Pesticide Prioritization Framework for the U.S. National Residue Program

FSIS continues to identify analytes of high public health concern to enhance the National Residue Program (NRP). Through our regular interagency meetings, FSIS works closely with the Environmental Protection Agency (EPA) to determine pesticides for inclusion into the testing program. FSIS uses a risk-based prioritization approach to develop a framework and rank pesticide residues based on relative public health concern. This approach is applied to a comprehensive list of pesticides that are used domestically and internationally (in countries that are eligible to export to the United States) and includes all pesticides with tolerances established by EPA for FSIS-regulated products. For pesticide residues with EPA-established tolerances in meat, poultry and egg products the associated U.S. Code of Federal Regulations (CFR) citation for the tolerance is listed. Through this process, FSIS ensures that all pesticides, including all pesticides with an EPA-established tolerance, are considered for inclusion in the NRP, while allowing the Agency to focus its analytical resources on the highest-priority pesticides. Due to analytical capabilities, FSIS does not currently test for some of the pesticides that are listed in the in the Agency's pesticide prioritization framework. FSIS notes that by not testing for these pesticides, the Agency does not know the extent to which exposures to these pesticides occur in the foods that FSIS regulates. As analytical techniques and methodologies advance, FSIS works closely with the EPA to prioritize pesticides and with the Agricultural Research Service to evaluate the addition of additional pesticide residues into the multi-residue pesticide method. Currently, FSIS analyzes for 108 of the 482 ranked pesticide residues. Details on the analytical method can be found in the FSIS Chemistry Laboratory Guidebook.

The pesticides are ranked based on various factors as described below:

The categories of " Usage (S)," "Bioavailability (B)," "Health-Based Guidance Value (H)," and "Carcinogenicity (C)" were employed as predictors of risk per unit of consumption from pesticides in animal products. The model uses a 6-point scale to give variability between overall score. The ranking list developed assesses both the toxicity and exposure of 482 pesticide residues and rank each residue based on potential human health risk. FSIS is analyzing for 108 of the 482 ranked pesticide residues. For each chemical, the relative risk assessment can be summarized with the following equation.

$$\boldsymbol{Relative\ public\ health\ risk = Exposure \times Toxicity}$$

The variables **S, and B** represent pesticide exposure and variables **H** and **C** represent the pesticides toxicity. By multiplying weighted average exposure (**S, and B**) to the weighted average of toxicity (**H** and **C**), a rough estimate of the relative risk per unit of consumption represented by each pesticide or pesticide class is obtained.

$$\boldsymbol{Relative\ public\ health\ risk\ score} = \left(\frac{\boldsymbol{S+B}}{\boldsymbol{2}}\right) \times \left(\frac{\boldsymbol{H+C}}{\boldsymbol{2}}\right)$$

1. Usage (S)

The U.S. Geological Survey (USGS) publishes the annual county-level pesticide use survey. The survey estimated pesticide usage (in kilograms (kg)) in the US 2016. FSIS believes this data is important because the increase usage of pesticides increases the probability of the pesticide being present in the food supply, including FSIS-regulated products.

Categorical distribution of pesticide usage (in kg)

6 If usage is > 1,000,000 kg

5 If usage is > 750,000 and ≤ 1,000,000 kg
4 If usage is > 500,000 and ≤ 750,000 kg
3 If usage is > 250,000 and ≤ 500,000 kg
2 If usage is > 1,000 and ≤ 250,000 kg
1 If usage is ≤ 1,000 kg

2. Bioavailability (B)

The bioavailability (B) factor has been adopted from the previously published blue book ranking models. This is a measure of a chemical's relative affinity for fat, as measured by the octanol-water coefficient, log K_{ow}. The log K_{ow} is defined as the ratio of a compound's concentration in a known volume of *n*-octanol to its concentration in a known volume of water after the octanol and water have reached equilibrium (Leo 1971). Compounds that have a high affinity for octanol tend to bioaccumulate in body fat and can easily cross the plasma membrane of cells. This is a concern, in that the chemical will stay in the fat of FSIS-regulated products. The log K_{ow} was calculated using EPA's EPISuite (v4.11) for chemicals lacking published log K_{ow}.

Categorical distribution of bioavailability

6 If log K_{ow} is > 5
5 If log K_{ow} is > 4 and ≤ 5
4 If log K_{ow} is > 3 and ≤ 4
3 If log K_{ow} is > 2 and ≤ 3
2 If log K_{ow} is > 1 and ≤ 2
1 If log K_{ow} is < 1

3. Health-Based Guideline Value (H)

Before pesticides are approved by EPA, each pesticide has to go through a rigorous testing process. It is at this stage that EPA determines if the pesticides have the potential to enter our food supply. Based on this possibility, dietary acute reference dose (aRFD) and chronic reference dose (cRFD) are determined.

The cRFD is an estimate (with uncertainty spanning an order of magnitude or greater) of a daily oral exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. The aRFD and cRFD are calculated by dividing the no-observed-adverse-effect-level (NOAEL) (i.e., the highest dose that gave no observable adverse effect) or the lowest-observed-adverse-effect-level (LOAEL) (i.e., the lowest dose at which an adverse effect was seen) by uncertainty factors (UF). UF's are used to account for differences between different humans (intraspecies variability) and for differences between the test animals and humans (interspecies extrapolation). If the LOAEL is used, an additional UF is required. These scores represent EPA's professional assessment of the extent to which the chronic dietary exposure to this compound may exceed EPA's level of concern. For each chemical, the level of regulatory concern was determined by the toxicological endpoint, chronic population adjusted dose (cPAD).

Categorical distribution of the cPAD

6 If HBGV is < 1E-6
5 If HBGV is < 1E-5 and ≥ 1E-6
4 If HBGV is < 1E-4 and ≥ 1E-5
3 If HBGV is < 1E-3 and ≥ 1E-4
2 If HBGV is < 1E-2 and ≥ 1E-3
1 If HBGV is ≥ 1E-2

4. Carcinogenic Potential (C)

The carcinogenic potential (C) factor is based on a report published by EPA's Office of Pesticide Programs, Chemicals Evaluated for Carcinogenic Potential (Dec 2018). The report lists the carcinogenicity hazard for pesticides, with no consideration of exposure information. The ranking is based on an EPA lettering system, designating the degree of carcinogenic potential. Similar to the previously mentioned variables, the carcinogenic potential will be classified based on the weight of evidence narrative in the cancer risk assessment.

Categorical distribution of the carcinogenic potential

4 or 6	Likely to Be Carcinogenic to Humans, Probable Carcinogenic to Humans
3	Suggestive Evidence of Carcinogenic Potential Possible Carcinogenic to Humans
2	Not Classifiable as to Human Carcinogenicity
1	Evidence of Non-carcinogenicity for Humans, Not Likely to Be Carcinogenic to Humans

For chemicals classified as 1) likely to be carcinogenic to humans and 2) probable carcinogenic to humans, the respective cancer slope factors (Q*) were used to determine the score. For $Q^* > 1$, the chemical was given 6 points, and for $Q^*<1$, the chemical was given 4 points.

Chemical Identification and Prioritization Framework Model Results

The chemical identification and prioritization framework determines an overall score for each pesticide residue (482 pesticide residues) evaluated and rank residues based on relative public health impact. The table includes each chemical residue, the respective classification type, relative public health scores, current sampling status, and current statutory U.S. Code of Federal Regulations (CFR) for each pesticide residues.

Table Legend:

Rank – Chemical Prioritization rank based-on relative public health importance

Chemical – Name of pesticide residue or active metabolite

Type – Classification type of each residue

S – Usage

B – Bioavailability

H – Health-Based Guidance Value

C – Carcinogenicity

Score – Final Score

FSIS Sampling – Indicates whether the residue is included in the FY2019 NRP

EPA Ranking – Priority list developed by EPA, which summarize pesticide analytes monitored in meats and poultry as part of USDA's Pesticide Data program (PDP)

Authority – All pesticides with EPA-established tolerances in FSIS-regulated products include a citation to the U.S. Code of Federal Regulations (CFR)

Pesticide Ranking Based on Relative Public Health Impact

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
1	Tribufos (DEF)	He	6	6	3	4	21.0	N	H	CFR 180.272
2	Aldrin	In	1	6	4	6	17.5	Y	H	CPG 575.100
3	Dieldrin	In	1	6	4	6	17.5	Y	HH	CPG 575.100
4	Chlordane cis	Pe	1	6	3	6	15.8	Y	HH	CPG 575.100
5	Chlordane trans	Pe	1	6	3	6	15.8	Y	HH	CPG 575.100
6	Heptachlor	In	1	6	3	6	15.8	Y	H	CPG 575.100
7	Hexachlorobenzene (HCB)	Fu	1	6	3	6	15.8	Y	HH	CPG 575.100
8	Chlordane	Pe	1	6	3	6	15.8	N		CPG 575.100
9	Chlordane-alpha-cis	Pe	1	6	3	6	15.8	N		CPG 575.100
10	Propargite	In	6	6	1	4	15.0	N	H	CFR 180.259
11	Trifluralin	He	6	6	2	3	15.0	N	H	
12	Mancozeb	Fu	6	2	3	4	14.0	N		CFR 180.176
13	Terbufos	In	6	5	4	1	13.8	N		
14	Diuron	He	6	3	2	4	13.5	Y	L	CFR 180.106
15	Propanil	He	6	4	2	3	12.5	Y	L	CFR 180.274
16	Alpha-Hexachlorocyclohexane	In	1	4	4	6	12.5	N	M	
17	Haloxyfop	Pe	1	4	4	6	12.5	N		
18	Triphenyltin hydroxide	Pe	1	4	4	6	12.5	N		
19	Chlorothalonil	Fu	6	4	1	4	12.5	Y	HH	CFR 180.275
20	Acetochlor	He	6	4	1	4	12.5	N		CFR 180.470
21	DDD	In	1	6	3	4	12.3	Y	H	CPG 575.100
22	DDD o,p'	In	1	6	3	4	12.3	Y	H	CPG 575.100
23	DDE o,p'	In	1	6	3	4	12.3	Y	H	CPG 575.100
24	DDD p,p' + DDT o,p'	In	1	6	3	4	12.3	Y	HH	CPG 575.100
25	DDE p,p'	In	1	6	3	4	12.3	Y	HH	CPG 575.100
26	DDT	In	1	6	3	4	12.3	Y	HH	CPG 575.100
27	DDT p,p'	In	1	6	3	4	12.3	Y	HH	CPG 575.100
28	Ethoprop	In	3	4	3	4	12.3	N		
29	Lactofen	He	3	5	2	4	12.0	N		
30	Pendimethalin	He	6	6	1	3	12.0	N		CFR 180.361
31	Permethrin (cis&trans)	In	3	6	1	4	11.3	Y	HH	CFR 180.378
32	Captan	Fu	6	3	1	4	11.3	N	L	CFR 180.103
33	Tetraconazole	Fu	2	5	2	4	10.5	Y	M	CFR 180.557
34	Bromadiolone	Pe	1	6	5	1	10.5	N		
35	Flocoumafen	Pe	1	6	5	1	10.5	N		
36	Mirex	In	1	6	3	3	10.5	N	H	CPG 575.100
37	Diclofop methyl	He	2	5	2	4	10.5	N		
38	Quintozene (Pentachloronitrobenzene)	Fu	2	5	3	3	10.5	N	M	
39	Kresoxim-methyl	Fu	2	4	3	4	10.5	N		CFR 180.554
40	Benfluralin	He	2	6	2	3	10.0	N	H	

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
41	Bifenthrin	In	4	6	1	3	10.0	Y	HH	CFR 180.442
42	Acifluorfen	He	4	4	1	4	10.0	N		
43	Dicofol (as dichlorobenzophenone)	In	2	6	2	3	10.0	N	H	
44	Oxyfluorfen	He	3	5	2	3	10.0	N	M	CFR 180.381
45	Spirodiclofen	In	2	6	1	4	10.0	N	H	CFR 180.608
46	Bromoxynil	He	6	4	1	3	10.0	N		CFR 180.324
47	MCPA (2-Methyl-4-chlorophenoxyacetic acid)	He	6	4	3	1	10.0	N		CFR 180.339
48	Propiconazole	Fu	6	4	1	3	10.0	Y	M	CFR 180.434
49	Carbaryl (1-Naphthol)	In	5	3	1	4	10.0	Y	HH	CFR 180.169
50	Ethalfluralin	He	4	6	1	3	10.0	N	H	
51	Fipronildesulfinyl	In	1	5	3	3	9.0	Y		
52	Fipronilsulfide	In	1	5	3	3	9.0	Y		
53	Fipronil	In	2	4	3	3	9.0	Y	HH	CFR 180.517
54	Clodinafop-propargyl	He	2	4	3	3	9.0	N		
55	Dimethenamid	He	6	3	1	3	9.0	N		
56	Tralkoxydim	He	1	5	2	4	9.0	N		
57	Tembotrione	He	3	3	3	3	9.0	N		CFR 180.634
58	Tebuconazole	Fu	5	4	1	3	9.0	N		CFR 180.474
59	Oxychlordane (chlordane byproduct)	In	1	6	4	1	8.8	Y	HH	CPG 575.100
60	Pentachlorobenzene (PCB)	Other	1	6	3	2	8.8	Y	H	
61	Resmethrin (cis& trans)	In	1	6	1	4	8.8	Y	H	
62	Amitraz	In	1	6	2	3	8.8	N	L	CFR 180.287
63	Endrin	In	1	6	3	2	8.8	N	H	
64	Ethiprole	Pe	1	6	2	3	8.8	N		
65	Tridiphane	He	1	6	2	3	8.8	N	H	
66	Beta-Hexachlorocyclohexane (b-HCH)	In	1	4	4	3	8.8	N	M	
67	Acephate	In	6	1	2	3	8.8	Y	HH	CFR 180.108
68	Pyraflufen	He	2	5	1	4	8.8	N		CFR 180.585
69	Thiodicarb	Pe	5	2	1	4	8.8	N		
70	Triallate	He	2	5	2	3	8.8	N		
71	Flumicloracpentyl	Pe	2	5	4	1	8.8	N		
72	Chlorpyrifos	In	6	5	2	1	8.3	Y	HH	CFR 180.342
73	Hexythiazox	In	2	6	1	3	8.0	Y	H	CFR 180.448
74	Cypermethrin (all isomers)	In	2	6	1	3	8.0	N	H	CFR 180.418
75	Pyrethrin I	Py	2	6	1	3	8.0	N	HH	CFR 180.128
76	Thiobencarb	He	6	4	1	2	7.5	Y	L	CFR 180.401
77	Profenofos	In	1	5	4	1	7.5	Y	M	CFR 180.404
78	Omethoate (dimethoate byproduct)	In	4	1	3	3	7.5	Y	L	CFR 180.204
79	Imazalil	Fu	2	4	1	4	7.5	Y	M	CFR 180.413
80	Lindane (gamma-hexachlorocyclohexane)	Pe	1	4	3	3	7.5	Y	HH	

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
81	Linuron	He	2	4	2	3	7.5	Y	L	CFR 180.184
82	Chlorfenapyr	Pe	1	5	2	3	7.5	N		
83	Chlorobenzilate	Pe	1	5	1	4	7.5	N		
84	EPN (Ethyl p-nitrophenyl phenylphosphorothioate)	Pe	1	5	4	1	7.5	N		
85	Fenthion (MPP)	In	1	5	4	1	7.5	N	M	
86	Isofenphos	In	1	5	4	1	7.5	N	M	
87	Oxadiazon	He	1	5	2	3	7.5	N	M	
88	Prochloraz	Fu	1	5	2	3	7.5	N		
89	Cadusafos	In	1	4	5	1	7.5	N		
90	Etridiazole	Fu	1	4	2	4	7.5	N	L	
91	Oxythioquinox	Pe	1	4	2	4	7.5	N	M	
92	Disulfoton	Pe	1	5	4	1	7.5	N		
93	Fluthiacet-Methyl (CGA-248757)	Pe	2	3	2	4	7.5	N		
94	Isoxaflutole	He	3	3	1	4	7.5	N	L	
95	Ziram	Fu	4	2	2	3	7.5	N		
96	Nonachlor-cis	In	1	6	3	1	7.0	Y	H	
97	Ethion	In	1	6	3	1	7.0	Y	H	
98	Ethion monoxon	In	1	6	3	1	7.0	Y	HH	
99	Nonachlor-trans	In	1	6	3	1	7.0	Y	H	
100	Piperonyl butoxide	Sy	2	5	1	3	7.0	Y	HH	CFR 180.127
101	Buprofezin	In	2	5	1	3	7.0	Y	M	CFR 180.511
102	Fenoxaprop ethyl	He	2	5	1	3	7.0	Y	M	CFR 180.430
103	Malathion	In	4	3	1	3	7.0	Y	L	CFR 180.111
104	Carbophenothion	In	1	6	3	1	7.0	N	H	
105	Chlorthal dimethyl (DCPA)	Pe	2	5	1	3	7.0	N		
106	Difenoconazole	Fu	2	5	1	3	7.0	Y	M	CFR 180.475
107	Dinocap	Fu	1	6	3	1	7.0	N		
108	Methoxychlor	In	1	6	2	2	7.0	N	H	
109	Metrafenone	He	2	5	1	3	7.0	N		
110	Penthiopyrad	Fu	2	5	1	3	7.0	N		CFR 180.658
111	Parathion methyl	In	1	3	4	3	7.0	N	M	
112	Phorate (thimet)	In	3	4	3	1	7.0	N	M	
113	Ethephon	He	6	1	2	2	7.0	N		CFR 180.300
114	Quizalofop ethyl	He	2	5	2	2	7.0	N	M	CFR 180.441
115	Dicrotophos	In	3	1	4	3	7.0	N		
116	Glufosinate-ammonium	He	6	1	3	1	7.0	N		CFR 180.473
117	Simazine	He	6	3	2	1	6.8	Y	L	CFR 180.213
118	Fomesafen	He	6	3	2	1	6.8	N		
119	2,4-D (2,4-Dichlorophenoxyacetic acid)	He	6	3	1	2	6.8	N		CFR 180.142
120	Cyhalothrin-lambda	Py	3	6	2	1	6.8	N		
121	Dicamba	He	6	3	1	2	6.8	N		CFR 180.227

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
122	Tetrachlorvinphos	In	1	4	1	4	6.3	Y	M	CFR 180.252
123	Thiabendazole	Fu	2	3	1	4	6.3	Y	HH	CFR 180.242
124	Dinoseb	Fu	1	4	2	3	6.3	N		
125	Epoxiconazole	Fu	1	4	1	4	6.3	N		
126	Iprovalicarb	Fu	1	4	1	4	6.3	N		
127	Molinate	Pe	1	4	2	3	6.3	N		
128	Parathion (Parathion-ethyl)	In	1	4	2	3	6.3	N	M	
129	Procymidone	Fu	1	4	1	4	6.3	N		
130	Terbutryn	He	1	4	2	3	6.3	N		
131	Tolyfluanid	In	1	4	1	4	6.3	N		
132	Alachlor	He	1	4	1	4	6.3	Y	M	CFR 180.249
133	Dimethoate	In	4	1	2	3	6.3	Y	L	CFR 180.204
134	Cyproconazole	Fu	2	3	1	4	6.3	N		CFR 180.485
135	Iprodione	Fu	2	3	1	4	6.3	N	L	CFR 180.399
136	Triadimenol	Fu	1	4	2	3	6.3	N	L	
137	Pyridaben	In	2	6	2	1	6.0	Y	H	CFR 180.494
138	Diazinon	In	2	4	3	1	6.0	Y	HH	CFR 180.153
139	Tefluthrin	In	2	6	2	1	6.0	Y	H	
140	Metribuzin	He	6	2	1	2	6.0	Y	L	CFR 180.332
141	Boscalid	Fu	3	3	1	3	6.0	Y	HH	CFR 180.589
142	Ethion dioxon	In	1	5	3	1	6.0	N	H	
143	Isoxaben	He	2	4	1	3	6.0	N		
144	Picoxystrobin	Fu	2	4	1	3	6.0	N		CFR 180.669
145	Pirimiphos ethyl	Pe	1	5	3	1	6.0	N		
146	Sulfoxaflor	In	2	4	1	3	6.0	N		CFR 180.668
147	Tetramethrin	In	1	5	1	3	6.0	N	M	
148	Bicyclopyrone	He	2	2	3	3	6.0	N		CFR 180.682
149	Flumethrin	Py	2	6	2	1	6.0	N		
150	Prometryn	He	4	4	2	1	6.0	N		
151	Clofentezine	Pe	2	4	1	3	6.0	N	L	CFR 180.446
152	Dichlorprop-P	He	2	4	3	1	6.0	N		
153	Fluazinam	Fu	2	4	1	3	6.0	N		CFR 180.574
154	Flufenacet	He	2	4	3	1	6.0	N	L	CFR 180.527
155	Fluometuron	Fu	3	3	1	3	6.0	N		CFR 180.229
156	Pyrimethanil	Fu	2	4	1	3	6.0	N		CFR 180.518
157	2,4-Db	He	4	4	2	1	6.0	N		CFR 180.331
158	Chlorpyrifos methyl	Pe	1	5	3	1	6.0	Y	M	CFR 180.419
159	Fenbuconazole	Fu	2	4	1	3	6.0	N	L	CFR 180.480
160	Triclopyr	He	5	3	1	2	6.0	N		
161	Mesotrione	Pe	6	2	2	1	6.0	N		
162	Pentachloroaniline (PCA)	Other	1	6	2	1	5.3	Y	H	
163	Sulprofos	In	1	6	2	1	5.3	Y	H	
164	Dimoxystrobin	Fu	1	6	2	1	5.3	N		

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
165	Fenvalerate (also see Esfenvalerate)	In	1	6	2	1	5.3	N	H	
166	Hydroprene	In	1	6	1	2	5.3	N	H	
167	Phenothrin	In	1	6	2	1	5.3	N	H	
168	Picolinafen	Pe	1	6	2	1	5.3	N		
169	Tolfenpyrad	In	1	6	2	1	5.3	N		CFR 180.675
170	Dodine	Pe	2	5	2	1	5.3	N		
171	Propazine	He	3	4	2	1	5.3	N		
172	Famoxadone	Fu	2	5	2	1	5.3	N	M	CFR 180.587
173	Fluazifop-p-butyl	He	2	5	2	1	5.3	N	M	CFR 180.411
174	Gamma-Cyhalothrin	Py	1	6	2	1	5.3	N		CFR 180.438
175	Fludioxonil	Fu	2	5	1	2	5.3	N		CFR 180.516
176	Paraquat	He	6	1	2	1	5.3	N		CFR 180.205
177	Metolachlor	He	6	4	1	1	5.0	Y	L	CFR 180.368
178	MGK-264 (isomers 1&2)	Sy	1	4	1	3	5.0	Y	HH	
179	Propetamphos	In	1	4	3	1	5.0	Y	M	
180	Propachlor	He	1	3	1	4	5.0	Y	L	CFR 180.211
181	Norflurazon	He	2	3	1	3	5.0	Y	L	CFR 180.356
182	Heptachlor epoxide (cis&trans) or (B+A)	In	1	1	4	6	5.0	Y	HH	CPG 575.100
183	Bromacil	Pe	2	3	1	3	5.0	N		
184	Chlorfenvinphos	In	1	4	3	1	5.0	N	M	
185	Endrin ketone	In	1	4	3	1	5.0	N		
186	Fenamiphos	In	1	4	3	1	5.0	N	L	
187	Hexaconazole	Fu	1	4	1	3	5.0	N		
188	Terbuthylazine	He	1	4	2	2	5.0	N		
189	Triflusulfuron-methyl	Pe	1	4	1	3	5.0	N		
190	Vinclozolin	Fu	1	4	1	3	5.0	N	L	
191	Famphur	Pe	1	3	4	1	5.0	N		
192	Fenthion sulfone	In	1	3	4	1	5.0	N	M	
193	Folpet	Pe	1	3	1	4	5.0	N		
194	Methidathion	In	1	3	2	3	5.0	N	L	
195	Triadimefon	Fu	1	3	2	3	5.0	N	L	
196	EPTC (S-Ethyl dipropylthiocarbamate)	He	6	4	1	1	5.0	N		
197	Pyrasulfotole	He	2	3	1	3	5.0	N		CFR 180.631
198	Clethodim	He	5	5	1	1	5.0	N	M	CFR 180.458
199	Thiacloprid	In	2	2	1	4	5.0	N	L	CFR 180.594
200	Pyraclostrobin	Fu	6	4	1	1	5.0	N	M	CFR 180.582
201	Endosulfan I	In	1	5	2	1	4.5	Y	HH	
202	Primisulfuron	He	2	4	2	1	4.5	N		CFR 180.452
203	Atrazine	He	6	3	1	1	4.5	Y	L	CFR 180.220
204	Azoxystrobin	Fu	6	3	1	1	4.5	N	L	CFR 180.507
205	Dichlorvos (ddvp)	Pe	1	2	3	3	4.5	N	L	CFR 180.235

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
206	Bitertanol	Fu	1	5	2	1	4.5	N		
207	Furathiocarb	Pe	1	5	2	1	4.5	N		
208	Penconazole	Fu	1	5	2	1	4.5	N		
209	Phenmedipham	Pe	2	4	1	2	4.5	N		
210	Phosalone	In	1	5	2	1	4.5	N	M	
211	Propaquizafop	He	1	5	2	1	4.5	Y		
212	Prosulfocarb	He	1	5	2	1	4.5	N		
213	Triflumuron	Pe	1	5	2	1	4.5	N		
214	Pirimicarb	Other	1	2	2	4	4.5	N		
215	Propoxur	In	1	2	2	4	4.5	Y		
216	Quinclorac	He	3	3	1	2	4.5	N		CFR 180.463
217	Bentazon	He	6	3	1	1	4.5	N		CFR 180.355
218	Pymetrozine	In	2	1	2	4	4.5	Y		
219	Fenpropathrin	Py	2	6	1	1	4.0	N	H	CFR 180.466
220	Pyriproxyfen	In	2	6	1	1	4.0	N	H	
221	Trifloxystrobin	Fu	3	5	1	1	4.0	N	M	CFR 180.555
222	Acequinocyl	In	2	6	1	1	4.0	N		CFR 180.599
223	Fenazaquin	In	2	6	1	1	4.0	Y		
224	Etoxazole	In	2	6	1	1	4.0	N		CFR 180.593
225	Fenbutatin oxide	In	2	6	1	1	4.0	N		CFR 180.362
226	Fenpyroximate	Pe	2	6	1	1	4.0	N	H	CFR 180.566
227	Florasulam	Pe	2	6	1	1	4.0	N		
228	Methiocarb	In	1	3	2	2	4.0	N	L	
229	Novaluron	He	2	6	1	1	4.0	N	H	CFR 180.598
230	Triforin	Fu	1	3	1	3	4.0	N		
231	Cyhalothrin (all isomers)	In	2	6	1	1	4.0	N	HH	
232	Fluroxypyr	He	5	3	1	1	4.0	N	L	CFR 180.535
233	Dichlobenil	Pe	1	3	1	3	4.0	N		
234	ETU (Ethylene thiourea)	Pe	1	1	4	4	4.0	N		
235	Cyfluthrin (all isomers)	In	2	6	1	1	4.0	Y	HH	CFR 180.436
236	Esfenvalerate	In	2	6	1	1	4.0	N	H	CFR 180.533
237	Phosmet	In	1	3	1	3	4.0	N	L	CFR 180.261
238	Chlorpyrifos oxon	In	1	3	3	1	4.0	N		
239	Prallethrin	In	1	4	1	2	3.8	N	M	
240	Endosulfan II	In	1	4	2	1	3.8	Y	HH	
241	Endosulfan sulfate	In	1	4	2	1	3.8	Y	HH	
242	Endosulfan	Pe	1	4	2	1	3.8	N	HH	CFR 180.182
243	Ethofumesate	He	2	3	1	2	3.8	N	L	CFR 180.345
244	Ametryn	He	2	3	2	1	3.8	Y		
245	Azinphos-ethyl	In	1	4	2	1	3.8	Y	L	
246	Chloroxuron	He	1	4	2	1	3.8	N		
247	Fenitrothion (MEP)	In	1	4	2	1	3.8	N	L	
248	Fluquinconazole	Fu	1	4	2	1	3.8	N		

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
249	Fpyriproxyfen	Fu	1	4	2	1	3.8	N	M	
250	Paclobutrazol	Fu	1	4	1	2	3.8	N		
251	Fenarimol	Fu	1	4	2	1	3.8	N	M	
252	Flusilazole	Fu	1	4	2	1	3.8	N		
253	Naptalam	He	1	4	1	2	3.8	N		
254	Diquat	He	2	3	2	1	3.8	N		CFR 180.226
255	Emamectin	In	2	1	4	1	3.8	N		CFR 180.505
256	Sulfosulfuron	He	2	1	1	4	3.8	Y		CFR 180.552
257	Metiram	Pe	2	1	1	4	3.8	Y		
258	Tribenuron methyl	Pe	2	1	2	3	3.8	N		
259	Indoxacarb	In	2	5	1	1	3.5	N	M	CFR 180.564
260	Tebufenozide	In	2	5	1	1	3.5	N	M	CFR 180.482
261	Methoxyfenozide	In	3	4	1	1	3.5	N	M	CFR 180.544
262	2,6-Diisopropylnaphthalene (2,6-DIPN)	He	1	6	1	1	3.5	N	L	
263	Beta cyfluthrin	Pe	1	6	1	1	3.5	N		CFR 180.436
264	Bromophos	In	1	6	1	1	3.5	Y		
265	Bromopropylate	In	1	6	1	1	3.5	N		
266	Carbosulfan	Other	1	6	1	1	3.5	Y		
267	Cloquintocet-mexyl	Pe	1	6	1	1	3.5	N		
268	Cyhexatin	Pe	1	6	1	1	3.5	N		
269	Cyphenothrin	In	1	6	1	1	3.5	N	H	
270	Deltamethrin	In	2	5	1	1	3.5	N	M	CFR 180.435
271	Etofenprox	In	1	6	1	1	3.5	N		CFR 180.620
272	Flucythrinate	Py	1	6	1	1	3.5	N		
273	Flufenoxuron	In	1	6	1	1	3.5	N	H	CFR 180.623
274	Fluxapyroxad	Fu	3	4	1	1	3.5	N		CFR 180.666
275	Isoxadifen-ethyl	He	1	6	1	1	3.5	Y		
276	Mefenpyr-diethyl	He	2	5	1	1	3.5	N		CFR 180.509
277	Methoprene	In	1	6	1	1	3.5	N	H	CFR 180.1033
278	Pyridate	Pe	1	6	1	1	3.5	N		
279	S-methoprene	Pe	1	6	1	1	3.5	N		CFR 180.368
280	Spiroxamine	Pe	1	6	1	1	3.5	N		
281	Temephos	In	1	6	1	1	3.5	N		
282	Tridemorph	Fu	1	6	1	1	3.5	N		
283	Butralin	He	2	5	1	1	3.5	N		
284	Cyhalofop-butyl	He	2	5	1	1	3.5	Y		
285	Fluopicolide	Fu	2	5	1	1	3.5	N		
286	Fluopyram	Fu	2	5	1	1	3.5	N		CFR 180.661
287	Flutolanil	Fu	3	4	1	1	3.5	N	M	CFR 180.484
288	Quinoxyfen	Pe	2	5	1	1	3.5	N		
289	Spiromesifen	In	2	5	1	1	3.5	N	M	CFR 180.607
290	Prothioconazole	Fu	3	4	1	1	3.5	N		CFR 180.626

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
291	Amitrole	He	1	1	3	4	3.5	N		
292	Clopyralid	He	5	2	1	1	3.5	N		CFR 180.431
293	Flumioxazin	He	4	3	1	1	3.5	N		
294	Glyphosate	He	6	1	1	1	3.5	N		CFR 180.364
295	Fluvalinate (τ-Fluvalinate)	In	1	5	1	1	3.0	N	M	
296	Pirimiphos methyl	In	1	5	1	1	3.0	N	M	CFR 180.409
297	Benoxacor	He	1	3	2	1	3.0	N	L	CFR 180.460
298	Diflubenzuron	In	2	4	1	1	3.0	N	M	CFR 180.377
299	Carbofuran	In	1	3	2	1	3.0	N	L	
300	Hexazinone	He	2	2	1	2	3.0	N	L	CFR 180.396
301	Carfentrazone ethyl	He	2	4	1	1	3.0	N	L	CFR 180.515
302	Azinphos methyl	In	1	3	2	1	3.0	N	L	
303	Acibenzolar-S-methyl	Fu	2	4	1	1	3.0	N		
304	Cyantraniliprole	In	2	4	1	1	3.0	N		CFR 180.672
305	Desmedipham	He	2	4	1	1	3.0	N		
306	Didecyldimethylammonium chloride	Pe	1	5	1	1	3.0	N		CFR 180.1317
307	Diflufenican	He	1	5	1	1	3.0	N		
308	Fenpropimorph	Pe	1	5	1	1	3.0	N		
309	Propyzamide	He	2	4	1	1	3.0	N		CFR 180.317
310	Tecnazene	Fu	1	5	1	1	3.0	N		
311	Tetradifon	Pe	1	5	1	1	3.0	N		
312	Tolclofos-methyl	Fu	1	5	1	1	3.0	N		
313	4-chlorophenoxyacetic acid (4-cpa)	Pe	1	3	2	1	3.0	N		
314	Dichloran	Pe	1	3	2	1	3.0	Y		
315	Fensulfothion	In	1	3	2	1	3.0	Y		
316	Guazatine	Fu	1	3	2	1	3.0	Y		
317	Naled	Pe	2	2	2	1	3.0	N		
318	Asulam	He	2	1	1	3	3.0	N		CFR 180.360
319	Bifenazate	Other	2	4	1	1	3.0	N	L	CFR 180.572
320	Carbendazim	Fu	1	2	1	3	3.0	N	L	
321	Clofencet	Pe	1	2	1	3	3.0	N		
322	Diclosulam	Pe	2	4	1	1	3.0	N		
323	Fenamiphos sulfone	In	1	2	3	1	3.0	N	L	
324	Fenamiphos sulfoxide	In	1	2	3	1	3.0	N	L	
325	Fenhexamid	Fu	2	4	1	1	3.0	Y		
326	Ferbam	Pe	2	1	1	3	3.0	N		
327	Flubendiamide	In	2	4	1	1	3.0	N		CFR 180.639
328	Formetanate hydrochloride	Pe	1	2	3	1	3.0	N		
329	Fosthiazate	Other	1	2	3	1	3.0	N		
330	Ipconazole	Fu	1	5	1	1	3.0	N		
331	Mandipropamid	Fu	2	4	1	1	3.0	N		

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
332	MCPB (4-(2-Methyl-4-chlorophenoxy) butyric acid)	He	2	4	1	1	3.0	N		
333	Metconazole	Fu	2	4	1	1	3.0	Y		CFR 180.617
334	Pinoxaden	He	2	4	1	1	3.0	N		CFR 180.611
335	Prosulfuron	He	2	4	1	1	3.0	N		
336	Spirotetramat	In	2	4	1	1	3.0	N		CFR 180.641
337	Chlorantraniliprole	In	2	4	1	1	3.0	N		CFR 180.628
338	Cyclanilide	He	2	2	2	1	3.0	N		CFR 180.506
339	Cyprodinil	Fu	2	4	1	1	3.0	N		CFR 180.532
340	Imazamethabenz-methyl	He	2	2	1	2	3.0	N		
341	Napropamide	He	2	4	1	1	3.0	N		
342	Topramezone	He	2	2	2	1	3.0	N		CFR 180.612
343	Trichlorfon	Pe	1	1	3	3	3.0	N		CFR 180.198
344	Trifloxysulfuron	He	2	2	2	1	3.0	Y		
345	Clomazone	He	3	3	1	1	3.0	N		
346	Flonicamid	In	2	1	1	3	3.0	N	L	CFR 180.613
347	Formetanate	Pe	2	1	3	1	3.0	N		
348	Oxydemeton methyl	In	2	1	3	1	3.0	Y	L	CFR 180.330
349	Phorate oxon	In	1	2	3	1	3.0	N	M	
350	Phorate sulfone	In	1	2	3	1	3.0	N	M	
351	Phorate sulfoxide	In	1	2	3	1	3.0	Y	M	
352	Pyrithiobac sodium	Pe	2	1	1	3	3.0	N		
353	Thiram	Pe	2	2	2	1	3.0	N		
354	Imazethapyr	He	3	3	1	1	3.0	N		CFR 180.447
355	Fentin hydroxide	Fu	2	1	3	1	3.0	N		CFR 180.236
356	Maneb	Pe	1	1	2	4	3.0	N		
357	Thifensulfuron-methyl	He	2	2	1	2	3.0	N		
358	Abamectin (Avermectin B1)	In	2	1	3	1	3.0	N		CFR 180.449
359	Atrazine-desethyl	He	1	3	2	1	3.0	N		
360	Chlorpyrifos-methyl oxon	In	1	2	3	1	3.0	N	M	CFR 180.419
361	Pronamide	He	1	4	1	1	2.5	N	L	
362	Chloroneb	Fu	1	4	1	1	2.5	N	L	
363	Chlorpropham	He	1	4	1	1	2.5	N	L	CFR 180.181
364	Methamidophos	In	1	1	4	1	2.5	N	L	
365	Myclobutanil	Fu	2	3	1	1	2.5	Y	L	CFR 180.443
366	Benalaxyl	Pe	1	4	1	1	2.5	N		
367	Butafenacil	He	1	4	1	1	2.5	Y		CFR 180.592
368	Cloransulam-methyl	Pe	2	3	1	1	2.5	N		
369	Diphenylamine (DPA)	Fu	1	4	1	1	2.5	N	HH	CFR 180.190
370	Ethoxyquin	Fu	1	4	1	1	2.5	N		
371	Fenamidone	Fu	2	3	1	1	2.5	N	L	CFR 180.579
372	Lenacil	He	1	4	1	1	2.5	N		
373	Nitrapyrin	Other	1	4	1	1	2.5	Y	L	

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
374	O-Phenylphenol	Other	1	4	1	1	2.5	Y		
375	Pyroxasulfone	Pe	3	2	1	1	2.5	N		
376	Tepraloxydim	He	1	4	1	1	2.5	Y		
377	Triazophos	Pe	1	4	1	1	2.5	N		
378	Cyazofamid	Fu	2	3	1	1	2.5	N		
379	Dimethomorph	Pe	2	3	1	1	2.5	N		
380	Flucarbazone	Pe	2	3	1	1	2.5	N		
381	Fluoxastrobin	Fu	2	3	1	1	2.5	N	L	CFR 180.609
382	Flutriafol	Fu	2	3	1	1	2.5	N		CFR 180.629
383	Imazapic-ammonium	He	2	3	1	1	2.5	N		CFR 180.490
384	Imazaquin	He	2	3	1	1	2.5	N		
385	Iodosulfuron methyl	Pe	1	4	1	1	2.5	N		
386	Propoxycarbazone	He	2	3	1	1	2.5	N		CFR 180.600
387	Triticonazole	Fu	1	4	1	1	2.5	N		
388	Captan epoxide	Pe	1	1	1	4	2.5	Y		
389	Daminozide	He	1	1	1	4	2.5	N		
390	Monocrotophos	In	1	1	4	1	2.5	N		
391	Phosphine (hydrogen phosphide)	Pe	1	1	3	2	2.5	N		
392	Propylene oxide	Fu	1	1	1	4	2.5	N		
393	Chlorimuron-ethyl	Pe	2	3	1	1	2.5	N		
394	Metsulfuron-methyl	He	2	3	1	1	2.5	N		CFR 180.428
395	Aldicarb sulfone	Other	1	2	2	1	2.3	N	L	
396	Aldicarb sulfoxide	Other	1	2	2	1	2.3	N	L	
397	Deethylatrazine	He	1	2	2	1	2.3	N		
398	Aldicarb	Other	1	2	2	1	2.3	N	L	
399	Azamethiphos	Pe	1	2	2	1	2.3	Y		
400	Bendiocarb	Pe	1	2	2	1	2.3	N		
401	Cyromazine	In	2	1	2	1	2.3	N		CFR 180.414
402	Endothall	He	1	2	2	1	2.3	N		
403	Phosalone oxon	Pe	1	2	2	1	2.3	N		
404	Imazapyr	He	2	1	2	1	2.3	N		CFR 180.500
405	Tebuthiuron	He	1	2	1	2	2.3	N	L	CFR 180.390
406	Aminopyralid	He	2	1	1	2	2.3	N		CFR 180.610
407	Fluridone	He	2	2	1	1	2.0	N	L	CFR 180.420
408	Fluroxypyr-1-Methylhepyl-Ester	He	1	3	1	1	2.0	Y	L	CFR 180.535
409	3-Hydroxycarbofuran	In	1	1	3	1	2.0	Y	L	
410	Metalaxyl	Fu	2	2	1	1	2.0	N	L	CFR 180.408
411	Methomyl	In	3	1	1	1	2.0	N	L	
412	Imidacloprid	In	3	1	1	1	2.0	N	L	CFR 180.472
413	Bupirimate	Fu	1	3	1	1	2.0	N		
414	Chloroneb, hydroxy-	Pe	1	3	1	1	2.0	N		
415	Diphenamid	He	1	3	1	1	2.0	N	L	
416	Diphenamid, desmethyl	Pe	1	3	1	1	2.0	Y		

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
417	Ethoxysulfuron	Pe	1	3	1	1	2.0	N		
418	Flucarbazone-sodium	He	1	3	1	1	2.0	N		CFR 180.562
419	Imiprothrin	In	1	3	1	1	2.0	N	L	
420	Prohexadione calcium	Fu	2	2	1	1	2.0	Y		CFR 180.547
421	Propham	He	1	3	1	1	2.0	N	L	
422	Propoxycarbazone-sodium	He	1	3	1	1	2.0	N		CFR 180.910
423	Trinexapac ethyl	He	2	2	1	1	2.0	N		CFR 180.662
424	Bifenthrin, 4'-hydroxy	Pe	1	1	1	3	2.0	N		
425	Carboxin	Pe	1	3	1	1	2.0	Y	L	CFR 180.301
426	Demeton-S-methyl sulfone	In	1	1	3	1	2.0	Y	L	
427	Dimethipin	Pe	1	1	1	3	2.0	Y		
428	Mesosulfuron methyl	He	2	2	1	1	2.0	N		CFR 180.597
429	Phosmet oxon	In	1	1	1	3	2.0	N		
430	Propamocarb hydrochloride	Fu	2	2	1	1	2.0	N		
431	Pyroxsulam	He	2	2	1	1	2.0	Y		
432	Thidiazuron	He	2	2	1	1	2.0	N		CFR 180.403
433	Thiencarbazone-methyl	Pe	2	2	1	1	2.0	N		CFR 180.645
434	Triasulfuron	He	2	2	1	1	2.0	N		CFR 180.459
435	Triflumazole	Fu	2	2	1	1	2.0	Y	L	CFR 180.476
436	Chlorsulfuron	He	2	2	1	1	2.0	N		CFR 180.405
437	Flumetsulam	He	2	2	1	1	2.0	N		
438	Saflufenacil	He	3	1	1	1	2.0	N		CFR 180.649
439	Terbacil	He	2	2	1	1	2.0	N	L	
440	Diflufenzopyr	He	2	2	1	1	2.0	N	HH	
441	Picloram	He	3	1	1	1	2.0	N		CFR 180.292
442	Sethoxydim	He	2	2	1	1	2.0	N	L	CFR 180.412
443	Malathion oxon	In	1	1	1	3	2.0	N	L	
444	Pyrazon	He	1	2	1	1	1.5	N		CFR 180.316
445	Clothianidin	In	2	1	1	1	1.5	N	L	
446	Coumaphos S	Pe	1	2	1	1	1.5	Y	L	
447	Thiamethoxam	In	2	1	1	1	1.5	N	L	CFR 180.565
448	Amicarbazone	He	1	2	1	1	1.5	N		CFR 180.615
449	Carbetamide	Pe	1	2	1	1	1.5	N		
450	Chloridazon	He	1	2	1	1	1.5	Y		
451	Coumaphos	In	1	2	1	1	1.5	N	L	CFR 180.189
452	Ethametsulfuron methyl	He	1	2	1	1	1.5	N		
453	Spinosad	In	2	1	1	1	1.5	N		CFR 180.495
454	Zineb	Fu	1	2	1	1	1.5	N		
455	Diquat dibromide	He	1	1	2	1	1.5	N		CFR 180.226
456	Flupropanate	Pe	1	1	2	1	1.5	N		
457	Paraquat dichloride	He	1	1	2	1	1.5	N		CFR 180.205
458	Sulfuryl fluoride	Pe	1	1	2	1	1.5	N		CFR 180.575
459	Dinotefuran	In	2	1	1	1	1.5	N	L	CFR 180.603

Rank	Chemicals	Type	S	L	H	C	Score	FSIS Sampling	EPA Rank	Authority
460	Fosetyl	Fu	2	1	1	1	1.5	N		
461	Maleic hydrazide	Pe	2	1	1	1	1.5	N		
462	Propamocarb	Fu	1	2	1	1	1.5	Y		
463	Spinetoram	In	2	1	1	1	1.5	N		CFR 180.635
464	Chlorsulfuron, 5-hydroxy-	Pe	1	2	1	1	1.5	N		
465	Cymoxanil	Fu	2	1	1	1	1.5	N		
466	Imazamox	He	2	1	1	1	1.5	N		CFR 180.1223
467	Oxamyl	In	2	1	1	1	1.5	N		
468	Halosulfuron-methyl	He	2	1	1	1	1.5	Y		CFR 180.479
469	Nicosulfuron	He	2	1	1	1	1.5	N		CFR 180.454
470	Rimsulfuron	He	2	1	1	1	1.5	N		
471	Coumaphos O	Pe	1	1	1	1	1.0	Y	L	
472	Acetamiprid	In	1	1	1	1	1.0	N	L	CFR 180.578
473	Azimsulfuron	He	1	1	1	1	1.0	N		
474	Azinphos-methyl oxon	In	1	1	1	1	1.0	N	L	
475	Chlormequat	Pe	1	1	1	1	1.0	Y		CFR 180.698
476	Dalapon (2,2-dpa)	He	1	1	1	1	1.0	N		
477	Difenzoquat	Pe	1	1	1	1	1.0	N		
478	Fosetyl-aluminum	Fu	1	1	1	1	1.0	N		
479	Glyphosate-Trimethylsulfonium (Sulfosate)	Pe	1	1	1	1	1.0	N		
480	Mepiquat chloride	He	1	1	1	1	1.0	N		CFR 180.384
481	Piperazine	Fu	1	1	1	1	1.0	N		
482	Mepiquat	He	1	1	1	1	1.0	N		

*Chemical type: fungicide “Fun,” insecticide “In,” herbicide “He,” pesticide “Pe,” pyrethroids “Py,” synergist “Sy,” other “Ot.”

** Priority list developed with EPA, which summarize pesticide analytes that have been monitored in meats and poultry as part of USDA’s Pesticide Data program (PDP). “HH” – highest priority, “H”- high priority, “M”- medium priority, L- low priority.

***Pesticides with EPA-established tolerances on FSIS-regulated products. Regulations are codified annually in the U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment is the section of the CFR that deals with EPA's mission of protecting human health and the environment. Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed are located in the Compliance Policy Guide (CPG),” Sec. 575.100