lettuce, leaf	23	73.9	0.0		
Mustard greens	4	50.0	0.0		
Spinach	20	40.0	0.0		
Other leaf & stem vegetables	16	75.0	0.0		
Mushrooms and Truffles	2	100.0	0.0		
Carrots	60	70.0	1.7		1
Onions/leeks/scallions/shallots	31	100.0	0.0		
Potatoes	144	41.7	4.2	6	
Radishes	2	50.0	0.0		
Red beets	11	100.0	0.0		
Sweet potatoes	21	81.0	0.0		
Turnips	5	100.0	0.0		
Other root & tuber vegetables	5	20.0	0.0		
Vegetables with sauce	1	100.0	0.0		
Vegetables, dried or paste	20	95.0	0.0		
Other vegetables/vegetable products	14	57.1	0.0		
Total	**888**	**70.0**	**1.5**	**7**	**6**
F. Other					
Almonds & almond products	1	100.0	0.0		
Peanuts & peanut products	9	77.8	0.0		
Other nuts & nut products	2	100.0	0.0		
Edible seeds & seed products	4	50.0	0.0		
Cocoa beans & chocolate products	8	100.0	0.0		
Honey & other sweeteners	18	100.0	0.0		
Baby foods/formula	27	96.3	0.0		
Nonfood items	1	100.0	0.0		
Total	**70**	**92.9**	**0.0**	**0**	**0**
Total A-F	**2,101**	**60.2**	**1.1**	**11**	**11**

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.
[b] Residue in one or more samples exceeded an action level rather than a tolerance.

Appendix B. Analysis of Import Samples by Commodity Group in 2001

Commodity Group	Total Samples	Samples without Residues, %	Samples Violative[a], %	# over tolerance	# no tolerance
A. Grains and Grain Products					
Barley & barley products	19	100.0	0.0		
Corn & corn products	9	100.0	0.0		
Oats & oat products	8	75.0	0.0		
Rice & rice products	27	88.9	0.0		
Soybeans & soybean products	2	100.0	0.0		
Wheat & wheat products	20	85.0	0.0		
Other grains & grain products	10	90.0	0.0		
Breakfast cereals	6	83.3	0.0		
Bakery products, crackers, etc.	7	100.0	0.0		
Pasta and noodles	18	94.4	0.0		
Total	**126**	**91.3**	**0.0**	**0**	**0**
B. Milk/Dairy Products/Eggs					
Cheese & cheese products	13	100.0	0.0		
Eggs	1	100.0	0.0		
Milk/cream & milk products	1	100.0	0.0		
Total	**15**	**100.0**	**0.0**	**0**	**0**
C. Fish/Shellfish/Other Aquatic Products					
Fish and Fish Products	288	93.4	0.3		1
Shellfish & Crustaceans	34	100.0	0.0		
Other Aquatic Animals & Products	4	100.0	0.0		
Total	**326**	**94.2**	**0.3**	**0**	**1**
D. Fruits					
Blackberries	22	68.2	0.0		
Blueberries	6	66.7	0.0		
Cranberries	1	100.0	0.0		
Grapes, raisins	71	36.6	1.4	1	
Raspberries	31	67.7	0.0		
Strawberries	47	36.2	4.3		2
Other berries	7	71.4	0.0		
Clementines	12	0.0	0.0		
Grapefruit	3	66.7	0.0		
Lemons	14	50.0	0.0		
Limes	6	100.0	0.0		
Oranges	23	69.6	0.0		
Other citrus fruit	2	100.0	0.0		

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.
[b] Residue in one or more samples 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
Apples	54	59.3	5.6	1	2
Pears	92	63.0	12.0	1	10
Other pome fruit	10	90.0	0.0		
Apricots	2	50.0	0.0		
Avocadoes	22	95.5	0.0		
Cherries	9	33.3	0.0		
Dates	4	100.0	0.0		
Nectarines	7	0.0	0.0		
Olives	21	100.0	0.0		
Peaches	26	61.5	3.9		1
Plums	18	55.6	0.0		
Other pit fruit	4	75.0	0.0		
Bananas, plantains	106	43.4	0.0		
Guavas	10	80.0	0.0		
Kiwi fruit	20	85.0	5.0		1
Mangoes	26	80.8	7.7		2
Papaya	57	84.2	1.8		1
Pineapple	51	80.4	0.0		
Other sub-tropical fruit	56	87.5	7.1		4
Bitter melon	13	46.1	30.8		4
Cantaloupe	39	48.7	0.0		
Honeydew	21	38.1	0.0		
Watermelon	17	70.6	0.0		
Other melons	12	75.0	0.0		
Other fruits	17	94.1	0.0		
Apple juice	24	91.7	0.0		
Citrus juice	12	100.0	0.0		
Other fruit juices	77	90.9	1.3		1
Fruit jams/jellies/pastes/toppings	131	85.5	2.3		3
Total	**1,203**	**67.8**	**2.8**	**3**	**31**
E. Vegetables					
Corn	24	95.8	0.0		
Mung beans and bean sprouts	7	85.7	0.0		
Peas (green/snow/sugar/sweet)	79	60.8	20.2		16
String beans (green/snap/pole/long)	56	64.3	5.4	2	1
Other beans & peas & products	106	80.2	5.7		6

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.
[b] Residue in one or more samples 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
Cucumbers	108	41.7	3.7		4
Eggplant	30	63.3	13.3		4
Okra	31	80.7	6.5		2
Peppers, hot	232	37.1	11.2	5	21
Peppers, sweet	230	61.7	8.3		19
Squash/pumpkins	190	50.0	7.4	3	11
Tomatoes	283	69.6	3.2		9
Other fruiting vegetables	84	78.6	13.1		11
Artichokes	18	94.4	0.0		
Asparagus	59	91.5	3.4		2
Bamboo shoots	6	100.0	0.0		
Bok choy & Chinese cabbage	19	94.7	5.3		1
Broccoli	33	51.5	0.0		
Cabbage	23	87.0	0.0		
Cauliflower	12	91.7	0.0		
Celery	17	47.1	5.9		1
Collards	3	100.0	0.0		
Endive	11	90.9	0.0		
Kale	20	75.0	10.0		2
Lettuce, head	16	43.8	6.2		1
Lettuce, leaf	22	77.3	13.6	1	2
Mustard greens	5	80.0	20.0		1
Radicchio	6	100.0	0.0		
Spinach	31	58.1	3.2		1
Other leaf & stem vegetables	143	79.0	9.1		13
Mushrooms and Truffles	43	100.0	0.0		
Carrots	42	78.6	7.1		3
Cassava	19	100.0	0.0		
Onions/leeks/scallions/shallots	162	85.2	1.9		3
Potatoes	15	93.3	0.0		
Radishes	60	95.0	1.7		1
Red beets	11	100.0	0.0		
Sweet potatoes	25	100.0	0.0		
Turnips	7	85.7	0.0		
Water chestnuts	14	85.7	14.3		2
Other root & tuber vegetables	49	87.8	4.1		2
Vegetables with sauce	11	81.8	9.1		1
Vegetables, dried or paste	97	66.0	8.2		8
Other vegetables/vegetable products	47	87.2	2.1		1
Total	**2,506**	**69.1**	**6.4**	**11**	**149**

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.
[b] Residue in one or more samples 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
F. Other					
Cashews	18	77.8	5.6		1
Coconut & coconut products	8	100.0	0.0		
Peanuts & peanut products	16	50.0	31.2		5
Other nuts & nut products	18	88.9	0.0		
Edible seeds & seed products	25	96.0	0.0		
Vegetable oil, crude	4	100.0	0.0		
Vegetable oil, refined	4	100.0	0.0		
Spices & condiments & flavors	45	75.6	15.6	1	6
Beverages & water	7	100.0	0.0		
Beverage bases	7	28.6	0.0		
Coffee/tea/wine	3	100.0	0.0		
Honey & other sweeteners	14	92.9	0.0		
Baby foods/formula	6	100.0	0.0		
Other food products, incl. prepared foods	14	92.9	7.1		1
Nonfood items	9	77.8	22.2		2
Total	**198**	**82.3**	**8.1**	**1**	**15**
Total A-F	**4,374**	**72.0**	**4.8**	**15**	**196**

[a] Includes samples with residues over tolerance or action level and samples with residues with no tolerance.
[b] Residue in one or more samples exceeded an action level rather than a tolerance.