UNITED STATES
National Residue Program
for
Meat, Poultry, and Egg Products

2019 Residue Sampling Plans
October 1, 2018 to September 30, 2019

United States Department of Agriculture
Food Safety and Inspection Service
Office of Public Health Science

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PREFACE

Welcome to the 2019 “Blue Book”, the 2019 United States National Residue Program (NRP) that summarizes the process used by the United States Department of Agriculture’s (USDA) Food Safety and Inspection Service (FSIS), for sampling and testing of FSIS regulated products for chemical compounds of public health concern. [For those reading this electronically, this document has been commonly known as the "Blue Book" because the covers of the printed versions were blue.] This document details the principles and methods used to plan and design the NRP sampling plans for veterinary drugs, pesticides, and environmental contaminants.

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ACRONYMS

AMDUCA – Animal Medicinal Drug Use Clarification Act
AMS – Agricultural Marketing Service
APHIS – Animal and Plant Health Inspection Service
ARS – Agricultural Research Service
CDC – Centers for Disease Control and Prevention
CHCs – Chlorinated Hydrocarbons
COPs – Chlorinated Organophosphates
FDA – Food and Drug Administration
FSIS – Food Safety and Inspection Service
EPA – Environmental Protection Agency
HACCP – Hazard Analysis and Critical Control Points
IPP – Inspection Program Personnel
IRSP – Import Reinspection Sampling Program
KIS™ test – Kidney Inhibition Swab Test
NASS – National Agricultural Statistics Service
NRP – U. S. National Residue Program (Domestic & Import)
NSAID – Non-Steroidal Anti-inflammatory Drug
OFO – Office of Field Operations
OPHS – Office of Public Health Science
PHIS – Public Health Information System
PHV – Public Health Veterinarian
SAT – Surveillance Advisory Team
TOI – Types of Inspection

INTRODUCTIONS

The U.S. National Residue Program (NRP) for Meat, Poultry, and Egg Products, is an interagency program designed to identify, rank, and analyze for chemical contaminants in meat, poultry, and egg products. The U.S. Department of Agriculture's (USDA) Food Safety and Inspection Service (FSIS) administers this program. FSIS publishes the NRP Residue Sampling Plans (traditionally known as the Blue Book) each year to provide information on the process of sampling meat, poultry, and egg products for chemical compounds of public health concern.

BACKGROUND

An essential aspect of food safety in meat, poultry, and egg products is the control of residues that may result from the use of animal drugs and pesticides, or from incidents involving environmental contaminants. The United States has a complex residue control system, with rigorous processes for approval, sampling and testing, and enforcement.

FSIS administers this regulatory program under the Federal Meat Inspection Act (FMIA) (21 U.S.C. 601 et seq.), the Poultry Products Inspection Act (PPIA) (21 U.S.C. 453 et seq.), and the Egg Products Inspection Act (EPIA) (21 U.S.C. 1031 et seq.). On December 2, 2015, FSIS published the final rule, "Mandatory Inspection of Fish of the Order Siluriformes and Products Derived from Such Fish." The 2008 Farm Bill amended the FMIA to make all fish of the order Siluriformes amendable to the FMIA and, therefore, subject to FSIS inspection. The NRP is an important component of FSIS mission to protect the health and welfare of the consumers by regulating the meat, poultry, and egg products produced in federally inspected establishments and to prevent the distribution into commerce of any such products that are adulterated or misbranded.

The NRP requires the cooperation and collaboration of several agencies for its successful design and implementation. FSIS, along with the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA), are the primary Federal agencies managing this program. The FDA, under the Federal Food, Drug, and Cosmetic Act (FFDCA), establishes tolerances for veterinary drugs and action levels for food additives and environmental contaminants. The EPA, under the FFDCA, the Federal insecticide, Fungicide, and Rodenticide Act (FIFRA), and the Toxic Substances Control Act (TSCA), establishes tolerances for registered pesticides. Title 21 Code of Federal Regulations (CFR) includes tolerance levels established by FDA, and Title 40 CFR includes tolerance levels established by EPA.

The Surveillance Advisory Team (SAT) meets annually to evaluate chemical compounds for inclusion in the NRP scheduled sampling plans. The SAT includes representatives from FSIS, FDA, EPA, USDA's Agricultural Research Service (ARS), and the USDA's Agricultural Marketing Service (AMS), as well as HHS' Centers for Disease Control and Prevention (CDC). The SAT consists of experts in veterinary medicine, toxicology, chemistry, and public health who provide professional advice, as well as information on veterinary drug and pesticide use in animal husbandry. SAT discussions are used to decide which compounds represent a public health concern and warrant inclusion in the NRP scheduled sampling plans. In addition, the SAT may propose, based on professional judgment and reliable field information, the initiation of exploratory assessments for directed sampling on a production class or region of the country. These agencies work together to create the annual sampling plan, based on the following: prior NRP findings of chemical residues in meat, poultry, and egg products; FDA veterinary drug inventories completed during on-farm visits and investigation information; and pesticides and environmental contaminants of current importance to EPA.

For 2019, SAT chose to employ techniques and principles from the field of risk assessment to rank pesticide and environmental contaminants based on relative public health concern, as described in

APPENDIX V. The risk-based ranking enables FSIS to allocate resources to chemicals of high public health concern. As laboratory techniques and methodology advances, FSIS anticipates including more chemicals in the pesticide multi-residue method. FSIS is currently evaluating approaches to identify and prioritize veterinary drugs associated with FSIS-regulated products.

The range of chemical compounds evaluated for inclusion in the NRP are comprehensive in scope. It includes approved and unapproved pharmaceutical drugs and pesticides, and environmental contaminants known or suspected to be present in food animals in the U.S. and in countries exporting products to the U.S. The NRP is designed to: (1) provide a structured process for identifying and evaluating chemical compounds intentionally and unintentionally used in food animals; (2) analyze chemical compounds of concern; (3) collect, analyze, and report results; and (4) identify the need for appropriate regulatory follow-up subsequent to the identification of violative levels of chemical residues.

Actions taken on violations

FSIS has administered the NRP since 1967 for meat and poultry, beginning in 1995 for egg products, and in 2016 for *Siluriformes*. A violation occurs when an FSIS laboratory detects a chemical compound at level in excess of an established tolerance or action level as well as if the residue detected has no established tolerance. Once the laboratory analysis is complete, FSIS enters the detailed residue violation information into the Residue Violator Tracking (RVT) system, an FSIS/FDA interagency database. FSIS provides establishment and the designated FSIS Inspection Program Personnel (IPP) with the analysis results and notifies the producer via certified letter. Under best practices, the establishment should also notify the producer that an animal from that business has been identified as having a residue violation. In addition, FSIS shares the violation data with EPA and FDA, where the latter Agency has on-farm jurisdiction. FDA and cooperating State agencies investigate producers linked to residue violations and, if conditions leading to residue violations are not corrected, can enforce legal action.

To notify the public and the industry of repeated residue violations by the same producer, FSIS posts a weekly Residue Repeat Violators List on its Web site that identifies producers with more than one violation on a rolling 12-month period. In addition, the list provides helpful information to the AMS-School Lunch Program processors and producers who are working to avoid illegal levels of residues, serves as a deterrent for violators, and enables FSIS and FDA to make better use of resources (list for processors and producers). Because FSIS updates are posted weekly, FDA may not have investigated each violation at the time of publication.

FSIS Laboratory Analytical Methods

In January 1997, FSIS implemented the Hazard Analysis and Critical Control Point (HACCP) inspection system in all federally inspected establishments. The HACCP regulation (9 CFR Part 417) requires FSIS-inspected slaughter and processing establishments to identify all food safety hazards (including drug residues, environmental contaminants, and pesticides) that are reasonably likely to occur before, during, and after the food animal or product enters the slaughter establishment. The regulation also requires establishments to identify preventive measures to control these hazards. FSIS takes regulatory action against establishments that do not have an effective chemical residue control program in place. Minimizing food safety hazards from farm-to-fork protects consumers from the public health risks associated with chemical contaminants in food.

With greater public concern about the risks of chemical contaminants, focus has increased on strengthening the identification, prioritization, and testing for chemical hazards in meat, poultry, and

egg products in the United States. The sampling plan for residues in FSIS-regulated products includes strengthening the focus of public health-based sampling. This approach includes broader screens for veterinary drugs, pesticides, and heavy metals, as well as conducting more analyses per sample.

FSIS uses analytical methods to detect, identify, and quantify residues that may be present in meat, poultry, and processed egg products. The Agency utilizes these methods for monitoring and for surveillance activities to determine product adulteration and for evaluations of human health risk.

FSIS uses multi-residue methods for the detection and confirmation of veterinary drugs, pesticides, and environmental contaminants (see APPENDIX I). The veterinary drug method screens and confirms for over 80 analytes. The pesticide method screens and confirms for over 100 pesticides.

The FSIS Analytical Chemistry Laboratory Guidebook lists the analytical methods used by the agency. Each of the methods specifically describes the analytical process and performance characteristics of the method. One such performance element is the Minimum Level of Applicability (MLA). FSIS defines an MLA as the lowest level at which a method has been successfully validated for a residue in each matrix (meat or poultry). It also refers to the lowest level at which a laboratory analyst is expected to maintain ongoing proficiency in the method.

OVERVIEW OF THE SAMPLING PLANS

The 2019 NRP is implemented on the United States Government fiscal year from October 1, 2018 to September 30, 2019. The NRP consists of three separate, but interrelated, chemical residue testing programs: scheduled sampling (Tier 1), targeted sampling at the production or compound class level (Tier 2), and targeted sampling at the herd/flock or compound class level (Tier 3). These testing programs provide FSIS data for the detection of chemical residues of public health concern and are updated annually in response to emerging chemical residue concerns and improved testing methodologies.

The 2019 NRP Residue Sampling Plan focuses on chemical residues in domestic meat, poultry, and egg products and the import reinspection of meat, poultry, and egg products. The domestic sampling plan includes scheduled sampling and inspector-generated sampling. The import reinspection sampling plan encompasses normal sampling, increased sampling, and intensified sampling. Directive 10,800.1, Rev 1 provides further detail on those sampling procedures.

FSIS conducts periodic sampling and testing for chemical residues of domestic raw *Siluriforme*s fish at official fish establishments to ensure that the product is not adulterated. FSIS conducts sampling of imported *Siluriforme*s fish products for chemical residues, at Official Import Inspection Establishments that have a Grant of Inspection (GOI) for *Siluriforme*s fish. More information about *Siluriforme*s fish can be found on the FSIS website.

DOMESTIC SAMPLING PLAN

1. TIER 1 (Directed sampling)

The Tier 1 sampling plan is the scheduled sampling of specified slaughter subclasses at the time of slaughter, after they have passed antemortem inspection. Carcasses are randomly selected for sampling. The number of samples scheduled each year is based on the probability of detecting at least one violation (APPENDIX II). Data collected from Tier 1 sampling serves as a baseline level for chemical residue exposure. Sampling tasks are assigned each month through the Public Health Information System (PHIS). The sampling task provides information to the FSIS inspection program personnel (IPP) on when to collect the sample (collection window) and which production class to sample. The establishment holds, or controls livestock carcasses selected for testing pending the results of analysis. For directed testing of poultry, the IPP recommends to the establishment that the establishment holds the specific poultry carcasses selected for residue testing pending the analysis results.

Tier 1 sampling results also can be used to identify producers or other entities marketing animals with violative levels of residues. Thus, the Tier 1 sampling plan not only gathers information, but also assists in deterring practices that lead to violative residues.

In 2019, the Tier 1 sampling plan will consist of random samples collected from each of the following production classes: beef cows, bob veal, dairy cows, eggs, steer, heifers, market swine, Siluriformes fish, sows, steers, roaster swine, goats, young chickens, and young turkeys. These production classes represent 95 percent of domestic meat and poultry consumption. Estimated consumption volume, per production class, can be found in APPENDIX I.

2. TIER 2

A. INSPECTOR-GENERATED SAMPLING

FSIS inspection program personnel (IPP) conduct inspector-generated sampling when they suspect that animals may have violative levels of chemical residues. Currently, inspector-generated sampling targets individual suspect animals, suspect populations of animals, and animals condemned for specific pathologies listed in FSIS Directive 10,800.1, Rev 1. When Public Health Veterinarians (PHVs) detect evidence of a disease that may have been treated or an evident injection site, they retain the carcass and analyze samples from those carcasses using an in-plant method to screen for the presence of chemical residues. IPP complete in-plant residue screen tests using the Kidney Inhibition Swab test (KIS™ test). If the in-plant test is negative for antimicrobial residues included in the screen, the carcass is released to the establishment. If there are screen positive results, the carcass is held pending the confirmation results of FSIS laboratory testing. The PHV condemns carcasses and parts animals found to contain violative levels of residues.

i. **Sampling of Individual Suspect Animals** Under the direction of the PHV, IPP conduct a KIS™ test on any carcass that based on herd history or ante-mortem or post-mortem findings inspection findings may contain a violative drug residue. IPP are to follow the instructions provided in Directive 10,800.1, Rev 1, circumstances warranting a KIS ™ test and for performing KIS™ tests and documenting the task in PHIS. The PHV selects a carcass for sampling based on the criteria outlined in FSIS Directive 10,800.1, Rev 1 (i.e., animal with disease signs and symptoms, producer history, or as a follow-up to results from random scheduled sampling). Usually, the sample is screened in the plant by the IPP and the screen-result verified when necessary by a PHV. Other samples are sent directly to the laboratory for analysis. For example, if the IPP suspects the misuse of a veterinary drug in an animal, she/he can perform the relevant in-plant screening analysis. If the result of a screening analysis is positive, the carcass is held (if it is not already condemned for other pathology or conditions that would make it unfit for human consumption), and the liver, kidney, and muscle samples from the carcass are then sent to an FSIS laboratory for analysis. If IPP suspects that there is misuse of drugs that cannot be detected by the KIS™, the samples are sent directly to the laboratory for appropriate analysis. These samples are reported under the **Collector-Generated** program.

ii. **Sampling of Suspect Animal Populations**

a. **KIS™ Testing of Bob Veal Calves**

Bob veal calf carcasses for KIS™ testing are selected from healthy appearing calves, as determined by the IPP or PHV, during antemortem inspection. Sampling is directed by the FSIS regulation 9 CFR 310.21 and Directive 10,800.1, Rev 1.

b. **Sampling of Show Animals**

Show animals, such as cattle, hogs, sheep, and goats presented for inspection, from a single fair or livestock show are selected for the KIS™ test whenever an establishment presents show animals for slaughter. When show animals appear otherwise healthy, the PHV selects animals at random from the entire lot of show animals for testing at the frequency specified in Directive 10800-1. When show animals appear unhealthy or are suspected of having antibiotic residues (e.g., injection sites, evidence of a disease process), IPP tags the animals as “U.S. Suspect” and perform a KIS™ test.

iii. Sampling of Animals from State-Inspected Slaughter Establishments

The state inspectors from the State inspected establishments that are, "at least equal to," the federal requirements, collect and submit samples of kidney, liver and muscle from animals suspected of having violative residues directly to the FSIS laboratory.

B. TARGETED SAMPLING

FSIS implements targeted sampling plans (exploratory assessments) in response to information, obtained by FDA and EPA and provided to FSIS, about misuse of animal drugs and/or exposure to environmental chemicals, as well as in response to Tier 1 analytical results. The duration of these sampling plans varies based on the situation. FSIS may conduct studies to develop information on the frequency and concentration at which some residues like trace metals and industrial components may be inadvertently present in animals. These sampling plans could be designed to distinguish components of meat, poultry and egg products in which residue problems exist, to measure the extent of problems, and to evaluate the impact of actions taken to reduce the occurrence of residues in the food animal population.

Sampling tasks are assigned through PHIS. The sampling task provides instructions to the IPP on when to collect the sample (the collection window) and which slaughter production class to collect. The establishment is required to hold or maintain control of livestock carcasses selected for testing pending the test results. For directed residue testing of poultry, the FSIS recommends that the establishments hold the specific poultry carcasses selected for residue testing pending the test results.

In 2019, Tier 2 targeted sampling includes, formula-fed veal, nonformula fed veal, heavy calf, bull and sheep as described in Table 3.

3. TIER 3

The Tier 3 sampling plan is similar in structure to the targeted sampling (exploratory assessment) program in Tier 2, with the exception that Tier 3 will encompass targeted testing at a herd or flock level. A targeted testing program designed for livestock or flocks originating from the same farm or geographic region may be necessary on occasion to determine the level of exposure to a chemical or chemicals. For instance, producers may administer some veterinary drugs to a herd or a flock (for example, growth promoters or antibiotics given in the feed) in a way that involves misuse. In addition, livestock and birds may be exposed unintentionally to an environmental contaminant. Therefore, a targeted testing program designed for livestock or flocks originating from the same farm or region may be necessary on occasion to determine the level of a chemical or chemicals to which the livestock or the birds in the flock have been exposed. Tier 3 will provide a vehicle for developing information that will support future policy development within the NRP.

In 2019, Tier 3 sampling includes feral swine analyses for pesticides

IMPORT REINSPECTION SAMPLING PLAN

Imported meat, poultry, and egg products are sampled through the port-of-entry Import Reinspection Sampling Plan, a chemical residue monitoring program conducted to verify the equivalence of inspection systems in exporting countries to United States standards. All imported products are subject to

reinspection, and one or more Types of Inspection (TOI) are conducted on every lot[1] of product before it enters the U.S. The reinspection of imported products includes chemical residue sampling. There are three levels of chemical residue reinspection which include:

- Normal sampling: random sampling from a lot;
- Increased sampling: above-normal sampling resulting from an Agency management decision;
- Intensified sampling: additional samples taken when a previous sample for a TOI that failed to meet U.S. requirements.

The data obtained from laboratory analyses are entered into PHIS, an FSIS database designed to generate reinspection assignments, receive and store results, and compile histories for the performance of foreign establishments certified by the inspection system in the exporting country. The import reinspection sampling program is structured based on criteria used to develop the domestic plan (Tier 1 and Tier 2). The estimated annual amount of product imported into the United States, listed in APPENDIX IV, was used to assign the number of samples. FSIS intends to collect approximately 1,100 import samples, similar to FY 2018.

SUMMARY OF CHANGES FROM THE 2018 NRP

1. In FY 2018, FSIS extended the multi-residue pesticide method to egg products. In FY 2019, egg products will be analyzed for pesticides.
2. In the previous three years, FSIS reported carbadox violations in roaster swine. Therefore, in FY 2019 NRP, roaster swine have been added to the Tier 1 sampling plan instead of Tier 2 sampling plan.
3. In FY 2018, FSIS extended the metal method to include arsenic. In FY 2019, FSIS-regulated products will be analyzed for metals.
4. In FY 2019, FSIS will reallocate import residue samples. The reallocation will not decrease or increase the overall number of residue samples collected but rather focus on assigning more residue samples to raw products instead of processed products.
5. In FY 2018, FSIS conducted an exploratory study to evaluate whether semicarbazide, the primary metabolite of nitrofurazone, could be detected in chicken samples before and after processing. In response to this exploratory study, FSIS is evaluating a possible Tier 3 nitrofuran analysis project for FY 2019.

POLICY AND PROCEDURES FOR HOLDING OR CONTROLLING PRODUCT UNDER NRP

As of February 2013, the Agency requires official establishments and importers of record to hold or maintain control of lots of product tested for adulterants until acceptable results become available. FSIS stated that the policy would apply to livestock carcasses subject to FSIS testing for residue on domestic products. FSIS explained that it will not require establishments to hold poultry carcasses pending test results for residues due to historically low residue problems and large lot size. This was outlined in a published Federal Register Notice 76 FRN 19955. FSIS will not require processors to hold Siluriformes fish pending test results for residues.

The hold and test policy applies to normal and increased import reinspection sampling. For intensified import sampling, FSIS retains the lot pending laboratory results.

[1] An import lot is a group of products defined statistically and/or scientifically by production segments and certified from one country, one establishment. A lot consists entirely of the same species, process category, and product standard of identity (sub-category). A single lot can contain shipping cartons with varying sizes of immediate containers.

ANIMAL PRODUCTION CLASSES

Production class nomenclature includes:

Bovine

- Beef cows are mature, female cattle bred for muscle development, ordinarily having given birth to one or more calves.
- Bulls are mature, uncastrated male cattle.
- Calves/veal: The agency is currently engaging in rulemaking to define "veal." For sampling purposes under the NRP, veal calves are defined as immature cattle (including dairy breeds) lacking a functional rumen and intended for meat production. They are recognized as a separate class from suckling calves because of their handling, housing, and proximity to slaughter.
- Dairy cows are mature, female cattle bred for milk production, ordinarily having given birth to one or more calves.
- Heifers are young, female cattle more than 1 year old that have not yet given birth to a calf.
- Steers are male cattle castrated before sexual maturity.

Porcine

- Boars are mature swine showing male sexual characteristics.
- Market swine are usually marketed near 6 months of age and 200 to 300 pounds live weight.
- Roaster swine are animals of both sexes and any age that are marketed with the carcass unsplit and with the head on.
- Sows are mature, female swine, ordinarily having given birth to one or more litters.
- Stags are male swine castrated after they have reached sexual maturity.
- Feral Swine are domestic swine that escape captivity and reproduce in the wild. Feral swine differ from their domestic counterparts in their physical appearance and in the manner in which they are raised and their method of capture. Typical characteristics of feral swine include color patterns (e.g., white stripes or spots), longer bristly haircoat, elongated snout with visible tusks, a "razorback" body shape, and wild boar males, which are uncastrated

Poultry

- Ducks are birds of both sexes and any age.
- Egg products include yolks, whites, or whole eggs after breaking; eggs are processed as dried, frozen, or liquid.
- Geese are birds of both sexes and any age.
- Mature chickens are adult female birds, usually more than 10 months of age.
- Old breeder turkeys are birds of both sexes and usually more than 15 months of age.
- Young chickens include broilers/fryers birds of both sexes that are usually less than 10 weeks of age.
- Roasters chickens are birds of both sexes, usually less than 12 weeks of age.
- Capons are surgically castrated male chickens usually less than 8 months of age.
- Young turkeys are fryer/roaster birds that are of both sexes and usually less than 12 weeks of age.
- Other poultry include ratites (e.g., ostriches, emus, rheas), guineas, squabs (young, unfledged pigeons), adult pigeons, pheasants, grouse, partridge, quail, etc.

Other Livestock

- Goats are animals of both sexes and any age.
- Lambs are sheep younger than 14 months and having a break joint in at least one leg.
- Rabbits are any of several lagomorph mammals of both sexes and any age.
- Sheep are mature animals of both sexes.
- Other livestock include bison, deer, elk, etc.

Siluriformes Fish

An order of bony fish that includes all catfish. All catfish have at least one pair of barbels ("feelers") on the upper jaw, with many possessing spines in front of the dorsal and pectoral fins. Most species inhabit fresh water, but a few species are marine (salt-water). This includes the following:

ORDER	FAMILY	ACCEPTABLE COMMON OR USUAL NAMES	GENUS SPECIES
SILURIFORMES*	Ictaluridae	Blue Catfish or Catfish	*Ictalurus furcatus*
		Channel Catfish or Catfish	*Ictalurus punctatus*
		White Catfish or Catfish	*Ameiurus catus*
		Black Bullhead or Bullhead or Catfish	*Ameiurus melas*
		Yellow Bullhead or Bullhead or Catfish	*Ameiurus natalis*
		Brown Bullhead or Bullhead or Catfish	*Ameiurus nebulosus*
		Flat Bullhead or Bullhead or Catfish	*Ameiurus platycephalus*
	Clariidae	Whitespotted fish or Chinese fish	*Clarias fuscus*
		Sharptooth Clarias Fish	*Clarias gariepinus*
		Broadhead Clarias Fish	*Clarias macrocephalus*
		Walking Clarias Fish	*Clarias batrachus*
	Pangasius	Swai or Sutchi or Striped Pangasius or Tra	*Pangasianodon hypophthalmus or Pangasius hypophthalmus*
		Basa	*Pangasius bocourti*
		Mekong Giant Pangasius	*Pangasius gigas*
		Giant Pangasius	*Pangasius sanitwongsei*
	* This list is not all-inclusive. For an exhaustive list of Siluriformes fish under FSIS jurisdiction see Siluriformes Fish Species FSIS. For other Siluriformes fish see the Integrated Taxonomic Information System (ITIS) at http://www.itis.gov and the Seafood List at http://www.accessdata.fda.gov/scripts/fdcc/?set=seafoodlist.		

SUMMARY OF THE DOMESTIC AND IMPORT REINSPECTION SAMPLING PLANS

SUMMARY TABLES 1 AND 2

Summary Tables 1 and 2 provide an overview of both domestic (Tier 1 and Tier 2) sampling organized by chemical compound class. Each table covers: Animal Medicinal Drug Use Clarification Act (AMDUCA)-prohibited drugs, veterinary drugs, pesticides, and environmental contaminants. The tables also identify the FSIS laboratory that would be conducting the analyses. Due to laboratory capacity, not every sample is analyzed for every compound class. Laboratory personnel make decisions on which samples to analyze. Some of the factors that are included in the decision are (1) the number of samples that can be analyzed per run, (2) the number of samples received that week, and (3) the total number of samples for that compound class/slaughter class pair. The factors behind these decisions can be found in the individual laboratory procedures.

Table 2 shows domestic Tier 2 sampling (formula-fed veal, non-formula-fed veal, heavy calf, bull, roaster swine, and sheep)

SUMMARY TABLES 3

Summary Tables 3 provide an overview of import sampling organized by animal production class. Each table includes the following: Animal Medicinal Drug Use Clarification Act (AMDUCA)-prohibited drugs, veterinary drugs, pesticides, and environmental contaminants.

OVERVIEW OF THE PROGRAM DESIGN

The sampling plan design begins with a list of residues that may occur in meat, poultry, and egg products and are of concern to human health. FSIS coordinates an annual meeting of the SAT members to identify and prioritize chemical compounds of public health concern and assemble detailed information on each compound. FSIS combines this information with historical data on violation rates for each chemical compound to develop the domestic sampling and import reinspection plans. These sampling plans guide the allocation of FSIS laboratory, supply, and inspection resources.

Factors considered when developing the domestic and import scheduled sampling plans include:

- Quantitative public health risk associated with each chemical compound or compound class in meat, poultry, and egg products;
- The food animals affected by each chemical compound or compound class;
- The analytical methods that are available to identify the chemical compound or compound classes;
- FSIS laboratory capacity to analyze chemical compounds or compound classes; and
- The existence of a regulatory tolerance.

The import reinspection plan design is similar to the domestic plan, with two important exceptions. Raw product testing from samples collected at the U.S. port-of-entry is rare, because concerns about foreign animal diseases limit many countries to ship processed products only. When import of raw products is allowed, most shipped raw product consists of muscle tissue only. FSIS requires exporting countries to identify the animal species in each product but does not require them to identify the production class. Imported meat and poultry testing is categorized by species (e.g., poultry or porcine); egg products are distinguished as a separate category. There are different compound applications by importing countries: allowance in food animals that are not approved for such use in the United States and different use practices for compounds that are approved in the United States. For these reasons, the compounds selected for analysis in the import plan may not necessarily be the same as those in the U.S. domestic plan.

Summary Table 1: No. of Analyses per Production Class by Compound Class
2019 Domestic Scheduled Sampling: Tier 1

Methods	No. of Chemical Analyses per Production Class *									
	Number of Animals	Aminoglycosides (M, L, K)	Antifungal Dyes (M)	Avermectins (M, L)	B-agonist (M, L)	Carbadox (L)	Metals (M, L, K)	MRM Drugs (M, L, K)	Pesticides (M, L, K)	Nitrofurans (M)
Beef cows	N= 800	800		400	400		100	800	400	
Bob veal	N= 400	400		200	200		100	400	200	
Dairy cows	N= 800	800		400	400		100	800	400	
Heifers	N= 400	400		200	200		100	400	200	
Steers	N= 400	400		200	200		100	400	200	
Market swine	N= 800	800		400	200		100	800	400	
Roaster swine	N= 300					300				
Sows	N= 800	800		400	200		100	800	400	
Young chickens	N= 800	800					150	800	400	400
Young turkeys	N= 800	800					150	800	400	400
Goats	N= 300	300		150				300	150	
Siluriformes*	N= 650	650	325				325	650	325	325
Egg products	N= 400								400	
Total		**6,950**	**325**	**2350**	**1,800**	**300**	**1325**	**6,950**	**3,875**	**1,125**

*Note: *N* denotes the number of samples collected/submitted for each production class (e.g., 800 total samples collected/submitted for beef cows and 400 total samples collected/submitted for heifers).
*Chemical analysis will be performed on tissue samples (M= muscle, L=liver, or K=kidney). Siluriformes fish analysis includes only muscle tissue.

Summary Table 2: No. of Analyses per Production Class by Compound Class
2019 Domestic Scheduled Sampling: Tier 2

Methods	No. of Chemical Analyses per Production Class *					
	Number of Animals	Aminoglycosides (M, L, K))	Avermectins (M, L)	B-agonist (M, L)	MRM Drugs (M, L, K))	Pesticides (M, L, K)
Formula-fed Veal	N= 75	75		37	75	
Non-formula-fed Veal	N= 75	75		37	75	
Heavy Calf	N= 75	75		37	75	
Bull/stags	N= 100	100	50		100	50
Sheep	N= 150	150			150	75
Total		**475**	50	111	475	125

*Note: *N* denotes the number of samples collected/submitted for each production class (e.g., 150 total samples collected/submitted for sheep).
*Chemical analysis will be performed on tissue samples (M= muscle, L=liver, or K=kidney)

Tier 3
75 Feral swine samples will be analyzed for pesticides.

Summary Table 3: No. of Analyses per Production Class by Compound Class
2019 Import Scheduled Sampling

Methods		No. of Chemical Analyses per Production Class								
		Aminoglycosides	Antifungal drugs	Avermectins	B-agonist	Metals	MRM (Drugs)	Nitrofurans	Pesticides	Sulfonamides
Beef	Raw	200		100	100	50	200		100	
	Processed			25		12				25
Chicken	Raw	50				25	50	25	25	
	Processed					5				5
Turkey	Raw	40				10	40	25	25	
	Processed					5				5
Veal	Raw	70		25	35		70		35	
	Processed			5						
Goat	Raw	25		15			25		25	
	Processed			5						
Lamb	Raw	20		10			20		10	
	Processed			5						
Mutton	Raw	5		10			5		5	
	Processed			5						
Pork	Raw	200		100	100	50	200		100	25
	Processed			25		12				
Siluriformes	Raw	1,800	900			900	1,800	900	900	
Egg Products									40	
Total		**2,410**	**900**	**330**	**235**	**1069**	**2,410**	**950**	**1,265**	**60**

APPENDIX I
List of Chemical Residues by Class/Method

The Chemistry Laboratory Guidebook (CLG) contains test methods used by FSIS laboratories to support the Agency's inspection program, ensuring the safety of meat, poultry, and processed egg products. The CLG contains methods for the analysis of food composition, food additives, nutrients, veterinary drug and pesticide residues. Methods are designed to provide analysts with written documentation to facilitate training, performance, quality assessment, and interpretation of data. The CLG can be found at https://www.fsis.usda.gov/news-and-events/publications/chemistry-laboratory-guidebook.

A. Veterinary Drugs

For 2019 sampling, FSIS has scheduled the following classes of veterinary drug analytes (not all analytes are tested in all commodities):

a. Multi-residue method (Drugs)

2-Aminosulfone albendazole	Difloxacin	Meloxicam	Sulfaethoxypyridazine
2-Amino-flubendazole	Dimetridazole	Metronidazole	Sulfamerazine
2-Quinoxaline carboxylic acid (QCA)	Dimetridazole - OH	Metronidazole-OH	Sulfamethazine
Abamectin	Dipyrone	Morantel tartrate	Sulfamethizole
Acepromazine	Doxycycline	Nafcillin	Sulfamethoxazole
Albendazole	Emamectin benzoate	Norfloxacin	Sulfamethoxypyridazine
Amoxicillin	Enrofloxacin	Orbifloxacin	Sulfanitran
Ampicillin	Eprinomectin	Oxacillin	Sulfapyridine
Azaperone	Erythromycin A	Oxyphenylbutazone	Sulfaquinoxaline
Butorphanol	Fenbendazole	Oxytetracycline	Sulfathiazole
Carazolol	Fenbendazole sulphone	Penicillin G	Tetracycline
Cefazolin	Florfenicol	Phenylbutazone	Thiabendazole
Chloramphenicol	Flubendazole	Pirlimycin	Tildipirosin
Chlortetracycline	Flunixin	Prednisone	Tilmicosin
Cimaterol	Gamithromycin	Ractopamine	Tolfenamic acid
Ciprofloxacin	Haloperidol	Ronidazole	Tulathromycin A
Clindamycin	Ipronidazole	Salbutamol	Tylosin
Cloxacillin	Ipronidazole - OH	Sarafloxacin	Tyvalosin
Danofloxacin	Ketamine	Selamectin	Virginiamycin
DCCD	Ketoprofen	Sulfachloropyridazine	Xylazine
Diethylene ciprofloxacin	Levamisole	Sulfadiazine	
Diclofenac	Lincomycin	Sulfadimethoxine	
Dicloxacillin	Melengestrol Acetate	Sulfadoxine	

b. Aminoglycoside Method

Amikacin	Gentamycin	Kanamycin	Spectinomycin
Apramycin	Hygromycin B	Neomycin	Streptomycin
Dihydrostreptomycin			

c. Beta-Agonist Method

Cimaterol	Ractopamine	Zilpaterol
Clenbuterol	Salbutamol	

d. Avermectin Method

Doramectin	Ivermectin	Moxidectin

e. Nitrofuran Method

3-Amino-2-oxazolidinone (AOZ)	1-Aminohydantoin (AHD)	Semicarbazide (SEM)	3-Amino-5-morpholinomethyl-2-oxazolidinone (AMOZ)

f. Antifungal dyes

Malachite green	Leucomalachite green	Crystal violet	Leucocrystal violet

g. Carbadox Method

Quinoxaline-2-carboxylic acid

B. Pesticides and environmental contaminants

a. Pesticide Method

1-Naphthol	Coumaphos O	Fluroxypyr-1-Methylhepyl-Ester	Pentachlorobenzene (PCB)
3-Hydroxycarbofuran	Coumaphos S	Fluvalinate	Permethrin (cis&trans)
Acephate	DDD o, p’	Heptachlor	Piperonyl butoxide
Acetamiprid	DDD p, p’ + DDT, o, p'	Heptachlor epoxide (cis+ trans) or (B+A)	Pirimiphos methyl
Alachlor	DDE o, p’	Hexachlorobenzene (HCB)	Prallethrin
Aldicarb	DDE p, p’	Hexazinone	Profenofos
Aldicarb sulfone	DDT p, p’	Hexythiazox	Pronamide
Aldicarb sulfoxide	Deethylatrazine	Imazalil	Propachlor
Aldrin	Diazinon	Imidacloprid	Propanil
Atrazine	Dichlorvos (DDVP)	Indoxacarb	Propetamphos
Azinphos methyl	Dieldrin	Lindane (BHC gamma)	Propiconazole
Azoxystrobin	Difenoconazole	Linuron	Pyraclostrobin
Benoxacor	Diflubenzuron	Malathion	Pyrethrin I
Bifenthrin	Dimethoate	Metalaxyl	Pyrethrin II
Boscalid	Diuron	Methamidophos	Pyridaben
Buprofezin	Endosulfan I	Methomyl	Pyriproxyfen
Carbaryl	Endosulfan II	Methoxyfenozide	Resmethrin (cis&trans)
Carbofuran	Endosulfan sulfate	Metolachlor	Simazine
Carfentrazone ethyl	Ethion	Metribuzin	Sulprofos
Chlordane cis	Ethion monoxon	MGK-264 (isomers 1 & 2)	Tebufenozide
Chlordane trans	Ethofumesate	Myclobutanil	Tefluthrin
Chloroneb	Fenoxaprop ethyl	Nonachlor cis	Tetrachlorvinphos
Chlorothalonil	Fenpropathrin	Nonachlor trans	Tetraconazole
Chlorpropham	Fipronil	Norflurazon	Thiabendazole
Chlorpyrifos	Fipronil desulfinyl	Omethoate	Thiamethoxam
Chlorpyrifos methyl	Fipronil sulfide	Oxychlordane	Thiobencarb
Clothianidin	Fluridone	Pentachloroaniline (PCA)	Trifloxystrobin

b. Metals Method

Arsenic (As)	Chromium (Cr)	Manganese (Mn)	Thallium (Tl)
Aluminum (Al)	Cobalt (Co)	Molybdenum (Mo)	Vanadium (V)
Barium (Ba)	Copper (Cu)	Nickel (Ni)	Zinc (Zn)
Boron (B)	Iron (Fe)	Selenium (Se)	
Cadmium (Cd)	Lead (Pb)	Strontium (Sr)	

APPENDIX II
STATISICAL TABLE

Scheduled sampling is done to provide some assurance of detection of a violation that affects a given percentage of the sample population.

The statistical table provides the calculated number of samples required to ensure detection of at least one violation that affects a given percentage of the sampled population. Statistically, for a binomial distribution with sample size "*n*" and violation rate "*v*" (in decimal), if *v* is the true violation rate in the population and *n* is the number of samples, the probability, *p*, of finding at least one violation among the *n* samples (assuming random sampling) is $p = 1 - (1 - v)^n$

For example, if the true violation rate is 1% the probability of detecting at least one violation with sample sizes of 230,300,390,460, and 800 are 90%, 95%, 98%, 99%, and 99.97% respectively.

In the table below the probability of detecting at least one violation with a sample size of 800 is italicized and bolded.

Statistical Table
2019 U.S. National Residue Program

Percentage % Violative in the population (v)	**Number of samples required to detect at least one violation in (n) samples with a probability (p)**				
	0.90	0.95	0.98	0.99	0.9997
	Sample Size required "n"				
10	22	29	37	44	77
5	45	59	76	90	158
1	230	300	389	459	***807***
0.57	403	525	684	***806***	1,419
0.50	460	598	***780***	919	1,618
0.37	620	***808***	1,055	1,242	2,188
0.29	***793***	1,032	1,347	1,586	2,793
0.10	2,302	2,995	3,910	4,603	8,108

The procedure to calculate the required sample size needed:

$p = 1 - (1 - v)^n$ ← Probability of detecting at least one violation in n sample of binomial distribution with violation rate v

$1 - p = (1 - v)^n$ ← Subtract one from both side of the equation. This gives the probability of detecting No violations in n samples

$\log(1 - p) = \log(1 - v)^n$ ← Apply logarithmic function to both side of the equation

$\log(1 - p) = n * \log(1 - v)$ ← A logarithmic function property

$n = \frac{\log(1 - p)}{\log(1 - v)}$ ← Sample size based on violation rate (v) and probability of detecting (p)

APPENDIX III

FY 2019 NRP: Estimated Amount of Domestically Produced Meat, Poultry, and Egg Products

FY 2018 NRP: Estimated Amount of Domestically Produced Meat, Poultry, and Egg Products	Number of Head Slaughtered /[1]	Pounds per Animal (dressed weight) /[2,3,4]	Total Pounds (dressed weight)	Percent Estimated Relative Consumption
Beef Cow	2,926,513	643.1	1,882,040,510.30	1.74
Bob Veal	292,915	40.6	11,892,349.00	0.01
Bull/Stag	574,747	860.5	494,569,793.50	0.46
Dairy Cow	3,072,103	676.8	2,079,199,310.40	1.92
Formula-fed Veal	203,288	267.0	54,277,896.00	0.05
Heavy Calf	19,615	279.4	5,480,431.00	0.01
Heifer	8,856,527	814.8	7,216,298,199.60	6.68
Non-Formula-fed Veal	8,927	149.2	1,331,908.40	0.001
Steer	16,594,915	881.8	14,633,396,047.00	13.55
SUBTOTAL, CATTLE	**137,643,545**		**26,378,486,445.20**	**24.42**
Boar/Stag Swine	378,599	189.7	71,820,230.30	0.07
Feral Swine	84,143	49.4	4,156,664.20	0.004
Market Swine	131,024,176	189.4	24,815,978,934.40	22.97
Roaster Swine	708,131	67.8	48,011,281.80	0.04
Sow	2,971,285	303.9	902,973,511.50	0.84
SUBTOTAL, SWINE	**135,166,334**		**25,842,940,622.20**	**23.92**
Goat	500,891	30.7	15,377,353.70	0.01
Lamb	1,870,281	69.6	130,171,557.60	0.12
Mature Sheep	106,039	59.5	6,309,320.50	0.01
SUBTOTAL, OVINE	**2,477,211**		**151,858,231.80**	**0.14**
Bison	50,868	637.7	32,438,523.60	0.03
Cattalo	6	430.7	2,584.20	0.000002
Deer/Reindeer	894	116.6	104,240.40	0.0001
Other Voluntary Livestock	1,604	232.5	372,930.00	0.0003
Water Buffalo	102	556.9	56,803.80	0.0001
TOTAL, ALL LIVESTOCK\[3]	**53,474**		**52,406,260,381.20**	**48.51**
Capon	160,133	5.1	816,678.30	0.001
Duck	27,401,979	4.9	134,269,697.10	0.12
Emu	2,598	40.5	105,219.00	0.0001
Fryer/Roaster Turkey	2,049	17.6	36,062.40	0.00003
Goose	119,451	10.4	1,242,290.40	0.001
Guinea	162,186	2.7	437,902.20	0.0004
Heavy Fowl	80,670,486	5.4	435,620,624.40	0.40
Light Fowl	48,642,982	1.9	92,421,665.80	0.09
Old Breeder Turkey	1,660,230	22.2	36,857,106.00	0.03
Ostrich	791	120.5	95,315.50	0.0001
Pheasant	236,674	1.9	449,680.60	0.0004
Quail	781,968	0.4	312,787.20	0.0003
Squab	880,966	1.3	1,145,255.80	0.001
Young Breeder Turkey	1,978,117	21.6	42,727,327.20	0.04
Young Chicken	9,038,155,226	4.6	41,575,514,039.60	38.49
Young Turkey	239,150,799	24.9	5,954,854,895.10	5.51

FY 2018 NRP: Estimated Amount of Domestically Produced Meat, Poultry, and Egg Products	Number of Head Slaughtered /[1]	Pounds per Animal (dressed weight) /[2,3,4]	Total Pounds (dressed weight)	Percent Estimated Relative Consumption
TOTAL POULTRY/[2]	**9,440,006,635.00**		**48,276,906,546.60**	**44.69**
Rabbit	244,643	3.8	929,643.40	0.001
Egg products			6,712,718,200.00	6.21
Siluriformes			625,586,450.00	0.58
Grand Total in Pounds, all Production Classes			**108,361,335,535.04**	**100.00**

1 Source - Slaughter Volume Data from July 1, 2017 to June 30, 2018 (Data Source for livestock, poultry and egg products: PHIS, July 16, 2018; Data source for Siluriformes: PHIS, July 27, 2018)
2 Dressed weight calculated by applying dressing percentages to live weights. Live weight data was obtained from PHIS and dressing percentage from USDA AMS Report "Weekly Poultry Slaughtered Under Federal Inspection" https://search.ams.usda.gov/mnreports/nw_py017.txt
3 All livestock = Calculated using PHIS
4 Goose = PHIS Average Live Weight

APPENDIX IV
FY 2019 NRP: Estimated Annual Amount of Product Imported in the United States[1]

Product	Product Weight in Pounds	Product Imported Percent
Beef Processed	183,003,060	4.21
Beef Raw	2,206,438,036	50.72
Chicken Processed	120,219,094	2.76
Chicken Raw	146,193,814	3.36
Duck Processed	296,901	0.01
Duck Raw	1,925,671	0.04
Egg Products	9,741,259	0.22
Goat Raw	35,830,618	0.82
Lamb Processed	21,020	0.000005
Lamb Raw	183,065,990	4.21
Mutton Processed	172,268	0.004
Mutton Raw	38,478,417	0.88
Ostrich Raw	28,074	0.001
Pork Processed	170,558,602	3.92
Pork Raw	1,018,454,896	23.41
Siluriformes-Processed	59,911	0.001
Siluriformes-Raw	173,694,438	3.99
Turkey Processed	4,834,617	0.11
Turkey Raw	18,082,641	0.42
Veal Processed	3,033	0.0001
Veal Raw	39,528,712	0.91
Grand Total	**4,350,631,072**	**100**

[1] Source - Slaughter Volume Data from **July 1, 2017 to June 30, 2018** (Data Source: PHIS, July 18, 2018)

APPENDIX V

Chemical Identification and Prioritization Framework for 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 based on relative public health importance. While not all registered pesticides are included in the NRP, FSIS uses techniques and principles of risk assessment to rank pesticide residues based on relative public health concern. This process enables FSIS to allocate resources to chemicals of high public health concern. First, FSIS collated an exhaustive list of pesticides used domestically and internationally (from countries that are eligible to import to the US). This list includes relative public health concern ranking of 481 pesticides, compounds analyzed by FSIS, pesticides that are currently of concern to the EPA, the U.S. Code of Federal Regulations citations for pesticide residues with EPA-established tolerances in meat, poultry and egg products. FSIS is analyzing for 108 of the 481 ranked pesticide residues. The analytical method can be found in the FSIS Chemistry Laboratory Guidebook. As analytical techniques and methodology advances, FSIS works closely with the EPA to evaluate pesticides for inclusion into the annual testing program. This list is provided to the Agriculture Research Service to evaluate the expansion of the multi-residue pesticide method.

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 481 pesticide residues and rank each residue based on potential human health risk. FSIS is analyzing for 108 of the 481 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 during 2008-2012. 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 > 25,000 kg
5	If usage is > 20,000 and ≤ 25,000 kg
4	If usage is > 15,000 and ≤ 20,000 kg
3	If usage is > 10,000 and ≤ 15,000 kg

2 If usage is > 1,000 and ≤ 10,000 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 2015). 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 (481 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 – U.S. Code of Federal Regulations (CFR) for pesticide residues with EPA-established tolerances on FSIS-regulated products

Pesticide Ranking Based on Relative Public Health Impact

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
1	Dieldrin	In	1	6	4	6	17.5	Y	HH	CPG 575.100
2	Aldrin	In	1	6	4	6	17.5	Y	H	CPG 575.100
3	Hexachlorobenzene (HCB)	He	1	6	3	6	15.8	Y	HH	CPG 575.100

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
4	Heptachlor	In	1	6	3	6	15.8	Y	H	CPG 575.100
5	Chlordane-alpha-cis	Pe	1	6	3	6	15.8	N		CPG 575.100
6	Chlordane trans	Pe	1	6	3	6	15.8	Y	HH	CPG 575.100
7	Chlordane cis	Pe	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	Tribufos (DEF)	He	2	6	3	4	14.0	N	H	CFR 180.272
10	Mancozeb	Fu	6	2	3	4	14.0	N		CFR 180.176
11	Trifluralin	He	5	6	2	3	13.8	N	H	
12	Permethrin (cis&trans)	In	5	6	1	4	13.8	Y	HH	CFR 180.378
13	Triphenyltin hydroxide	Pe	1	4	4	6	12.5	N		
14	Haloxyfop	Pe	1	4	4	6	12.5	N		
15	Chlorothalonil	Fu	6	4	1	4	12.5	Y	HH	CFR 180.275
16	Alpha-Hexachlorocyclohexane	In	1	4	4	6	12.5	N	M	
17	DDT p,p'	In	1	6	3	4	12.3	Y	HH	CPG 575.100
18	DDT	In	1	6	3	4	12.3	Y	HH	CPG 575.100
19	DDE p,p'	In	1	6	3	4	12.3	Y	HH	CPG 575.100
20	DDE o,p'	In	1	6	3	4	12.3	Y	H	CPG 575.100
21	DDD p,p' + DDT o,p'	In	1	6	3	4	12.3	Y	HH	CPG 575.100
22	DDD o,p'	In	1	6	3	4	12.3	Y	H	CPG 575.100
23	DDD	In	1	6	3	4	12.3	Y	H	CPG 575.100
24	Pendimethalin	He	6	6	1	3	12.0	N		CFR 180.361
25	Lactofen	He	3	5	2	4	12.0	N		
26	Diuron	He	5	3	2	4	12.0	Y	L	CFR 180.106
27	Carbaryl (1-Naphthol)	In	6	3	1	4	11.3	Y	HH	CFR 180.169
28	Acetochlor	He	5	4	1	4	11.3	N		CFR 180.470
29	Ethalfluralin	He	5	6	1	3	11.0	N	H	
30	Chlorpyrifos methyl	Pe	6	5	3	1	11.0	Y	M	CFR 180.419
31	Bifenthrin	In	5	6	1	3	11.0	Y	HH	CFR 180.442
32	Tralkoxydim	He	2	5	2	4	10.5	N		
33	Tetraconazole	Fu	2	5	2	4	10.5	Y	M	CFR 180.557
34	Quintozene (Pentachloronitrobenzene)	Fu	2	5	3	3	10.5	N	M	
35	Mirex	In	1	6	3	3	10.5	N	H	CPG 575.100
36	Kresoxim-methyl	Fu	2	4	3	4	10.5	N		CFR 180.554
37	Flocoumafen	Pe	1	6	5	1	10.5	N		
38	Ethoprop	In	2	4	3	4	10.5	N		
39	Diclofop methyl	He	2	5	2	4	10.5	N		
40	Bromadiolone	Pe	1	6	5	1	10.5	N		
41	Spirodiclofen	In	2	6	1	4	10.0	N	H	CFR 180.608
42	Propiconazole	Fu	6	4	1	3	10.0	Y	M	CFR 180.434
43	Propargite	In	2	6	1	4	10.0	N	H	CFR 180.259
44	Flumiclorac pentyl	Pe	3	5	4	1	10.0	N		

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
45	Dicofol (as dichlorobenzophenone)	In	2	6	2	3	10.0	N	H	
46	Captan	Fu	5	3	1	4	10.0	N	L	CFR 180.103
47	Alachlor	He	4	4	1	4	10.0	Y	M	CFR 180.249
48	Tembotrione	He	3	3	3	3	9.0	N		CFR 180.634
49	Tebuconazole	Fu	5	4	1	3	9.0	N		CFR 180.474
50	Metolachlor	He	5	4	1	3	9.0	Y	L	CFR 180.368
51	Lindane (gamma-hexachlorocyclohexane)	Pe	2	4	3	3	9.0	Y	HH	
52	Fipronil sulfide	In	1	5	3	3	9.0	Y		
53	Fipronil desulfinyl	In	1	5	3	3	9.0	Y		
54	Fipronil	In	2	4	3	3	9.0	Y	HH	CFR 180.517
55	Difenoconazole	Fu	4	5	1	3	9.0	Y	M	CFR 180.475
56	Cyhalothrin- lambda	Py	6	6	2	1	9.0	N		
57	Clodinafop-propargyl	He	2	4	3	3	9.0	N		
58	Chlorpyrifos oxon	In	6	3	3	1	9.0	N		
59	Tridiphane	He	1	6	2	3	8.8	N	H	
60	Triallate	He	2	5	2	3	8.8	N		
61	Terbufos	In	2	5	4	1	8.8	N		
62	Resmethrin (cis& trans)	In	1	6	1	4	8.8	Y	H	
63	Pyraflufen	He	2	5	1	4	8.8	N		CFR 180.585
64	Pentachlorobenzene (PCB)	Ot	1	6	3	2	8.8	Y	H	
65	Oxyfluorfen	He	2	5	2	3	8.8	N	M	CFR 180.381
66	Oxychlordane (chlordane byproduct)	In	1	6	4	1	8.8	Y	HH	CPG 575.100
67	Linuron	He	3	4	2	3	8.8	Y	L	CFR 180.184
68	Ethiprole	Pe	1	6	2	3	8.8	N		
69	Endrin	In	1	6	3	2	8.8	N	H	
70	Disulfoton	Pe	2	5	4	1	8.8	N		
71	Beta-Hexachlorocyclohexane (b-HCH)	In	1	4	4	3	8.8	N	M	
72	Benfluralin	He	1	6	2	3	8.8	N	H	
73	Amitraz	In	1	6	2	3	8.8	N	L	CFR 180.287
74	Chlorpyrifos	In	6	5	2	1	8.3	Y	HH	CFR 180.342
75	Quizalofop ethyl	He	3	5	2	2	8.0	N	M	CFR 180.441
76	Pyrethrin I	Py	2	6	1	3	8.0	N	HH	CFR 180.128
77	Phosmet	In	5	3	1	3	8.0	N	L	CFR 180.261
78	Hexythiazox	In	2	6	1	3	8.0	Y	H	CFR 180.448
79	Cypermethrin (all isomers)	In	2	6	1	3	8.0	N	H	CFR 180.418
80	Chlorpyrifos-methyl oxon	In	6	2	3	1	8.0	N	M	CFR 180.419
81	Ziram	Fu	4	2	2	3	7.5	N		
82	Tribenuron methyl	Pe	5	1	2	3	7.5	N		
83	Triadimenol	Fu	2	4	2	3	7.5	N	L	

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
84	Propanil	He	2	4	2	3	7.5	Y	L	CFR 180.274
85	Profenofos	In	1	5	4	1	7.5	Y	M	CFR 180.404
86	Prochloraz	Fu	1	5	2	3	7.5	N		
87	Oxythioquinox	Pe	1	4	2	4	7.5	N	M	
88	Oxadiazon	He	1	5	2	3	7.5	N	M	
89	Isoxaflutole	He	3	3	1	4	7.5	N	L	
90	Isofenphos	In	1	5	4	1	7.5	N	M	
91	Imazalil	Fu	2	4	1	4	7.5	Y	M	CFR 180.413
92	Fluthiacet-Methyl (CGA-248757)	Pe	2	3	2	4	7.5	N		
93	Fludioxonil	Fu	5	5	1	2	7.5	N		CFR 180.516
94	Fenthion (MPP)	In	1	5	4	1	7.5	N	M	
95	Etridiazole	Fu	1	4	2	4	7.5	N	L	
96	EPN (Ethyl p-nitrophenyl phenylphosphorothioate)	Pe	1	5	4	1	7.5	N		
97	Chlorobenzilate	Pe	1	5	1	4	7.5	N		
98	Chlorfenapyr	Pe	1	5	2	3	7.5	N		
99	Cadusafos	In	1	4	5	1	7.5	N		
100	Acifluorfen	He	2	4	1	4	7.5	N		
101	Parathion methyl	In	1	3	4	3	7.0	N	M	
102	Nonachlor -trans	In	1	6	3	1	7.0	Y	H	
103	Nonachlor -cis	In	1	6	3	1	7.0	Y	H	
104	Methoxychlor	In	1	6	2	2	7.0	N	H	
105	MCPA (2-Methyl-4-chlorophenoxyacetic acid)	He	3	4	3	1	7.0	N		CFR 180.339
106	Fenoxaprop ethyl	He	2	5	1	3	7.0	Y	M	CFR 180.430
107	Fenbuconazole	Fu	3	4	1	3	7.0	N	L	CFR 180.480
108	Ethion monoxon	In	1	6	3	1	7.0	Y	HH	
109	Ethion	In	1	6	3	1	7.0	Y	H	
110	Dinocap	Fu	1	6	3	1	7.0	N		
111	Carbophenothion	In	1	6	3	1	7.0	N	H	
112	Buprofezin	In	2	5	1	3	7.0	Y	M	CFR 180.511
113	Bromoxynil	He	3	4	1	3	7.0	N		CFR 180.324
114	Boscalid	Fu	4	3	1	3	7.0	Y	HH	CFR 180.589
115	Tefluthrin	In	3	6	2	1	6.8	Y	H	
116	Gamma-Cyhalothrin	Py	3	6	2	1	6.8	N		CFR 180.438
117	Dicamba	He	6	3	1	2	6.8	N		CFR 180.227
118	Atrazine-desethyl	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	Tolyfluanid	In	1	4	1	4	6.3	N		
121	Tetrachlorvinphos	In	1	4	1	4	6.3	Y	M	CFR 180.252
122	Terbutryn	He	1	4	2	3	6.3	N		
123	Procymidone	Fu	1	4	1	4	6.3	N		

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
124	Parathion (Parathion-ethyl)	In	1	4	2	3	6.3	N	M	
125	Nitrapyrin	Pe	1	4	1	4	6.3	N	L	
126	Molinate	Pe	1	4	2	3	6.3	N		
127	Iprovalicarb	Fu	1	4	1	4	6.3	N		
128	Iprodione	Fu	2	3	1	4	6.3	N	L	CFR 180.399
129	Epoxiconazole	Fu	1	4	1	4	6.3	N		
130	Dinoseb	Fu	1	4	2	3	6.3	N		
131	Dimethoate	In	4	1	2	3	6.3	Y	L	CFR 180.204
132	Cyproconazole	Fu	2	3	1	4	6.3	N		CFR 180.485
133	Acephate	In	4	1	2	3	6.3	Y	HH	CFR 180.108
134	Tetramethrin	In	1	5	1	3	6.0	N	M	
135	Simazine	He	5	3	2	1	6.0	Y	L	CFR 180.213
136	Pyrimethanil	Fu	2	4	1	3	6.0	N		CFR 180.518
137	Pyridaben	In	2	6	2	1	6.0	Y	H	CFR 180.494
138	Pirimiphos ethyl	Pe	1	5	3	1	6.0	N		
139	Piperonyl butoxide	Sy	1	5	1	3	6.0	Y	HH	CFR 180.127
140	Phorate (thimet)	In	2	4	3	1	6.0	N	M	
141	Penthiopyrad	Fu	1	5	1	3	6.0	N		CFR 180.658
142	Metrafenone	He	1	5	1	3	6.0	N		
143	Malathion	In	3	3	1	3	6.0	Y	L	CFR 180.111
144	Glufosinate-ammonium	He	5	1	3	1	6.0	N		CFR 180.473
145	Flumethrin	Py	2	6	2	1	6.0	N		
146	Flufenacet	He	2	4	3	1	6.0	N	L	CFR 180.527
147	Fluazinam	Fu	2	4	1	3	6.0	N		CFR 180.574
148	Fluazifop-p-butyl	He	3	5	2	1	6.0	N	M	CFR 180.411
149	Famoxadone	Fu	3	5	2	1	6.0	N	M	CFR 180.587
150	Ethion dioxon	In	1	5	3	1	6.0	N	H	
151	Esfenvalerate	In	6	6	1	1	6.0	N	H	CFR 180.533
152	Endosulfan	Pe	4	4	2	1	6.0	Y	HH	CFR 180.182
153	Dimethenamid	He	3	3	1	3	6.0	N		
154	Dichlorprop-P	He	2	4	3	1	6.0	N		
155	Diazinon	In	2	4	3	1	6.0	Y	HH	CFR 180.153
156	Cyfluthrin (all isomers)	In	6	6	1	1	6.0	N	HH	CFR 180.436
157	Clofentezine	Pe	2	4	1	3	6.0	N	L	CFR 180.446
158	Chlorthal dimethyl	Pe	1	5	1	3	6.0	N		
159	2,4-Db	He	4	4	2	1	6.0	N		CFR 180.331
160	Trifloxystrobin	Fu	6	5	1	1	5.5	Y	M	CFR 180.555
161	Triclopyr	He	4	3	1	2	5.3	N		
162	Tolfenpyrad	In	1	6	2	1	5.3	N		CFR 180.675
163	Thifensulfuron-methyl	He	5	2	1	2	5.3	N		
164	Sulprofos	In	1	6	2	1	5.3	Y	H	
165	Picolinafen	Pe	1	6	2	1	5.3	N		

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166	Phenothrin	In	1	6	2	1	5.3	N	H	
167	Pentachloroaniline (PCA)	Ot	1	6	2	1	5.3	Y	H	
168	Paraquat	He	6	1	2	1	5.3	N		CFR 180.205
169	Metribuzin	He	5	2	1	2	5.3	Y	L	CFR 180.332
170	Mesotrione	Pe	5	2	2	1	5.3	N		
171	Hydroprene	In	1	6	1	2	5.3	N	H	
172	Fomesafen	He	4	3	2	1	5.3	N		
173	Fenvalerate (also see Esfenvalerate)	In	1	6	2	1	5.3	N	H	
174	Dodine	Pe	2	5	2	1	5.3	N		
175	Dimoxystrobin	Fu	1	6	2	1	5.3	N		
176	Dicrotophos	In	2	1	4	3	5.3	N		
177	Azinphos methyl	In	4	3	2	1	5.3	Y	L	
178	Vinclozolin	Fu	1	4	1	3	5.0	N	L	
179	Triflusulfuron-methyl	Pe	1	4	1	3	5.0	N		
180	Triadimefon	Fu	1	3	2	3	5.0	N	L	
181	Thiodicarb	Pe	2	2	1	4	5.0	N		
182	Thiacloprid	In	2	2	1	4	5.0	N	L	CFR 180.594
183	Thiabendazole	Fu	1	3	1	4	5.0	Y	HH	CFR 180.242
184	Terbuthylazine	He	1	4	2	2	5.0	N		
185	Sulfoxaflor	In	1	4	1	3	5.0	N		CFR 180.668
186	Pyrasulfotole	He	2	3	1	3	5.0	N		CFR 180.631
187	Pyraclostrobin	Fu	6	4	1	1	5.0	N	M	CFR 180.582
188	Propetamphos	In	1	4	3	1	5.0	Y	M	
189	Propachlor	He	1	3	1	4	5.0	Y	L	CFR 180.211
190	Picoxystrobin	Fu	1	4	1	3	5.0	N		CFR 180.669
191	Norflurazon	He	2	3	1	3	5.0	Y	L	CFR 180.356
192	MGK-264 (isomers 1&2)	Sy	1	4	1	3	5.0	Y	HH	
193	Metiram	Pe	3	1	1	4	5.0	N		
194	Methidathion	In	1	3	2	3	5.0	N	L	
195	Isoxaben	He	1	4	1	3	5.0	N		
196	Hexaconazole	Fu	1	4	1	3	5.0	N		
197	Heptachlor epoxide (cis&trans) or (B+A)	In	1	1	4	6	5.0	Y	HH	CPG 575.100
198	Folpet	Pe	1	3	1	4	5.0	N		
199	Fluometuron	Fu	2	3	1	3	5.0	N		CFR 180.229
200	Fenthion sulfone	In	1	3	4	1	5.0	N	M	
201	Fenamiphos	In	1	4	3	1	5.0	N	L	
202	Famphur	Pe	1	3	4	1	5.0	N		
203	Endrin ketone	In	1	4	3	1	5.0	N		
204	Dichlobenil	Pe	2	3	1	3	5.0	N		
205	Clethodim	He	5	5	1	1	5.0	N	M	CFR 180.458
206	Chlorfenvinphos	In	1	4	3	1	5.0	N	M	

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
207	Abamectin (Avermectin B1)	In	4	1	3	1	5.0	N		CFR 180.449
208	Triflumuron	Pe	1	5	2	1	4.5	N		
209	Thiobencarb	He	2	4	1	2	4.5	Y	L	CFR 180.401
210	Pymetrozine	In	2	1	2	4	4.5	N		
211	Prosulfocarb	He	1	5	2	1	4.5	N		
212	Propoxur	In	1	2	2	4	4.5	N		
213	Propazine	He	2	4	2	1	4.5	N		
214	Propaquizafop	He	1	5	2	1	4.5	N		
215	Prometryn	He	2	4	2	1	4.5	N		
216	Pirimicarb	In	1	2	2	4	4.5	N		
217	Phosalone	In	1	5	2	1	4.5	N	M	
218	Penconazole	Fu	1	5	2	1	4.5	N		
219	Naptalam	He	2	4	1	2	4.5	N		
220	Maneb	Pe	2	1	2	4	4.5	N		
221	Furathiocarb	Pe	1	5	2	1	4.5	N		
222	Flusilazole	Fu	2	4	2	1	4.5	N		
223	Fenarimol	Fu	2	4	2	1	4.5	N	M	
224	Endosulfan I	In	1	5	2	1	4.5	Y	HH	
225	Diquat	He	3	3	2	1	4.5	N		CFR 180.226
226	Dichlorvos (ddvp)	Pe	1	2	3	3	4.5	Y	L	CFR 180.235
227	Cyhalothrin (all isomers)	In	3	6	1	1	4.5	N	HH	
228	Bitertanol	Fu	1	5	2	1	4.5	N		
229	Bicyclopyrone	He	1	2	3	3	4.5	N		CFR 180.682
230	Azoxystrobin	Fu	6	3	1	1	4.5	Y	L	CFR 180.507
231	Atrazine	He	6	3	1	1	4.5	Y	L	CFR 180.220
232	Triforin	Fu	1	3	1	3	4.0	N		
233	Pyriproxyfen	In	2	6	1	1	4.0	Y	H	
234	Phorate sulfoxide	In	2	2	3	1	4.0	N	M	
235	Phorate sulfone	In	2	2	3	1	4.0	N	M	
236	Phorate oxon	In	2	2	3	1	4.0	N	M	
237	Novaluron	He	2	6	1	1	4.0	N	H	CFR 180.598
238	Methiocarb	In	1	3	2	2	4.0	N	L	
239	Malathion oxon	In	3	1	1	3	4.0	N	L	
240	Imazethapyr	He	5	3	1	1	4.0	N		CFR 180.447
241	Flumioxazin	He	5	3	1	1	4.0	N		
242	Florasulam	Pe	2	6	1	1	4.0	N		
243	Fentin hydroxide	Fu	3	1	3	1	4.0	N		CFR 180.236
244	Fenpyroximate	Pe	2	6	1	1	4.0	N	H	CFR 180.566
245	Fenpropathrin	Py	2	6	1	1	4.0	Y	H	CFR 180.466
246	Fenbutatin oxide	In	2	6	1	1	4.0	N		CFR 180.362
247	ETU (Ethylene thiourea)	Pe	1	1	4	4	4.0	N		
248	Etoxazole	In	2	6	1	1	4.0	N		CFR 180.593

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
249	Ethephon	He	3	1	2	2	4.0	N		CFR 180.300
250	Carfentrazone ethyl	He	4	4	1	1	4.0	Y	L	CFR 180.515
251	Bromacil	Pe	1	3	1	3	4.0	N		
252	Thiram	Pe	3	2	2	1	3.8	N		
253	Sulfosulfuron	He	2	1	1	4	3.8	N		CFR 180.552
254	Quinclorac	He	2	3	1	2	3.8	N		CFR 180.463
255	Prallethrin	In	1	4	1	2	3.8	Y	M	
256	Phenmedipham	Pe	1	4	1	2	3.8	N		
257	Paclobutrazol	Fu	1	4	1	2	3.8	N		
258	Methamidophos	In	2	1	4	1	3.8	Y	L	
259	Fpyriproxyfen	Fu	1	4	2	1	3.8	N	M	
260	Fluquinconazole	Fu	1	4	2	1	3.8	N		
261	Fenitrothion (MEP)	In	1	4	2	1	3.8	N	L	
262	Ethofumesate	He	2	3	1	2	3.8	Y	L	CFR 180.345
263	Endosulfan sulfate	In	1	4	2	1	3.8	Y	HH	
264	Endosulfan II	In	1	4	2	1	3.8	Y	HH	
265	Emamectin	In	2	1	4	1	3.8	N		CFR 180.505
266	Chloroxuron	He	1	4	2	1	3.8	N		
267	Carbofuran	In	2	3	2	1	3.8	Y	L	
268	Azinphos-ethyl	In	1	4	2	1	3.8	N	L	
269	Aminopyralid	He	4	1	1	2	3.8	N		CFR 180.610
270	Tridemorph	Fu	1	6	1	1	3.5	N		
271	Thiamethoxam	In	6	1	1	1	3.5	Y	L	CFR 180.565
272	Temephos	In	1	6	1	1	3.5	N		
273	Tebufenozide	In	2	5	1	1	3.5	Y	M	CFR 180.482
274	Spiroxamine	Pe	1	6	1	1	3.5	N		
275	Spiromesifen	In	2	5	1	1	3.5	N	M	CFR 180.607
276	S-methoprene	Pe	1	6	1	1	3.5	N		CFR 180.368
277	Sethoxydim	He	5	2	1	1	3.5	N	L	CFR 180.412
278	Quinoxyfen	Pe	2	5	1	1	3.5	N		
279	Pyridate	Pe	1	6	1	1	3.5	N		
280	Prothioconazole	Fu	3	4	1	1	3.5	N		CFR 180.626
281	Napropamide	He	3	4	1	1	3.5	N		
282	Myclobutanil	Fu	4	3	1	1	3.5	Y	L	CFR 180.443
283	Metsulfuron-methyl	He	4	3	1	1	3.5	N		CFR 180.428
284	Methoxyfenozide	In	3	4	1	1	3.5	Y	M	CFR 180.544
285	Methoprene	In	1	6	1	1	3.5	N	H	CFR 180.1033
286	Isoxadifen-ethyl	He	1	6	1	1	3.5	N		
287	Ipconazole	Fu	2	5	1	1	3.5	N		
288	Indoxacarb	In	2	5	1	1	3.5	Y	M	CFR 180.564
289	Imidacloprid	In	6	1	1	1	3.5	Y	L	CFR 180.472
290	Glyphosate	He	6	1	1	1	3.5	N		CFR 180.364

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
291	Fluopyram	Fu	2	5	1	1	3.5	N		CFR 180.661
292	Fluopicolide	Fu	2	5	1	1	3.5	N		
293	Flufenoxuron	In	1	6	1	1	3.5	N	H	CFR 180.623
294	Flucythrinate	Py	1	6	1	1	3.5	N		
295	Fenazaquin	In	1	6	1	1	3.5	N		
296	Etofenprox	In	1	6	1	1	3.5	N		CFR 180.620
297	EPTC (S-Ethyl dipropylthiocarbamate)	He	3	4	1	1	3.5	N		
298	Cyprodinil	Fu	3	4	1	1	3.5	N		CFR 180.532
299	Cyphenothrin	In	1	6	1	1	3.5	N	H	
300	Cyhexatin	Pe	1	6	1	1	3.5	N		
301	Cyhalofop-butyl	He	2	5	1	1	3.5	N		
302	Cloquintocet-mexyl	Pe	1	6	1	1	3.5	N		
303	Clomazone	He	4	3	1	1	3.5	N		
304	Chlorimuron-ethyl	Pe	4	3	1	1	3.5	N		
305	Chlorantraniliprole	In	3	4	1	1	3.5	N		CFR 180.628
306	Carbosulfan	In	1	6	1	1	3.5	N		
307	Butralin	He	2	5	1	1	3.5	N		
308	Bromopropylate	In	1	6	1	1	3.5	N		
309	Bromophos	In	1	6	1	1	3.5	N		
310	Beta cyfluthrin	Pe	1	6	1	1	3.5	N		CFR 180.436
311	Bentazon	He	4	3	1	1	3.5	N		CFR 180.355
312	Amitrole	He	1	1	3	4	3.5	N		
313	Acequinocyl	In	1	6	1	1	3.5	N		CFR 180.599
314	2,6-Diisopropylnaphthalene (2,6-DIPN)	He	1	6	1	1	3.5	N	L	
315	Triticonazole	Fu	2	4	1	1	3.0	N		
316	Trifloxysulfuron	He	2	2	2	1	3.0	N		
317	Trichlorfon	Pe	1	1	3	3	3.0	N		CFR 180.198
318	Topramezone	He	2	2	2	1	3.0	N		CFR 180.612
319	Tolclofos-methyl	Fu	1	5	1	1	3.0	N		
320	Tetradifon	Pe	1	5	1	1	3.0	N		
321	Tecnazene	Fu	1	5	1	1	3.0	N		
322	Tebuthiuron	He	2	2	1	2	3.0	N	L	CFR 180.390
323	Spirotetramat	In	2	4	1	1	3.0	N		CFR 180.641
324	Rimsulfuron	He	5	1	1	1	3.0	N		
325	Pyrithiobac sodium	Pe	2	1	1	3	3.0	N		
326	Prosulfuron	He	2	4	1	1	3.0	N		
327	Pirimiphos methyl	In	1	5	1	1	3.0	Y	M	CFR 180.409
328	Pinoxaden	He	2	4	1	1	3.0	N		CFR 180.611
329	Oxydemeton methyl	In	2	1	3	1	3.0	N	L	CFR 180.330
330	Omethoate (dimethoate byproduct)	In	1	1	3	3	3.0	Y	L	CFR 180.204

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
331	Metconazole	Fu	2	4	1	1	3.0	N		CFR 180.617
332	Metalaxyl	Fu	4	2	1	1	3.0	Y	L	CFR 180.408
333	Mefenpyr-diethyl	He	1	5	1	1	3.0	N		CFR 180.509
334	MCPB (4-(2-Methyl-4-chlorophenoxy) butyric acid)	He	2	4	1	1	3.0	N		
335	Mandipropamid	Fu	2	4	1	1	3.0	N		
336	Iodosulfuron methyl	Pe	2	4	1	1	3.0	N		
337	Imazamethabenz-methyl	He	2	2	1	2	3.0	N		
338	Hexazinone	He	2	2	1	2	3.0	Y	L	CFR 180.396
339	Guazatine	Fu	1	3	2	1	3.0	N		
340	Fosthiazate	Pe	1	2	3	1	3.0	N		
341	Formetanate hydrochloride	Pe	1	2	3	1	3.0	N		
342	Formetanate	Pe	2	1	3	1	3.0	N		
343	Fluvalinate (τ-Fluvalinate)	In	1	5	1	1	3.0	Y	M	
344	Flutolanil	Fu	2	4	1	1	3.0	N	M	CFR 180.484
345	Fluroxypyr	He	3	3	1	1	3.0	N	L	CFR 180.535
346	Flubendiamide	In	2	4	1	1	3.0	N		CFR 180.639
347	Flonicamid	In	2	1	1	3	3.0	N	L	CFR 180.613
348	Fensulfothion	In	1	3	2	1	3.0	N		
349	Fenpropimorph	Pe	1	5	1	1	3.0	N		
350	Fenhexamid	Fu	2	4	1	1	3.0	N		
351	Fenamiphos sulfoxide	In	1	2	3	1	3.0	N	L	
352	Fenamiphos sulfone	In	1	2	3	1	3.0	N	L	
353	Diflufenzopyr	He	4	2	1	1	3.0	N	HH	
354	Diflufenican	He	1	5	1	1	3.0	N		
355	Diflubenzuron	In	2	4	1	1	3.0	Y	M	CFR 180.377
356	Didecyldimethylammonium chloride	Pe	1	5	1	1	3.0	N		CFR 180.1317
357	Diclosulam	Pe	2	4	1	1	3.0	N		
358	Dichloran	Pe	1	3	2	1	3.0	N		
359	Deltamethrin	In	1	5	1	1	3.0	N	M	CFR 180.435
360	Cyclanilide	He	2	2	2	1	3.0	N		CFR 180.506
361	Clopyralid	He	4	2	1	1	3.0	N		CFR 180.431
362	Clofencet	Pe	1	2	1	3	3.0	N		
363	Carbendazim	Fu	1	2	1	3	3.0	N	L	
364	Bifenazate	Pe	2	4	1	1	3.0	N	L	CFR 180.572
365	Benoxacor	He	1	3	2	1	3.0	Y	L	CFR 180.460
366	Ametryn	He	1	3	2	1	3.0	N		
367	Aldicarb	Pe	2	2	2	1	3.0	Y	L	
368	4-chlorophenoxyacetic acid (4-cpa)	Pe	1	3	2	1	3.0	N		
369	Triazophos	Pe	1	4	1	1	2.5	N		
370	Terbacil	He	3	2	1	1	2.5	N	L	

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
371	Tepraloxydim	He	1	4	1	1	2.5	N		
372	Propyzamide	He	1	4	1	1	2.5	N		CFR 180.317
373	Propylene oxide	Fu	1	1	1	4	2.5	N		
374	Propoxycarbazone	He	2	3	1	1	2.5	N		CFR 180.600
375	Pronamide	He	1	4	1	1	2.5	Y	L	
376	Picloram	He	4	1	1	1	2.5	N		CFR 180.292
377	Phosphine (hydrogen phosphide)	Pe	1	1	3	2	2.5	N		
378	O-Phenylphenol	Fu	1	4	1	1	2.5	N		
379	Nicosulfuron	He	4	1	1	1	2.5	N		CFR 180.454
380	Monocrotophos	In	1	1	4	1	2.5	N		
381	Methomyl	In	4	1	1	1	2.5	Y	L	
382	Lenacil	He	1	4	1	1	2.5	N		
383	Imazaquin	He	2	3	1	1	2.5	N		
384	Imazapic-ammonium	He	2	3	1	1	2.5	N		CFR 180.490
385	Halosulfuron-methyl	He	4	1	1	1	2.5	N		CFR 180.479
386	Fluxapyroxad	Fu	1	4	1	1	2.5	N		CFR 180.666
387	Flutriafol	Fu	2	3	1	1	2.5	N		CFR 180.629
388	Fluoxastrobin	Fu	2	3	1	1	2.5	N	L	CFR 180.609
389	Flumetsulam	He	3	2	1	1	2.5	N		
390	Flucarbazone	Pe	2	3	1	1	2.5	N		
391	Ethoxyquin	Fu	1	4	1	1	2.5	N		
392	Diphenylamine (DPA)	Fu	1	4	1	1	2.5	N	HH	CFR 180.190
393	Dimethomorph	Pe	2	3	1	1	2.5	N		
394	Desmedipham	He	1	4	1	1	2.5	N		
395	Daminozide	He	1	1	1	4	2.5	N		
396	Cyazofamid	Fu	2	3	1	1	2.5	N		
397	Cyantraniliprole	In	1	4	1	1	2.5	N		CFR 180.672
398	Chlorsulfuron, 5-hydroxy-	Pe	3	2	1	1	2.5	N		
399	Chlorsulfuron	He	3	2	1	1	2.5	N		CFR 180.405
400	Chlorpropham	He	1	4	1	1	2.5	Y	L	CFR 180.181
401	Chloroneb	Fu	1	4	1	1	2.5	Y	L	
402	Carboxin	Pe	2	3	1	1	2.5	N	L	CFR 180.301
403	Captan epoxide	Pe	1	1	1	4	2.5	N		
404	Butafenacil	He	1	4	1	1	2.5	N		CFR 180.592
405	Benalaxyl	Pe	1	4	1	1	2.5	N		
406	Acibenzolar-S-methyl	Fu	1	4	1	1	2.5	N		
407	Phosalone oxon	Pe	1	2	2	1	2.3	N		
408	Naled	Pe	1	2	2	1	2.3	N		
409	Imazapyr	He	2	1	2	1	2.3	N		CFR 180.500
410	Endothall	He	1	2	2	1	2.3	N		
411	Deethylatrazine	He	1	2	2	1	2.3	Y		
412	Bendiocarb	Pe	1	2	2	1	2.3	N		

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
413	Azamethiphos	Pe	1	2	2	1	2.3	N		
414	Aldicarb sulfoxide	Pe	1	2	2	1	2.3	Y	L	
415	Aldicarb sulfone	Pe	1	2	2	1	2.3	Y	L	
416	Triflumazole	Fu	2	2	1	1	2.0	N	L	CFR 180.476
417	Triasulfuron	He	2	2	1	1	2.0	N		CFR 180.459
418	Thiencarbazone-methyl	Pe	2	2	1	1	2.0	N		CFR 180.645
419	Thidiazuron	He	2	2	1	1	2.0	N		CFR 180.403
420	Saflufenacil	He	3	1	1	1	2.0	N		CFR 180.649
421	Pyroxsulam	He	2	2	1	1	2.0	N		
422	Pyrazon	He	2	2	1	1	2.0	Y		CFR 180.316
423	Propoxycarbazone-sodium	He	1	3	1	1	2.0	N		CFR 180.910
424	Propham	He	1	3	1	1	2.0	N	L	
425	Propamocarb hydrochloride	Fu	2	2	1	1	2.0	N		
426	Propamocarb	Fu	2	2	1	1	2.0	N		
427	Phosmet oxon	In	1	1	1	3	2.0	N		
428	Oxamyl	In	3	1	1	1	2.0	N		
429	Mesosulfuron methyl	He	2	2	1	1	2.0	N		CFR 180.597
430	Imiprothrin	In	1	3	1	1	2.0	N	L	
431	Imazamox	He	3	1	1	1	2.0	N		CFR 180.1223
432	Fluroxypyr-1-Methylhepyl-Ester	He	1	3	1	1	2.0	Y	L	CFR 180.535
433	Flucarbazone-sodium	He	1	3	1	1	2.0	N		CFR 180.562
434	Ferbam	Pe	1	1	1	3	2.0	N		
435	Fenamidone	Fu	1	3	1	1	2.0	N	L	CFR 180.579
436	Ethoxysulfuron	Pe	1	3	1	1	2.0	N		
437	Diphenamid, desmethyl	Pe	1	3	1	1	2.0	N		
438	Diphenamid	He	1	3	1	1	2.0	N	L	
439	Dimethipin	Pe	1	1	1	3	2.0	N		
440	Demeton-S-methyl sulfone	In	1	1	3	1	2.0	N	L	
441	Cymoxanil	Fu	3	1	1	1	2.0	N		
442	Cloransulam-methyl	Pe	1	3	1	1	2.0	N		
443	Chloroneb, hydroxy-	Pe	1	3	1	1	2.0	N		
444	Bupirimate	Fu	1	3	1	1	2.0	N		
445	Bifenthrin, 4'-hydroxy	Pe	1	1	1	3	2.0	N		
446	Asulam	He	1	1	1	3	2.0	N		CFR 180.360
447	Acetamiprid	In	3	1	1	1	2.0	Y	L	CFR 180.578
448	3-Hydroxycarbofuran	In	1	1	3	1	2.0	Y	L	
449	Zineb	Fu	1	2	1	1	1.5	N		
450	Trinexapac ethyl	He	1	2	1	1	1.5	N		CFR 180.662
451	Sulfuryl fluoride	Pe	1	1	2	1	1.5	N		CFR 180.575
452	Spinetoram	In	2	1	1	1	1.5	N		CFR 180.635
453	Pyroxasulfone	Pe	1	2	1	1	1.5	N		
454	Prohexadione calcium	Fu	1	2	1	1	1.5	N		CFR 180.547

Rank	Chemical	Type*	S	L	H	C	Score	FSIS Testing	EPA Rank**	Authority***
455	Paraquat dichloride	He	1	1	2	1	1.5	N		CFR 180.205
456	Mepiquat	He	2	1	1	1	1.5	N		
457	Maleic hydrazide	Pe	2	1	1	1	1.5	N		
458	Fosetyl	Fu	2	1	1	1	1.5	N		
459	Fluridone	He	1	2	1	1	1.5	Y	L	CFR 180.420
460	Flupropanate	Pe	1	1	2	1	1.5	N		
461	Ethametsulfuron methyl	He	1	2	1	1	1.5	N		
462	Diquat dibromide	He	1	1	2	1	1.5	N		CFR 180.226
463	Dinotefuran	In	2	1	1	1	1.5	N	L	CFR 180.603
464	Cyromazine	In	1	1	2	1	1.5	N		CFR 180.414
465	Coumaphos S	Pe	1	2	1	1	1.5	Y	L	
466	Coumaphos	In	1	2	1	1	1.5	N	L	CFR 180.189
467	Chloridazon	He	1	2	1	1	1.5	N		
468	Carbetamide	Pe	1	2	1	1	1.5	N		
469	Amicarbazone	He	1	2	1	1	1.5	N		CFR 180.615
470	Spinosad	In	1	1	1	1	1.0	N		CFR 180.495
471	Piperazine	Fu	1	1	1	1	1.0	N		
472	Mepiquat chloride	He	1	1	1	1	1.0	N		CFR 180.384
473	Glyphosate-Trimethylsulfonium (Sulfosate)	Pe	1	1	1	1	1.0	N		
474	Fosetyl-aluminum	Fu	1	1	1	1	1.0	N		
475	Difenzoquat	Pe	1	1	1	1	1.0	N		
476	Dalapon (2,2-dpa)	He	1	1	1	1	1.0	N		
477	Coumaphos O	Pe	1	1	1	1	1.0	Y	L	
478	Clothianidin	In	1	1	1	1	1.0	Y	L	
479	Chlormequat	Pe	1	1	1	1	1.0	N		CFR 180.698
480	Azinphos-methyl oxon	In	1	1	1	1	1.0	N	L	
481	Azimsulfuron	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