

**FOOD SAFETY AND INSPECTION SERVICE
1998 NATIONAL RESIDUE PROGRAM
DOMESTIC RESIDUE DATA BOOK**

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EXPLANATION OF THE 1998 FSIS NATIONAL RESIDUE PROGRAM

Introduction

Under Hazard Analysis and Critical Control Points (HACCP), the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) and industry each contribute to ensuring that USDA-inspected meat, poultry, and egg products are safe, wholesome, free of adulterating residues, and accurately labeled. As part of its responsibility, FSIS conducts the National Residue Program (NRP) to help prevent products from animals containing unacceptable (violative) residues from pesticides, animal drugs, or potentially hazardous chemicals from entering the food chain. The NRP collects samples of meat and poultry products at domestic slaughter establishments under FSIS and State inspection authority. These samples are then analyzed for the presence of violative residues. The presence of violative residues is determined by reference to residue limits (tolerances or action levels) established by the Environmental Protection Agency (EPA) for pesticides and by the Food and Drug Administration (FDA) for animal drugs and environmental contaminants.

The NRP activities reported in this report cover monitoring and enforcement testing.

Monitoring

Monitoring involves the sampling of meat, poultry, and egg products from specified slaughter classes to provide information about the occurrence of residue violations on an annual, national basis. Compounds considered for inclusion in the National Residue Program generally have established residue limits - either tolerances or action levels. Residue limits pertinent to the 1998 NRP are listed in Appendix I.

Selection for monitoring is based on compound evaluations and the availability of laboratory methodology that is suitable for regulatory purposes. Monitoring information is obtained through a statistically based random selection of specimens of normal-appearing tissues from passed carcasses (healthy animals). Generally, for a specific slaughter class/compound pair, the number of randomly chosen specimens (300) provides a 95% probability of detecting at least one violation when 1 percent of the animal population is violative (see Table on page 16). In addition to profile information, the results are used to identify producers or other entities marketing animals with violative concentrations of residues. When such producers subsequently offer animals for slaughter the meat and poultry products from these animals may be subjected to enforcement testing until compliance is demonstrated.

Exceptions to the number of specimens selected are made for minor slaughter classes and for major slaughter classes in which problems are suspected; smaller sample sizes may be used in the former case, larger sample sizes in the latter. The information generated from monitoring is reviewed periodically to assist in the allocation of Agency resources. A total of **26,888** monitoring sample units were analyzed during 1998 from all classes of food-producing animals.

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Enforcement Testing

Enforcement testing consists of the analysis of specimens obtained from individual animals or lots based on clinical signs, herd history, or post mortem findings. Testing is performed to detect individual animals with violative concentrations of residues. It is emphasized in problem (high prevalence) populations and used as a tool to prevent products that contain illegal residues from entering the food supply. Testing frequently results from decisions by program employees based on regional guidelines or direct observations. It is also used to follow up on those who have been identified as marketing animals with violative concentrations of residues. A total of **166,282** enforcement testing samples were analyzed in 1998.

In-plant Tests: In-plant tests are a key part of the NRP. They provide a rapid screening method to detect the presence of residues at the plant level.

SOS, for Sulfa-On-Site, was implemented in April 1988 to test swine urine for sulfonamide residues. SOS is used in approximately 50 of the largest swine slaughtering facilities. Laboratory confirmation of violations is required.

CAST, for Calf Antibiotic and Sulfonamide Test, is used to test bob veal calves (under 150 pounds and less than three weeks old). Prior to 1996, CAST did not require laboratory confirmation of the result; any violation found with CAST resulted in immediate condemnation of the calf. Beginning in 1996, any zone of inhibition measuring greater than 18 mm is sent to the laboratory for confirmation.

STOP, for Swab Test on Premises, was implemented in 1979 to detect the presence of antibiotic residues in kidney tissue. Originally developed for testing dairy cows, STOP is now used for a number of slaughter classes. Laboratory confirmation is required before the animal carcass is condemned. Certain STOP-positive samples are tested for both antibiotics and sulfonamides; the sulfonamide violations are reported with the STOP antibiotic violations.

Confirmed STOP-positive sample specimens with sulfonamide residues that have no established limits are considered violative in those slaughter classes for which they are not approved for use.

FAST, for Fast Antimicrobial Screen Test, quickly detects both antibiotic and sulfonamide drug residues in kidneys and livers and has proved to be a suitable replacement for CAST and STOP. Though FAST is capable of detecting sulfonamides, this test is significantly less sensitive than the SOS test. FAST was implemented in pilot plants in 1995. FAST has now been extended to virtually all the larger bovine slaughtering plants.

INTERPRETATION OF PROGRAM RESULTS

Sample Analyses/Violations

In the 1998 Residue Data Book, the main entries in the body of the table under compound or compound/class headings refer to analyses of sample units comprising tissues from a single animal

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or several birds from the same production lot. The “Specific Violative Residues” sections presented in smaller type below the tables refer to the actual residues found.

The violations and positives reported in the tables giving the results for the 1998 residue program and in Appendix III represent the number of sample units. A sample unit is generally a single animal, except for poultry. A poultry sample unit is a composite of six birds taken from the same flock. For example, tissue from one animal analyzed by the Chlorinated Hydrocarbons (CHCs) and Chlorinated Organophosphates (COPs) method could contain more than one violative residue from this compound class. In the table, this animal would be counted as a single violation. Below the tables, the specific violative residues are enumerated. In the example above, if two different CHCs were found to be violative in a single animal, both analytes would be listed in this section.

It should also be noted that some sample tissues are analyzed for more than one compound or compound class and are reported here as separate analyses under each relevant compound heading. Each analysis is reported and included in the total residue findings, even when the samples came from the same animal.

In addition, limits of quantitation and detection should be considered when interpreting residue levels and occurrences.

Aggregation of Data

Care must be taken when making statistical inferences from these data. The domestic monitoring sampling program is designed to detect, with a predetermined level of confidence, specific compounds in the designated slaughter classes. The sampling program is not designed to provide an estimate of an overall national percentage of violations for all chemical residues or slaughter classes tested. The data on violations reported here should not be summed across either slaughter class or compound with the intent of arriving at a single value to represent the percentage occurrence of violations over all the species that were tested. This mathematical operation will not produce a statistically valid estimate for the population, given the sample design in use.

Confidence Intervals

Within a slaughter class/compound pair, the results of the random sampling may be considered as representative of that slaughter class population, since the sample selection procedure is designed to approximate the selection of a simple random sample of animals. The percentage of violations in each slaughter class/compound pair is a statistically valid estimate of the corresponding slaughter class population percentage, based on the randomness model. Therefore, the information presented includes these estimates of percentage of violations, along with appropriate confidence intervals. The two-sided 95% confidence intervals for the population percentage of violations are given (i.e., the probability is approximately 95% that the interval ranging from the lower bound through the upper bound will contain the true population value). The confidence intervals were computed using a binomial distribution.

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A Note on Calf Nomenclature

This edition follows the usage of the 1989 and later editions of the NRPP. "Fancy calves" in the 1988 edition became "Formula-fed calves" in 1989; "Western calves" in the 1988 edition became "Heavy calves" in 1989.

Non-violative Positive Results

Appendix III displays, for monitoring and enforcement testing (excluding In-plant tests), those laboratory-confirmed residues that are below tolerance. The results may include some Unidentified Microbial Inhibitors (UMI's), residues from antibacterial agents that are present but cannot be accurately identified.

Voluntary Inspection Program

Voluntary inspection and certification program are maintained for rabbits and ratites. Results for rabbits from 1998 are presented in Appendix IV.

RESULTS

1998 Summary

A low level of violative monitoring samples was detected in **1998**, as has been found in previous sampling years. FSIS data indicate that the great majority of the 151.28 million head of livestock and 8.01 billion birds are free of violative residues when they are slaughtered in federally inspected plants.

The 1998 production for the various slaughter classes are tabulated below:

Class	Total heads	Class	Total Heads
Horses	68,783	Goats	455,076
Bulls	721,868	Market hogs	100,365,553
Beef and dairy cows	7,093,206	Boar/stags	735,616
Heifers	12,871,623	Sows	3,578,225
Steers	19,818,380	Young chickens	7,556,363,108
Bob calves	690,506	Mature chickens	164,353,454
Formula-fed calves	727,667	Young turkeys	265,266,399
Non-formula calves	24,592	Mature turkeys	1,871,937
Heavy calves	40,665	Ducks	23,050,277
Sheep	214,892	Rabbits	317,022
Lambs	3,556,435	Geese	142,428

In **1998** the FSIS monitoring program sampled and tested for seven classes of animal drug and pesticide compounds, comprising approximately 59 residues. Of the 26,888 monitoring analyses, 66

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showed violative concentrations of residues. As noted earlier, the percentage of violations for all samples and all residues is not representative of the percentage that are violative in the livestock population as a whole. The percentage occurrence of violations or positive findings can be considered representative only within a slaughter class/compound pair.

In the **1998** monitoring program, the following violations were found: 16 sulfonamides, 38 antibiotics, four chlorinated hydrocarbons and chlorinated organophosphates, eight ivermectin, and one arsenic. Multiple antibiotic violations were found in a horse sample.

The majority of these violations detected in the monitoring program were from illegal levels of approved animal drugs, particularly sulfonamides and antibiotics used to prevent or treat bacterial infections. Most antibiotic and sulfonamide residue violations are confined to a relatively small percentage of livestock and poultry that make up the meat supply. The recurring reason for drug residue violations in livestock and poultry is an apparent failure to allow an adequate withdrawal time for the drugs to clear the animal's system. Detected illegal residues are usually concentrated in kidney, liver, or fat rather than muscle meat. The monitoring program focuses on kidney and liver tissues, since most FDA limits are established in these tissues.

SPECIFIC NATIONAL RESIDUE PROGRAM COMPOUNDS/CLASSES

Antibiotics

In 1998, 7,829 samples were analyzed for antibiotic residues. Thirty-eight antibiotic monitoring violations were found in 37 animals from all slaughter classes monitored for antibiotics. Multiple antibiotic violations were found in one horse. Horses, in fact, accounted for 21 of the antibiotic violations.

CAST: 8,958 analyses were performed on bob veal calf samples in **1998**, with 82 violative animals. (11,988 CAST samples were tested in 1997, with 55 violative specimens.)

STOP: 37,633 analyses were performed on samples from horses, cattle, sheep/lambs, goats, swine, and ostriches in 1998, with 220 violative animals. (33,709 STOP samples were tested in 1997, with 150 violations.)

FAST: 108,020 analyses were performed in cattle, sheep, goats, swine, and other animals in 1998, with 751 violative animals. (109,021 FAST samples in 1997 resulted in 472 violations.)

Sulfonamides

Sixteen sulfonamide violations occurred among 5,652 samples from all slaughter classes monitored for sulfonamides. Bob calves had four violations, sows had three sulfa violations, and boar/stags, market hogs, and non-formula fed veal each had two violations. Steers, dairy cows, and formula-fed veal each had one violation. The 16 sulfa violations included seven sulfamethazine, eight sulfadimethoxine, and one sulfamethoxazole. SOS testing resulted in 28 violative animals of 11,109 analyses in 1998. All violations involved sulfamethazine. (10,072 SOS samples were tested in

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1997 with nine violations.)

Arsenicals

Arsenical compounds are used in food-producing animals (swine and poultry) primarily as growth promoters and to prevent bacterial enteritis. Of the 2,542 monitoring samples of poultry, one violation was detected in a young turkey.

Chlorinated Hydrocarbons & Chlorinated Organophosphates

These chemicals are effective insecticides. Some of these compounds - such as DDT - are no longer marketed because of their extremely long half-life. Of the 5,613 monitoring samples, four violative analyses were found in sample specimens. Violative levels of DDT were found in a heavy calf. Violative levels of chlordane were found in a goat and in a boar/stag. Violative levels of pentachloroaniline were found in a boar/stag.

Eggs were added to the National Residue Program in October 1995. In 1998, 359 samples were analyzed for chlorinated hydrocarbons and chlorinated organophosphates. No detectable residues were found.

Halofuginone

Halofuginone prevents coccidiosis, a serious and potentially fatal parasitic infection that spreads rapidly among chickens and turkeys. No violations were found among the 881 monitoring samples taken in 1998. The following samples were analyzed: 284 young chickens, 233 mature chickens, 238 young turkeys and 126 mature turkeys.

Ivermectin

Ivermectin is one of the most widely-sold anthelmintic drugs in the United States. It is active against a wide variety of parasites. Eight of 3,672 samples in 1998 monitoring were violative: two in horses, two in bulls, two in goats, and one each in a lamb and a heavy calf. Samples were taken from 16 production classes.

Carbadox

Carbadox is a coccidiostat registered for use in swine. During each FDA/State investigation of an illegal tissue residue the inspector notes drugs found on the farm. Such field intelligence data indicated that carbadox was occasionally found at cattle-only facilities raising questions about possible misuse of the product. The high regulatory and toxicological concerns associated with this product elevated the need to monitor for this compound in a species other than in which it was approved.

No violations were found among the 471 steers and 228 heifers tested.

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Beta-Agonists: Clenbuterol

Clenbuterol, a growth promotant, is not currently registered for any food animal use in the United States. Clenbuterol is also a β -agonist and can cause increased heart rate, muscular tremors, headache, nausea, fever, and chills in people who have eaten the livers of animals that have been treated with clenbuterol.

In 1998, the livers from 218 animals (mostly show animals) were analyzed. All the liver samples were negative for clenbuterol.

Phenylbutazone

The method used to analyze for chlorinated hydrocarbons can be used to screen for residues of phenylbutazone, an anti-inflammatory that is not registered for use in food animals. The presence of phenylbutazone is confirmed by full scan GC/MS. Phenylbutazone was detected in one steer during enforcement testing.

1998 RESIDUE PROGRAM SPECIES-SPECIFIC RESULTS

Appendix V contains the results of the National Residue Program in a species-specific format. The number of positives and violations are reported in intervals, with the lowest interval being 0.01-0.1 ppm. If samples did not contain detectable residues, the samples are categorized under "None" for "Amount Found in Sample." The no-detect level, however, varies for each analyte and is **not** <0.01 ppm for every analyte in Appendix V. The limits of detection may be found in Appendix II (FSIS Laboratory Residue Analytical Capability).

IMPORT RESIDUE PLAN

Federal meat and poultry inspection laws require foreign countries exporting meat and poultry to the U.S. to impose inspection requirements equivalent to U.S. requirements. As part of the process for a foreign country satisfying the equivalence standard with respect to the U.S., the country must respond to a set of five questionnaires that are designed to obtain information regarding various risk areas. One of the risk areas is residues.

A critical process in the foreign inspection system is residue control and monitoring to ensure that chemicals or drugs prohibited in food animal production in the US are controlled by foreign countries whose products are destined for the US consumer. Present statutes require that foreign residue control programs include random sampling of animals at slaughter, the use of approved sampling and analytical methods, testing of the target tissue for specific compounds, and testing for compounds identified as potential contaminants of meat, poultry and egg product exported to the U.S. In addition, every foreign country must submit residue monitoring plans and results of the previous year's testing.

FSIS evaluates foreign residue control programs through on-site observation of the foreign country's inspection system, including the exporting plants, equipment and the laboratories, and through

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actual sampling of imported products at the time of entry into the U.S. Import reinspection performed by FSIS inspectors at various ports-of-entry around the country is a check on the effectiveness of foreign inspections systems. A component of the import reinspections process is residue sampling. To ensure that representative specimens are selected, a specimen is chosen at random from the lot selected for reinspection.

The criteria for acceptance or rejection of imported products are the same as those applied to U.S. meat and poultry products prepared under Federal inspection. When test results indicate a violative level of residue in an imported product, every effort is made to locate and destroy any product already in U.S. distribution channels. Subsequent shipments of the same product from the same establishment are retained at the port-of-entry until laboratory results are known. If results are negative, product is permitted to move into commerce; if violative, product is refused entry into the U.S. In addition, all shipments of like product from the country are placed on an increased testing schedule until a record of compliance is re-established.

Imported products are analyzed for the same residues as in the domestic samples tested in the National Residue Program. The results from import testing are tabulated in Appendix VI.

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Contacts and Address for Comments:

The results of the domestic residue sampling programs were compiled by the Emerging Issues Branch, Chemistry and Toxicology Division, in the Office of Public Health and Science. Technical comments/questions about the residue program should be referred to the **Chemistry and Toxicology Division**. The telephone number is 202-501-7319.

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1998 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS

In all the tables in this section and in Appendix III, the number of violations or positives reflects the number of animals (or the number of composite samples in the case of poultry) that were found to contain at least one violative or detectable residue.

Bacitracin	Hygromycin	Novobiocin
Chlortetracycline	Neomycin	Streptomycin
Erythromycin	Oxytetracycline	Tetracycline
Gentamicin	Penicillins	Tylosin

(Non-violative positives are reported in Appendix III)

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses*	442/20	4.5	2.8-6.9	10/0
Bulls	244/0	0	0.0-1.5	
Beef cows	464/0	0	0.0-0.8	
Dairy cows	479/2	0.4	0.0-1.5	
Heifers	299/1	0.3	0.0-1.8	
Steers	479/1	0.2	0.0-1.2	
Bob calves	410/2	0.5	0.1-1.8	
Formula-fed calves	510/4	0.8	0.2-2.0	
Non-formula calves	256/3	1.2	0.2-3.4	
Heavy calves	286/3	1.0	0.2-3.0	
Cattle				102/3

1998 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Sheep	294/0	0	0.0-1.2	
Lambs	348/0	0	0.0-1.1	
Sheep/Lambs				5/0
Goats	324/0	0	0.0-1.1	
Market hogs	463/0	0	0.0-0.8	
Boar/Stags	220/1	0.5	0.0-2.5	
Sows	493/0	0	0.0-0.7	
Swine				49/2
Young chickens	429/0	0	0.0-0.9	
Mature chickens	234/0	0	0.0-1.6	
Chickens				4/0
Young turkeys	468/0	0	0.0-0.8	
Mature turkeys	162/0	0	0.0-2.3	
Turkeys				22/0
Ducks	525/0	0	0.0-0.7	
Rabbits				26/3
Other				1/0

* Multiple violations were found in some animals

1998 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

- Horses:** 15 streptomycin, 6 penicillin
- Steers:** 1 gentamicin
- Heifers:** 1 gentamicin
- Dairy cows:** 2 gentamicin
- Bob calves:** 1 neomycin, 1 gentamicin
- Formula-fed veal:** 4 gentamicin
- Non-formula veal:** 1 neomycin, 2 gentamicin
- Heavy calves:** 3 gentamicin
- Boars:** 1 penicillin

Enforcement Testing:

- Cattle:** 1 tylosin, 1 oxytetracycline, 1 penicillin
- Swine:** 2 penicillin
- Rabbits:** 3 streptomycin

In-plant Tests

Calf Antibiotic and Sulfonamide Test (CAST): There were 89 violations found in the 8958 animals tested

CAST SPECIFIC VIOLATIVE RESIDUES

Cattle: 4 penicillin, 6 streptomycin, 6 tetracycline, 1 tylosin, 3 oxytetracycline, 13 neomycin, 28 gentamicin, 2 lincomycin, 7 sulfadimethoxine, 11 sulfamethazine, 8 sulfamethoxazole

Swab Test on Premises (STOP) [Includes samples tested for sulfonamides]	Enforcement Testing: Analyses/Violations
Horse	70/0
Bull	418/1
Steer	1,796/4
Beef cow	8,185/33
Heifer	668/8

1998 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

Swab Test on Premises (STOP) [Includes samples tested for sulfonamides	Enforcement Testing: Analyses/Violations
Dairy cow	20,336/160
Formula fed calves	436/2
Non formula fed calves	139/4
Bob veal	30/0
Heavy Calves	53/1
Calves	8/0
Mature sheep	21/0
Lambs	727/0
Goats	88/0
Market hogs	2,919/3
Boar/stags	125/1
Sows	857/3
Ostrich	757/0
TOTAL STOP	37,633/220

STOP SPECIFIC VIOLATIVE RESIDUES

Bulls: 1 oxytetracycline

Steer: 1 penicillin, 2 tilmicosin, 1 sulfamethazine

Beef cows: 21 penicillin, 1 streptomycin, 1 tetracycline, 3 oxytetracycline, 3 gentamicin, 1 tilmicosin, 4 sulfadimethoxine, 1 sulfamethazine

Heifers: 3 penicillin, 1 streptomycin, 3 oxytetracycline, 1 tilmicosin,

Dairy cows: 81 penicillin, 15 streptomycin, 7 tetracycline, 1 tylosin, 1 neomycin, 14 oxytetracycline, 18 gentamicin, 2 lincomycin, 4 tilmicosin, 18 sulfadimethoxine, 9 sulfamethazine

Formula fed veal: 1 streptomycin, 1 gentamycin

Non formula fed veal: 1 tetracycline, 2 oxytetracycline, 3 gentamycin

Heavy calf: 1 penicillin, 1 neomycin, 1 oxytetracycline

Market hogs: 1 sulfamethazine

1998 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

Boar/Stag: 1 penicillin

Sows: 3 penicillin

Fast Antimicrobial Screen Test (FAST) [Includes samples tested for sulfonamides also]	Enforcement Testing: Analyses/Violations
Bulls	544/2
Steers	950/4
Beef cows	9,303/26
Heifers	760/10
Dairy cows	83,729/651
Bob calves	12,482/54
Formula fed calves	152/3
Non formula fed calves	43/0
Heavy Calves	42/1
Market hogs	3/0
Sows	12/0
TOTAL FAST	108,020/751

FAST SPECIFIC VIOLATIVE RESIDUES

Bulls: 1 penicillin, 1 sulfamethazine

Steers: 2 penicillin, 1 oxytetracycline, 1 sulfadimethoxine

Beef cows: 15 penicillin, 3 streptomycin, 1 oxytetracycline, 6 gentamicin, 1 tilmicosin, 1 sulfadimethoxine, 1 sulfamethazine

Heifer: 3 penicillin, 1 streptomycin, 1 gentamycin, 4 tilmicosin, 1 sulfamethazine

Dairy cows: 266 penicillin, 58 streptomycin, 10 tetracycline, 2 tylosin, 1 erythromycin, 10 neomycin, 24 oxytetracycline, 167 gentamicin, 7 tilmicosin, 120 sulfadimethoxine, 22 sulfamethazine, 1 sulfamethoxazole

1998 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

Bob veal: 6 penicillin, 10 streptomycin, 4 tetracycline, 2 neomycin, 3 oxytetracycline, 17 gentamycin, 4 sulfadimethoxine, 9 sulfamethazine, 7 sulfamethoxazole

Formula-fed veal: 1 streptomycin, 1 tylosin, 1 gentamycin,

Heavy calves: 1 tilmicosin

SULFONAMIDES

Sulfachlorpyridazine
Sulfadimethoxine

Sulfamethazine
Sulfathiazole

(Non-violative positives are reported in Appendix III)

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses	226/0	0	0.0-1.6	
Bulls	247/0	0	0.0-1.5	
Beef cows	306/0	0	0.0-1.2	
Dairy cows	310/1	0.3	0.0-1.8	
Heifers	234/0	0	0.0-1.6	
Steers	321/1	0.3	0.0-1.7	
Bob calves	407/4	1.0	0.3-2.5	
Formula-fed calves	327/1	0.3	0.0-1.7	
Non-formula calves	258/2	0.8	0.1-2.5	
Heavy calves	223/0	0	0.0-1.6	
Cattle				9/0

1998 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES, continued

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Sheep	93/0	0	0.0-3.9	
Lambs	103/0	0	0.0-3.5	
Sheep/Lambs				4/0
Goats	327/0	0	0.0-1.1	
Market hogs	485/2	0.4	0.0-1.5	
Boars/Stags	217/2	0.9	0.1-3.3	
Sows	319/3	0.9	0.2-2.7	
Swine				17/11
Young chickens	278/0	0	0.0-1.3	
Mature chickens	233/0	0	0.0-1.6	
Chickens				1/0
Young turkeys	307/0	0	0.0-1.2	
Mature turkeys	163/0	0	0.0-2.2	
Turkeys				1/0
Ducks	268/0	0	0.0-1.4	

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Steer: 1 sulfamethazine

Dairy cows: 1 sulfadimethoxine

Bob calves: 2 sulfadimethoxine, 1 sulfamethazine, 1 sulfamethoxazole

1998 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES, continued

Formula-fed veal: 1 sulfadimethoxine
Non-formula veal: 2 sulfadimethoxine
Market hogs: 2 sulfamethazine
Boars: 1 sulfadimethoxine, 1 sulfamethazine
Sows: 1 sulfadimethoxine, 2 sulfamethazine

Enforcement Testing:

Swine: 11 sulfamethazine

SULFA-ON-SITE (SOS)

Of the 11,109 swine that were tested, 28 animals contained violative levels of sulfamethazine.

ARSENIC

(Non-violative positives are reported in Appendix III)

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses	91/0	0	0.0-4.0	
Bulls	103/0	0	0.0-3.5	
Beef cows	90/0	0	0.0-4.0	
Dairy cows	95/0	0	0.0-3.8	
Heifers	92/0	0	0.0-3.9	
Steers	93/0	0	0.0-3.9	
Bob calves	87/0	0	0.0-4.2	
Formula-fed calves	100/0	0	0.0-3.6	

1998 DOMESTIC RESIDUE PROGRAM RESULTS

ARSENIC, continued

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Non-formula fed calves	50/0	0	0.0-7.1	
Heavy calves	84/0	0	0.0-4.3	
Cattle				1/0
Sheep	90/0	0	0.0-4.0	
Lambs	108/0	0	0.0-3.4	
Goats	247/0	0	0.0-1.5	
Market hogs	239/0	0	0.0-1.5	
Boars/Stags	71/0	0	0.0-5.1	
Sows	90/0	0	0.0-4.0	
Young chickens	434/0	0	0.0-0.8	
Mature chickens	95/0	0	0.0-3.8	
Chickens				4/0
Young turkeys	236/1	0.4	0.0-2.3	
Mature turkeys	47/0	0	0.0-7.6	
Turkeys				3/0

1998 DOMESTIC RESIDUE PROGRAM RESULTS

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Aldrin	Chlorpyrifos	Endrin
Benzene Hexachloride (BHC)	Coumaphos and oxygen analog	Heptachlor and heptachlor epoxide
Carbophenothion (trithion)	DDT and metabolites	Hexachlorobenzene (HCB)
Chlordane (technical)	Dieldrin	Lindane
2-Chloro-1(2,4,-dichlorophenyl)vinyl diethyl phosphate [chlorfenvinphos, supona]	Dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta(cd)pentalene [mirex]	Linuron
2-Chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate [stirofos, gardona]	Endosulfan	Methoxychlor
		Phosalone
		Polybrominated biphenyls
		Polychlorinated biphenyls

(Non-violative positives are reported in Appendix III)

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses	467/0	0	0.0-0.8	6/0
Bulls	233/0	0	0.0-1.6	
Beef cows	303/0	0	0.0-1.2	
Dairy cows	228/0	0	0.0-1.6	
Heifers	241/0	0	0.0-1.5	
Steers	307/0	0	0.0-1.2	
Bob calves	204/0	0	0.0-1.8	
Formula-fed calves	256/0	0	0.0-1.4	
Non-formula calves	182/0	0	0.0-2.0	
Heavy calves	265/1	0.4	0.0-2.1	
Cattle				12/0

1998 DOMESTIC RESIDUE PROGRAM RESULTS

CHCs/COPs, continued

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Sheep	310/0	0	0.0-1.2	
Lambs	260/0	0	0.0-1.4	
Goats	492/1	0.2	0.0-1.1	
Market hogs	306/0	0	0.0-1.2	
Boars/Stags	233/2	0.9	0.1-3.1	
Sows	313/0	0	0.0-1.2	
Swine				28/0
Young chickens	268/0	0	0.0-1.4	
Mature chickens	94/0	0	0.0-3.8	
Young turkeys	245/0	0	0.0-1.5	
Mature turkeys	145/0	0	0.0-2.5	
Ducks	261/0	0	0.0-1.4	

Eggs were added to the National Residue Program in October, 1995. In 1998, 359 samples were analyzed for chlorinated hydrocarbons and chlorinated organophosphates. No detectable residues were found in 1998.

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Heavy calves: 1 DDT

Goats: 1 chlordane

Boars: 1 chlordane, 1 pentachloroaniline

1998 DOMESTIC RESIDUE PROGRAM RESULTS

HALOFUGINONE

(Non-violative positives are reported in Appendix III)

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Young chickens	284/0	0	0.0-1.3	
Mature chickens	233/0	0	0.0-1.6	
Chickens				2/0
Young turkeys	238/0	0	0.0-1.5	
Mature turkeys	126/0	0	0.0-2.9	
Turkeys				1/0

IVERMECTIN

(Non-violative positives are reported in Appendix III)

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Horses	292/2	0.7	0.1-2.5	
Bulls	257/2	0.8	0.1-2.8	
Beef cows	227/0	0	0.0-1.6	

1998 DOMESTIC RESIDUE PROGRAM RESULTS

IVERMECTIN, continued

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Dairy cows	312/0	0	0.0-1.2	
Heifers	95/0	0	0.0-3.8	
Bob calves	85/0	0	0.0-4.2	
Steers	312/0	0	0.0-1.2	
Formula-fed calves	249/0	0	0.0-1.5	
Non-formula calves	181/0	0	0.0-2.0	
Heavy calves	213/1	0.5	0.0-2.6	
Cattle				4/0
Sheep	198/0	0	0.0-1.8	
Lambs	268/1	0.4	0.0-2.1	
Sheep/Lambs				17/0
Goats	322/2	0.6	0.1-2.2	
Market hogs	240/0	0	0.0-1.5	
Boar/Stags	182/0	0	0.0-2.0	
Sows	239/0	0	0.0-1.5	
Swine				3/0

1998 DOMESTIC RESIDUE PROGRAM RESULTS

CARBADOX

(Non-violative positives are reported in Appendix III)

Slaughter Class	Monitoring			Enforcement Testing
	Analyses/ Violations	Percent Violative	95 percent Confidence Interval	Analyses/ Violations
Steers	471/0	0	0.0-0.8	
Heifers	228/0	0	0.0-1.6	
Swine				1/0

TRACE METAL ENFORCEMENT TESTING

One steer, one beef cow, two sheep, and six market hogs were tested for trace metals. There were no violations.

CLENBUTEROL ENFORCEMENT TESTING

Livers from the following animals were analyzed: 6 bovine (unspecified class), 87 steers, 3 bulls, 1 beef cow, 1 heifer, 3 dairy cows, 4 bob veal, 2 sheep, 59 lambs, 3 goats, and 49 market hogs. All samples were negative.

PHENYLBUAZONE ENFORCEMENT TESTING

One steer was analyzed for residues of phenylbutazone. The sample was violative.

1998 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTALS - BY SLAUGHTER CLASS

Slaughter Class	Monitoring: Analyses	Enforcement Testing: Analyses*
Horses	1,518	16
Bulls	1,084	
Beef cows	1,390	
Dairy cows	1,424	
Heifers	1,189	
Steers	1,983	
Bob calves	1,193	
Formula-fed calves	1,442	
Non-formula calves	927	
Heavy calves	1,071	
Cattle		236
Sheep	985	
Lambs	1,087	
Sheep/Lambs		89
Goats	1,712	3
Market hogs	1,733	
Boars/Stags	923	
Sows	1,454	
Swine		153
Young chickens	1,693	
Mature chickens	889	
Chickens		11
Young turkeys	1,494	

1998 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTALS, continued

Slaughter Class	Monitoring: Analyses	Enforcement Testing: Analyses*
Mature turkeys	643	
Turkeys		27
Ducks	1,054	
Rabbits		26
Other		1
TOTAL	26,888	562*

* Domestic follow-up and inspector-generated sampling; does not include in-plant testing

CUMULATIVE TOTALS - BY COMPOUND OR CLASS

Compound Class	Monitoring: Analyses	Enforcement Testing: Analyses
Antibiotics	7,829	154,830 ¹
Sulfonamides	5,652	11,141 ²
Arsenic	2,542	8
CHC/COP's	5,613	46
Ivermectin	3,672	24
Carbadox	699	1
Halofuginone	881	3
Clenbuterol		218
Phenylbutazone		1
Metals		10
TOTAL	26,888	166,282

¹ Includes CAST, FAST, STOP data and inspector-generated samples

² Includes SOS data and inspector-generated samples

1998 DOMESTIC RESIDUE PROGRAM RESULTS

STATISTICAL TABLE: NUMBER OF SAMPLES REQUIRED TO ENSURE DETECTION OF A PROBLEM THAT AFFECTS A GIVEN PERCENTAGE OF THE SAMPLED POPULATION

Percentage Violative in Sampled Population	Probability of Detection (Percent)			
	90	95	99	99.9
	Samples Required			
10	22	29	44	66
5	45	59	90	135
1	230	299	459	688
0.5	460	598	919	1,379
0.1	2,302	2,995	4,603	6,905
0.05	4,605	5,990	9,209	13,813