CHAPTER 3

CHAPTER 3

Animal Disease Eradication Programs and Control and Certification Programs

The following Veterinary Services (VS) programs are designed to eradicate, control, or prevent diseases that threaten the biological and commercial health of the U.S. livestock and poultry industries.

Eradication Programs

VS eradication programs include scrapie in sheep and goats, tuberculosis in cattle and cervids, pseudorabies and brucellosis in swine, and brucellosis in cattle and bison.

Scrapie in Sheep and Goats

Disease and Program History—Scrapie was first discovered in the United States in 1947 in a Michigan flock that, for several years, had imported sheep of British origin from Canada. Since 1952, VS has worked to control scrapie in the United States. As a result of increasing industry and public concern about transmissible spongiform encephalopathies (TSEs) and the discovery of new TSE diagnostic and control methods, VS initiated an accelerated scrapie eradication program in 2000.

Current Program—The primary aspects of the scrapie eradication program are animal identification, surveillance, tracing of positive and exposed animals, testing of sheep and goats in exposed flocks, cleanup of infected flocks, and certification of flocks.

Animal Identification—Identification of breeding sheep and culled breeding sheep is mandatory when ownership changes. The only sheep that do not have to be identified are those less than 18 months old and, in the case of ewes, those that also have not lambed or become pregnant and are in slaughter channels. As of September 30, 2005, 103,580 premises with sheep and/or goats were recorded in the scrapie national database. (In this database, a premises that contains both sheep and goats might be listed once for each species.) Of these premises, 73,807 have requested and received official eartags (tags approved for use by the Animal and Plant Health Inspection Service [APHIS] in the official scrapie eradication program).

Regulatory Scrapie Slaughter Surveillance (RSSS)—The RSSS program, initiated on April 1, 2003, is the primary surveillance method for scrapie in the United States. RSSS identifies scrapie-infected flocks through targeted slaughter surveillance of sheep and goat populations that have been recognized as having higher-than-average scrapie prevalence. These are defined as mature black- or mottle-faced sheep and any mature sheep or goats showing clinical signs that could be associated with scrapie, such as poor body condition, wool loss, or gait abnormalities. Only sheep with some form of identification (e.g., such as United States Department of Agriculture [USDA]-approved eartags, electronic ID, backtags, and tattoos or lot identification) are sampled. This arrangement allows for tracing positive animals back to the farm of origin.

During FY 2005, as part of the RSSS program, 30,247 sheep and goat samples, collected from 78 slaughter plants in 24 States, were tested for scrapie using immunohistochemistry on brain or lymphoid tissue, or both. Of the 106 animals diagnosed as positive for scrapie, 93 were black-faced, 11 were mottle-faced, 1 was white-faced, and 1 was unknown.

Under the scrapie program, positive test results are traced back to the animal's flock of origin, and the flock is placed under movement restrictions until all high-risk animals (genetically susceptible females) are removed. High-risk animals that had been moved from these flocks before being placed under movement restrictions are traced and tested.

Testing Summary—In response to epidemiologic suspicions of disease, field Veterinary Medical Officers conduct testing to determine if scrapie is present. Such cases are known as regulatory field cases. In addition to the 30,247 samples tested under the RSSS program in 2005, about 5,200 additional tests were conducted for scrapie—either by third-eyelid testing or necropsy—in response to epidemiologic suspicions of disease.

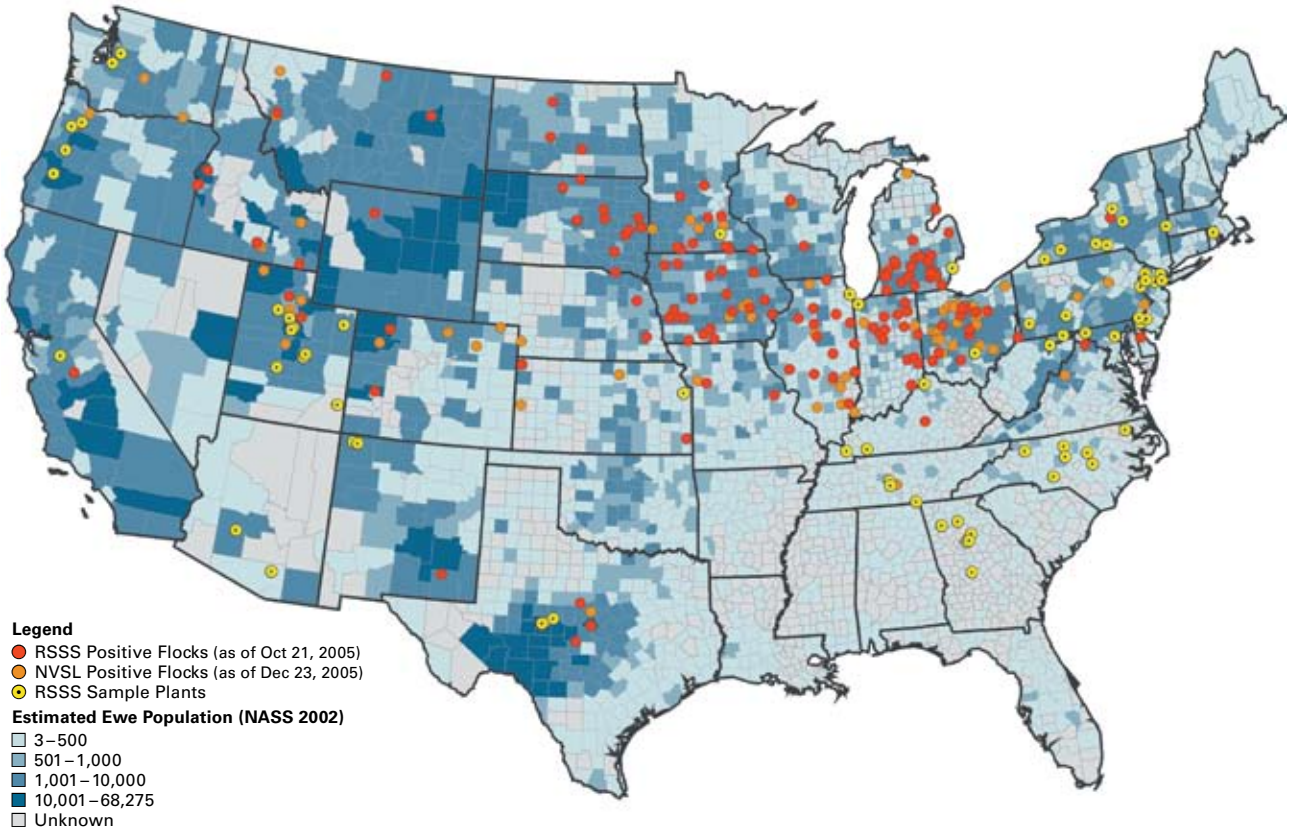
Case and Infected Flock Summary—In FY 2005, 165 newly identified infected flocks were reported, and 598 scrapie cases were confirmed and reported by the National Veterinary Services Laboratories (NVSL) (table 6). A scrapie case is defined as an animal for which a diagnosis of scrapie has been made by the NVSL using a USDA-approved test (typically immunohistochemistry on the obex or a peripheral lymph node). During FY 2005, two scrapie cases were reported in goats. Figure 30 presents the geographic location of U.S. mature ewe populations (National Agricultural Statistics Service 2002 Census) relative to flocks found to be positive for scrapie through RSSS sampling or another regulatory or surveillance method (denoted by NVSL-positive flocks).

TABLE 6. **Scrapie cases, FY 2003 through FY 2005**

	Number of cases		
Tests or examinations	**FY 2003**	**FY 2004**	**FY 2005**
Necropsies	315	374	461
Regulatory third-eyelid	32	20	31
RSSS	[1]23	86	106
Total	370	480	598

[1] Includes part of FY 2003 (April 1–September 30, 2003).

FIGURE 30: **Distribution of mature ewe populations, by county, compared to positive flocks (FY 2003–early FY 2006).**



Scrapie susceptibility in sheep in the United States has been associated with two codons that encode for amino acids in the PrP protein. These codons are at positions 136 and 171, the latter of which is thought to be the major determinant of scrapie susceptibility in the United States. For all the scrapie-positive sheep with known genotypes in FY 2005, 98.4 percent were QQ at codon 171. Of these, 82.6 percent were AA at codon 136, 5.4 percent were AV at codon 136, 0.4 percent were VV at codon 136, and 11.6 percent did not have results for codon 136. Of the remaining 1.6 percent that were not QQ at codon 171, 0.3 percent were AAQH and 1.3 percent were AVQR at codons 136 and 171.

Scrapie Flock Certification Program (SFCP)—The SFCP is a cooperative effort among producers, State and Federal animal health agencies, and industry representatives. Through the SFCP, a flock becomes certified if, during a 5-year monitoring period, no sheep in the flock are diagnosed with scrapie and no clinical evidence of scrapie is found in the flock. The program categories are described in the following paragraphs.

*Complete Monitored Category—*A flock in this category is approved to participate in the program. There are two status levels for flocks in this category:

- **Enrolled flock:** A flock entering the program is assigned enrolled status and is a "complete monitored enrolled flock."
- **Certified flock:** An enrolled flock that has met program standards for 5 consecutive years advances to certified status, meaning that it is unlikely to contain any sheep infected with scrapie.

*Selective Monitored Category—*This category, though open to any flock, was designed for producers of slaughter lambs to allow for scrapie surveillance in large production flocks. Only male animals over 1 year of age must have official identification. Producers agree on the basis of flock size to submit for scrapie diagnosis a portion of the mature animals that are culled or die. Additionally, an accredited veterinarian must inspect all cull ewes for clinical signs of scrapie before slaughter. Selective status is maintained indefinitely as long as the flock meets the category requirements.

*Trends in Plan Enrollment—*Enrollment in the SFCP has increased since 2002. As of September 30, 2005, 1,961 flocks were participating, and of these 188 were certified flocks (table 7). One possible reason for the increased number of certifications in 2005 was participant awareness of standards changes, which now allow rams from lower status flocks to be added to certified flocks without lowering the certified flock's status.

TABLE 7. **Scrapie Flock Certification Program participation 2002–05**

Fiscal year, as of 9/30	Status			
	Flocks	Enrolled	Certified	Selective Monitored
2002	1,539	1,452	78	9
2003	1,776	1,663	105	8
2004	1,868	1,726	135	7
2005	1,961	1,770	188	3

Challenges—For the coming year, major challenges are to continue expanding surveillance efforts into underrepresented areas and to increase the traceability of sheep and goats presented for sampling. Traceability will be enhanced by increasing compliance activities and by improving methods for identifying and tracking sheep and goats through review and testing of available identification systems and integration with the National Animal Identification System. A second tier of challenges includes upgrading the scrapie national database, improving field data collection by refining sample collection and submission, and streamlining data entry and analysis.

Tuberculosis (TB) in Cattle and Cervids

Disease and Program History—In the 1800s and early 1900s, bovine TB presented a significant health risk to people and caused considerable losses in the cattle industry. To reduce the effects of TB, the Federal Government created the Cooperative State–Federal Tuberculosis Eradication Program, which was initially implemented in 1917. This program is administered by USDA–APHIS, State animal health agencies, and U.S. livestock producers.

Although TB prevalence reached very low levels in the 1990s, eradication has proved difficult. In 2000, a comprehensive Strategic Plan for the Eradication of Bovine Tuberculosis was announced in concert with an emergency declaration by the Secretary of Agriculture. A goal of final eradication was set for the end of 2003.

In 2005, VS reviewed the TB eradication program and the United States Animal Health Association (USAHA) TB strategic plan to evaluate program costs and benefits and determine how best to proceed with TB eradication. After developing and evaluating several plans, the working group recommended a "progressive program" based on elements of the USAHA TB strategic plan and the existing

TB program that will promote a more aggressive approach to eradicating bovine TB in the United States. A new strategic plan for implementing this approach is expected to be released in 2006.

Current Program—In the current testing program, States, zones, or regions are classified into five categories based on prevalence of TB in cattle and bison herds (table 8). The publication "Bovine Tuberculosis Eradication: Uniform Methods and Rules" gives the minimum standards adopted and approved by the Deputy Administrator, VS–APHIS, on January 20, 2005 (<http://www.aphis.usda.gov/vs/nahps/tb/tb-umr.pdf>). To retain or improve their status, States, zones, or regions must comply with reporting requirements (annually for Accredited Free and Modified Accredited Advanced, semiannually for Modified Accredited and Accredited Preparatory).

In addition, surveillance is conducted primarily by collecting and testing suspicious granulomas at slaughter establishments.

Disease and Program Status: 2004–05—In FY 2005, the number of cattle herds found to be TB affected declined relative to the previous year. These herds, however, were detected in locations where TB had not been found for many years. In FY 2005, four affected herds were found, down from six affected herds in FY 2004. Slaughter surveillance for TB continued to improve in FY 2005, and two out of the four newly discovered herds were found through slaughter surveillance. The other two herds were detected as a result of the epidemiologic investigation of one of the TB-affected herds identified at slaughter (they were fenceline contacts).

At the end of 2005, 47 U.S. States, Puerto Rico, the U.S. Virgin Islands, Michigan's Upper Peninsula, and part of New Mexico were considered Accredited TB Free (table 8). Texas, part of Michigan's Lower Peninsula, and part of New Mexico were classified as Modified Accredited Advanced, and 11 counties plus portions of 2 other counties in northern lower Michigan were Modified Accredited. During FY 2005, Michigan's split-State status,

TABLE 8. **Tuberculosis accreditation categories and State status—end of calendar year 2005**

Category	Prevalence of TB	States (numbers as of 12/31/05)
Accredited Free	**Zero** for cattle and bison	47 U.S. States, Michigan's Upper Peninsula, most of New Mexico, all of Puerto Rico, and the U.S. Virgin Islands
Modified Accredited Advanced	**Less than 0.01 percent** of total cattle and bison herds for each of recent years	Texas, part of Michigan's Lower Peninsula, and part of two counties in eastern New Mexico
Modified Accredited (Regionalized)	**Less than 0.1 percent** of the cattle and bison herds	11 counties in northern Lower Michigan and parts of 2 other counties
Accredited Preparatory	**Less than 0.5 percent** of the total number of cattle and bison herds	—
Nonaccredited	**Either unknown or 0.5 percent** or more of the total number of cattle and bison herds	—

originally granted in FY 2004, was again changed by granting Accredited Free status to the Upper Peninsula and retaining an area of northeastern Lower Michigan as Modified Accredited and the rest of the Lower Peninsula as Modified Accredited Advanced. In addition, in July, USDA approved New Mexico's request for regionalization. New Mexico was divided into two zones; a portion of two counties in eastern New Mexico retained Modified Accredited Advanced status whereas the remainder of the State was granted TB Free Status.

Activities in specific States follow.

California—After being downgraded from Accredited TB Free status to Modified Accredited Advanced status in 2003, California completed a 3-county-area test of 691 herds comprising 886,504 individual animals. More than 13,000 head of cattle were destroyed during depopulation of the affected herds and for diagnostic necropsy examinations conducted on skin-test suspects and/or reactors in unaffected herds. California regained Accredited TB Free status in April 2005.

Michigan—After reviewing the State's application, epidemiology related to affected herds, and management of infected wildlife, USDA approved Michigan's application for split-State status. As of September 30, 2005, Michigan had received verbal approval from USDA, and an Interim Rule was set to be published in FY 2006.

No new TB-affected herds were detected in FY 2005, and the Upper Peninsula was granted Accredited Free status this year. In the Modified Accredited Zone, 1,100 herds were tested during the fiscal year. The prevalence of TB in wild deer in the Modified Accredited Zone decreased from 0.5 to 0.2 percent.

Two dairy herds, classed as "carry-over herds" from FY 2004, are under test-and-removal herd plans. Both of these herds were detected through area (annual surveillance) testing. One herd, with about 100 head total, had 1 positive animal initially, and 4 subsequent herd tests detected no additional infected cattle. In the other herd, which has about 175 animals, 5 reactors were found on the area testing. Four herd tests conducted subsequently on this farm detected three more TB-positive cattle. This is the second time this herd has been found affected; before TB was detected in 2004, the herd had been found positive in 2000 and released from quarantine in 2002.

Michigan had two slaughter investigations in FY 2005. The first was a histocompatible head lymph node found at slaughter. This was a crossbred beef steer that came from a feedlot in Michigan; however, all of the cattle in the lot originated from out of State. In the second slaughter investigation, a finished Holstein steer was found on further testing to be positive for *M. avium.*

New Mexico and Arizona—Through slaughter surveillance, one newly affected dairy was found in Arizona; epidemiologic investigation of this herd is ongoing.

In April 2004, New Mexico applied for regionalization. USDA requested that New Mexico complete all of the epidemiology surrounding the affected herds in that State before any response to that application. New Mexico completed that work during FY 2005, and in July, USDA approved the State's request for regionalization, with two counties in eastern New Mexico retaining Modified Accredited Advanced status and the remainder of the State receiving TB Free Status.

Texas—No TB-affected herds were carried over from FY 2004, and no TB-affected herds were disclosed in FY 2005. The last affected herd was depopulated in September 2004. Texas initiated 310 TB investigations in FY 2005: 1 adult slaughter trace, 32 feedyard slaughter traces, and 277 traces associated with affected herds and dairy-calf-raising operations in New Mexico, Arizona, Texas, and Minnesota. Fourteen new dairy operations with 4,358 cattle were tested and classified negative. The total Texas dairy surveillance in FY 2004–05 was 786 herds, and 339,305 cattle were tested. With 1,244 beef seedstock herds containing 70,240 cattle tested and classified negative in FY 2005, the total beef surveillance in FY 2004–05 was 1,574 herds, and 102,092 cattle were tested. About 500 registered beef herds remained to be tested within the State to meet the surveillance objective. In April 2005, Texas changed its approach from voluntary recruitment to mandatory by random selection.

Minnesota Update—After a 34-year period of having no positive bovine TB cases, Minnesota had three positive beef herds detected in FY 2004, and two additional herds were found in FY 2005. The index herd was a commercial purebred beef herd, which has since been depopulated. Epidemiologic traces are underway in Minnesota and additional States. As of February 3, 2006, investigations in Minnesota had led to quarantines of 92 herds in that State. Quarantines were removed from 68 of those herds after they completed the required testing. Remaining herds are in the process of having exposed animals removed and/or whole-herd tests completed. In September 2005, the State discovered through its investigation that 2 cattle operations (300–350 head each) having fenceline contact with the index herd were also affected. The fourth (600 head) and fifth (1,000 head) herds were detected in October 2005. USDA paid indemnity for all affected herds, and, as of February 1, 2006, the herds had been depopulated by the State of Minnesota. The State conducted surveillance in affected areas during fall 2005 to determine the presence of infection in the wild deer population. As a result of that surveillance, two positive wild, white-tailed deer were identified close to the index herd. Minnesota is currently making plans for additional surveillance in wildlife.

Slaughter Surveillance—In FY 2005, 40 cases of *M. bovis* were found at slaughter, which is an increase from 35 cases the year before. Five of the 40 cases were in adult cattle (greater than 2 years of age), and the remaining 35 were in feedlot steers. The national granuloma submission rate for adult cattle at the end of 2005 was 16.2 submissions per 10,000 adult cattle killed. This rate represents a continued improvement in adult-cattle submission rates as compared with adult-cattle rates in past years.

Of the 35 *M. bovis* cases identified in feedlot steers by slaughter surveillance, 32 (91 percent) involved Mexican steers or exposure to them.

Cervids—No TB-infected captive or farmed cervid herds were found in 2005. During 2004, a working group of State and Federal personnel developed a surveillance plan for captive cervids that was presented to, and conditionally approved by, cervid industry leadership. This input was incorporated into a draft of the Uniform Methods and Rules (UM&R) document specifically for captive Cervidae. This will be the first such document for captive cervids and has long been anticipated. The draft UM&R was presented at the 2005 USAHA meeting to both the Committee on Tuberculosis and the Committee on Captive Wildlife and Alternative Livestock. If a consensus can be reached on this document, a final UM&R is expected to be published in 2006. Some aspects of this document will not immediately go into effect, however, because they will be dependent on similar changes being made in the Code of Federal Regulations; these portions will be clearly identified in the document itself.

Challenges—The cooperative State–Federal–industry effort to eradicate bovine TB from the United States has made significant progress toward eradication, markedly decreasing the prevalence of the disease. The goal of eradication, however, has been elusive despite renewed efforts. Remaining challenges (infected wildlife, large affected dairies and calf-raising facilities, and infected cattle entering the country from Mexico) hinder eradication. In reviewing the current TB eradication program in the United States, previous tuberculosis planning documents, and the 2004 USAHA TB strategic plan, the VS working group concluded that eradication of bovine TB remains biologically and economically feasible and helps to protect human health and international trade of livestock. A new strategic plan providing a more aggressive approach to eradicating TB is expected to be released in 2006. APHIS is considering mitigations for those Mexican States that produce cattle at higher risk for TB. Such mitigations may include limiting cattle that originate in Accreditation Preparatory-equivalent Mexican States to approved feedlots only once they enter the United States.

Pseudorabies in Swine

Disease and Program History—Until 1962, in the United States pseudorabies virus (PRV) was considered to cause a mild and often subclinical infection except in baby pigs. However, in 1962 a virulent strain of PRV appeared in Indiana and spread across pig farms in the Midwest. By the mid-1970s, pseudorabies was widespread with concentrated outbreaks in the Midwest's major pork-producing States. Pork producers demanded that infected herds be quarantined and that movement of infected pigs be controlled. As a result, States without pseudorabies wanted to be classified as PRV free to facilitate the interstate movement of their hogs.

The Livestock Conservation Institute (now the National Institute for Animal Agriculture) set up a task force in the 1980s that defined two State stages and established the National Pseudorabies Control Board to oversee the stages and determine the status of each State. In 1989, USDA–APHIS published the program standards for an eradication plan.

The main goal of the program was to eradicate pseudorabies from commercial swine production by 2000. By 1999, the U.S. infection rate was down to less than 1 percent of all swine herds, or about 1,000 herds. With the market for pork severely depressed in 1999,

the Accelerated Pseudorabies Eradication Program was established to remove the last infected domestic commercial herds through depopulation by the end of 2004.

Current U.S. Program—Conducted in cooperation with State governments and swine producers, the National Pseudorabies Eradication Program eliminated pseudorabies from domestic commercial herds in all States, Puerto Rico, and the U.S. Virgin Islands by the end of 2004. Pseudorabies program measures (see <http://www.aphis.usda.gov/vs/nahps/pseudorabies>) are based on prevention, vaccination (now largely discontinued), disease surveillance, and eradication, and primary activities include surveillance, herd certification, and herd cleanup. These are minimum standards developed by VS and endorsed by swine health practitioners and State animal health officials in cooperation with the USAHA. Active surveillance components include testing market and cull swine, breeding animals moved interstate, imported breeding swine, and feral and transitional swine being moved. The program also has passive and outbreak surveillance components. If an infected swine herd is identified, pseudorabies is eliminated by complete depopulation, as documented in the Pseudorabies Program Standards (see <http://www.aphis.usda.gov/vs/nahps/pseudorabies>).

There are five stages in the eradication program, beginning with a preparatory phase in stage I and culminating in the pseudorabies-free stage V. States in stages I, II, or III demonstrate progress in herd cleanup consistent with the goal of eradication. In stage I, States develop the basic procedures to control and eradicate pseudorabies such as establishing a committee and formulating plans to estimate pseudorabies prevalence. After 24 to 28 months, States must indicate that they continue to meet the stage I requirements or certify that they meet the requirements of a subsequent stage. States in stages II, III, IV, and V must be recertified at 12- to 14-month intervals. Beginning in 2004, each State must file a Feral–Transitional Swine Management Plan that outlines its plans for dealing with PRV threats from feral swine.

Disease Status: 2004–05—In FY 2005, all 50 States, Puerto Rico, and the Virgin Islands filed annual reports with VS National Center for Animal Health Programs swine staff for review by the PRV control board as part of the status renewal process. These filings were analyzed to ensure testing of the breeding herd population was adequate and that the Feral–Transitional Swine Management Plan was complete, as required by pseudorabies program standards.

As of December 31, 2005, there were no known domestic production swine herds infected with PRV in the United States. Nationally, four transitional herds were disclosed through surveillance as infected with PRV during FY 2005.

Challenges—The greatest challenge to eliminating PRV is the sporadic appearance of the virus in feral pigs as well as transitional herds (primarily in the South) that are exposed to feral swine. Research conducted by the Southeastern Cooperative Wildlife Disease Study, funded through a cooperative agreement with USDA, showed the distribution of feral swine in the United States has increased from 475 counties in 17 States in 1982 to 1,014 counties in 28 States in 2004. Currently, an estimated 3 to 4 million feral swine are located in at least 30 States. Although the expanding distribution of feral swine could increase opportunities for contact between domestic and feral swine, exclusion plans are part of good biosecurity protocol on most commercial production farms, and evidence over the past 3 years suggests that no commercial production farms have been infected.

Brucellosis in Swine

Disease and Program History—Brucellosis of swine is an infectious disease, caused by *Brucella suis,* that occurs in most parts of the world where pigs exist in the wild or domesticated state. In the United States, porcine brucellosis caused considerable economic loss from the 1920s to the 1950s. Since then, changes in management combined with regulatory programs to eradicate the disease have gradually eliminated brucellosis as a major disease problem from large areas of the country. All States now participate in the Federal eradication program, and regions where the majority of pigs are raised are free of brucellosis.

Current U.S. Program—The current brucellosis eradication program in the United States is a joint State–Federal and livestock industry program. The program is administered, supervised, and funded by cooperative efforts between State and Federal animal-health regulatory agencies. The livestock industries are represented on advisory committees that ultimately advise changes in the UM&R for brucellosis eradication, the principal guideline for conducting the program (for details, see <http://www.aphis.usda.gov/vs/nahps/swine_bruc/pdf/sbruumr.pdf>).

One important component of the program to eliminate swine brucellosis has been the use of confinement systems and closed herds to eliminate many opportunities for interfarm spread of disease. Additionally, production on a large scale and use of artificial insemination have reduced one avenue of disease spread—the "community boar."

An integral part of the swine brucellosis eradication program has been the establishment and maintenance of validated brucellosis-free herds—especially purebred

herds or herds selling breeding stock. Surveillance programs, such as identification and testing of market sows and boars, have located and led to elimination of large numbers of infected herds.

When a herd is, or appears to be, infected with *B. suis,* three alternative plans are recommended. Plan 1 entails depopulating the entire herd, which is the most successful and economical approach. Plan 2 is designed to salvage irreplaceable bloodlines and basically consists of marketing the adult pigs for slaughter and retaining weanling pigs for breeding stock; this plan is not always successful and necessitates considerable isolation and retesting. Plan 3 involves removing only serologic reactors and retesting the herd as many times as necessary. Though rarely successful if the herd is actually infected, Plan 3 is the approach of choice for a herd with only one reactor or a very low proportion of reactors and in which there is reasonable doubt that brucellosis exists in the herd.

The swine brucellosis eradication program has evolved to recognize that *B. suis* bacteria will continue to exist indefinitely in feral swine and associated transitional swine populations. Efforts are now concentrated on effective separation of commercial production swine from transitional and feral swine with adequate surveillance and testing of at-risk populations to ensure compliance. The Pseudorabies Eradication Program now requires each State to file a Feral–Transitional Swine Management Plan outlining a process for dealing with feral swine PRV threats. Each State's plan will also address swine brucellosis infection threats from feral swine populations. Swine brucellosis will be considered but one of many swine pathogens to be controlled by effective management and biosecurity measures to prevent transmission from feral and/or transitional swine.

Disease Status: 2005—As of December 31, 2005, all States and U.S. territories, except Texas, were in stage III (Free) status of the Swine Brucellosis Control and Eradication Program, and there were no known commercial production swine herds infected with swine brucellosis in the United States. For several years, all outbreaks of infection in transitional herds, including those in Texas, have been attributed to feral swine exposure. Texas will likely gain equal status once the UM&R is revised to reflect Federal–State–industry consensus to remove loosely managed feral-exposed domestic herds from commercial herd classification.

During FY 2005, swine brucellosis infections were identified in three transitional herds. One case was a very small transitional herd in Texas. The second, in Georgia, was a seed-stock herd with extremely poor biosecurity protocols that allowed intrusions of feral swine into the breeding herd. The third case, which occurred in Iowa, was identified when the herd owner was diagnosed and hospitalized with *B. suis* infection, leading to diagnosis of infection in his herd. Feral swine, apparently new to the area, were sighted in a pasture breeding operation in summer 2004 before the onset of reproductive problems in the affected herd. None of the adjacent commercial production herds became infected.

Challenges—The greatest challenge to eliminating brucellosis is the sporadic appearance of the bacteria in feral pigs as well as transitional herds (primarily in the South) that are exposed to feral swine. As reported above in the pseudorabies section, the distribution of feral swine in the United States has expanded in recent decades, and an estimated 3–4 million feral swine are located in at least 30 States. Exclusion plans will continue to be vital in preventing or minimizing contact between domestic and feral swine.

Brucellosis in Cattle and Bison

Disease and Program History—Since 1934, the goal of the Cooperative State–Federal Brucellosis Eradication Program has been to eliminate brucellosis from the domestic livestock population of the United States. The program's UM&R sets forth minimum standards for States to achieve eradication (for details, see <http://www.aphis.usda.gov/vs/nahps/brucellosis>).

In 1957, testing disclosed 124,000 brucellosis-infected cattle herds in the United States. By 1992, only 700 herds were known to be affected, and as of December 31, 2005, only 1 known brucellosis-affected domestic cattle herd was under quarantine.

Current Program—The brucellosis eradication program is based on active surveillance of cattle and bison herds by States. States are designated as being free of brucellosis when none of their cattle or bison are found to be infected for 12 consecutive months while under an active surveillance program.

The Market Cattle Identification (MCI) program and the brucellosis milk surveillance test (BMST), using the brucellosis ring test, are the two main components of the national brucellosis surveillance program. Each State is required to maintain surveillance at certain levels to maintain its brucellosis State status (table 9). Each State must test at least 95 percent of test-eligible cattle (cows and bulls 2 years of age and older) going to slaughter with at least 90-percent traceback of any animals that respond positively to testing (reactors) and successful case closure on at least 95 percent of these tracebacks. These specifications apply to both Class Free and Class A States. BMST surveillance must be conducted at least two times per year in all commercial dairy herds in Class Free States and at least four times per year in Class A States. In addition, Class A States must conduct first-point testing (market testing).

TABLE 9. **Brucellosis accreditation categories and State Status—2005**

Designation	Infection rate	No. States with designation
Class Free	No cattle or bison found to be infected for 12 consecutive months while under an active surveillance program	47 States, Puerto Rico, U.S. Virgin Islands
Class A	Herd infection rate less than 0.10 percent. [1 herd per 1,000]	3 (Idaho, Texas, and Wyoming)
Class B	Herd infection rate between 0.10 percent and 1.0 percent	0

Note: States or Areas not having at least Class B status are considered 'No Status.'

The program regulations stipulate that, if a single affected herd is found in a Class Free State, that State may retain its Class Free status if it meets two conditions that must be satisfied within 60 days of the identification of the affected animal. First, the affected herd must be immediately quarantined, tested for brucellosis, and depopulated as soon as practicable. Second, an epidemiologic investigation must be performed, and the investigation must confirm that brucellosis has not spread from the affected herd. All adjacent herds, source herds, and contact herds must be epidemiologically investigated, and each of those herds must receive a complete herd test with negative results.

Disease Status: 2005—As of December 31, 2005, 47 States, Puerto Rico, and the U.S. Virgin Islands were officially declared free of brucellosis (table 9). Three States—Idaho, Texas and Wyoming—had an infection rate of less than 0.10 percent and earned Class A status. Texas achieved Class A State status in August 1994 and has been working to attain Class Free State status. Wyoming lost its Class Free State status in February 2004 after the disclosure of a second brucellosis-affected herd within a 12-month (consecutive) period. Formal loss of Class Free State status for Idaho was pending at the end of 2005 because of the finding of two brucellosis-affected cattle herds in November 2005.

Discussions of activities in specific States follow.

Texas—Texas disclosed two brucellosis-affected herds during 2005 (one in January and another in August). The herd disclosed in January 2005 was depopulated. The herd disclosed in August 2005 was not depopulated and remains under quarantine pending completion of the required number of negative herd tests and completion of the epidemiologic investigation.

Idaho—The two brucellosis-affected herds disclosed were both depopulated. The index herd likely became infected through exposure to free-ranging elk in the Greater Yellowstone Area that are known to be infected with brucellosis. It was through the epidemiologic investigation on the index herd and the associated trace-out herd testing that the second brucellosis-affected herd was disclosed. DNA fingerprinting of *Brucella* cultures from the infected cattle and from the known affected elk herd in the area is being conducted.

About 8.7 million cattle were tested for brucellosis in FY 2005. Of these, about 640,000 (7.4 percent) were sampled on farms or ranches, and about 8.06 million (92.6 percent) were tested under the MCI program (table 10).

MCI surveillance continues to be effective in finding reactor animals; new affected herds have been identified primarily through market testing. Of the 8.061 million MCI blood tests conducted in FY 2005, about 5.2 million samples (64.2 percent) were collected at slaughter plants, and roughly 2.9 million (35.8 percent) were collected during first-point testing at livestock markets (table 10). First-point testing at markets is conducted primarily in the Nation's Central and Southern regions, where the majority of States that have recently attained Class Free status and one Class A State are located. Class A States are required to conduct first-point testing as part of their efforts toward achieving Class Free status; therefore, Idaho and Wyoming must conduct first-point testing as well as Texas.

Surveillance using the BMST detected no brucellosis-affected dairy herds in FY 2005. About 171,000 BMSTs were conducted in FY 2005; roughly 200 of those BMSTs yielded suspicious results on initial screening. All suspicious BMSTs in FY 2005 were confirmed negative by subsequent epidemiologic investigations and additional herd testing.

In FY 2005, 4.061 million calves were vaccinated for brucellosis with RB51. The national calfhood vaccination policy recommends proper calfhood vaccination in high-risk herds and areas. It also recommends the elimination of mandatory vaccination in all States and that adult vaccination be reserved for cattle herds in high-risk areas.

TABLE 10. **Number of cattle tested for brucellosis (million head)—2004 and 2005**

			MCI Program	
FY	**Total**	**Farm/Ranch**	**Slaughter plants**	**Markets**
2004	9.1	0.8	5.5	2.8
2005	8.7	0.6	5.2	2.9

Challenges—The only known focus of *Brucella abortus* infection left in the Nation is in bison and elk in the Greater Yellowstone Area. APHIS is cooperating with State and Federal agencies to implement a management plan for Yellowstone National Park bison that will maintain a wild, free-ranging bison population while minimizing the risk of transmitting brucellosis from Yellowstone National Park bison to domestic cattle on public and private lands in Montana adjacent to Yellowstone National Park. The U.S. Department of the Interior; Idaho, Montana, and Wyoming; and USDA are working toward the goal of eliminating brucellosis from the Greater Yellowstone Area while maintaining a free-roaming bison herd.

APHIS has assisted Wyoming with funding to vaccinate elk on elk feeding grounds in an effort to reduce the prevalence of brucellosis. APHIS has also provided funds for habitat improvement to keep elk dispersed and away from cattle and cattle feeding grounds. Eliminating brucellosis from elk and bison remains a high priority for APHIS. Efforts to develop new, safe, and effective vaccines as well as vaccine delivery systems for bison and elk are continuing.

APHIS is cooperating with, and assisting States in, the development of herd plans for individual livestock herds in the Greater Yellowstone Area. The individual livestock herd plans will address concerns of brucellosis transmission from wild bison and elk and provide suggested mitigation measures to prevent transmission. When requested by the States, APHIS is also consulting and cooperating with State wildlife agencies in their development of herd unit management plans for wild elk and bison. APHIS has also cooperated with the Grand Teton National Park and the National Elk Refuge in drafting an environmental impact statement about management alternatives for elk and bison on the refuge.

Montana has initiated a bison hunt as part of its effort to address the issue of Yellowstone National Park bison movement from the park into Montana.

Control and Certification Programs

Chronic Wasting Disease (CWD) in Cervids

Disease and Program History—First recognized in 1967 as a clinical "wasting" syndrome in mule deer at a wildlife research facility in northern Colorado, CWD was identified as a TSE in 1978. There is no known relationship between CWD, which occurs in cervids, and any other TSE of animals or humans.

In the mid–1980s, CWD was detected in free-ranging deer and elk in contiguous areas of northeastern Colorado and southeastern Wyoming. In May 1999, CWD was found in free-ranging deer in the southwestern corner of Nebraska (adjacent to Colorado and Wyoming) and later in other areas in western and central Nebraska. Since 2002, CWD has also been detected in wild deer, elk, or both in south-central Wisconsin, southwestern South Dakota, the western slope of the Rocky Mountains in Colorado, southern New Mexico, northern Illinois, eastern and central Utah, central New York, the eastern arm of West Virginia, and northwestern Kansas. (Note: The Kansas positive deer was harvested in late 2005, but test results were not completed and confirmed until early 2006.) The first infected free-ranging moose was detected in Colorado in 2005.

The first CWD-positive farmed elk herd in the United States was detected in 1997 in South Dakota. Through December 31, 2005, 31 additional CWD-positive farmed elk herds and 8 CWD-positive farmed deer herds have been found, for a total of 40 infected farmed cervid herds.

Current Program—APHIS–VS and State CWD surveillance in farmed animals began in late 1997 and has increased each year since. APHIS–VS pays laboratory costs for all surveillance testing of farmed cervids. Responses to onfarm CWD-positive cases include depopulation with indemnity or quarantine. Additionally, VS conducts traceforward and traceback epidemiologic investigations.

A proposed rule for a CWD herd-certification program for farmed-cervid operations was published for comment in the Federal Register on December 24, 2003. Program goals are to control and eventually eradicate CWD from farmed cervid herds. The program would certify herds that demonstrate 5 years of CWD surveillance with no evidence of disease. The proposed program requirements include fencing, identification, inventory, and surveillance. The rule is intended to limit interstate movement of farmed cervids to herds enrolled in the herd-certification program. State programs meeting or exceeding Federal standards will be included in the Federal program. The final rule for this program will be published and the program implemented in 2006.

APHIS–VS has also supported CWD surveillance in wildlife beginning in 1997. Since the national "Plan for Assisting States, Federal Agencies, and Tribes in Managing Chronic Wasting Disease in Wild and Captive Cervids" was adopted in June 2002, APHIS–VS has cooperated with the International Association of Fish and Wildlife Agencies to promote uniform, nationwide surveillance while allowing flexibility to meet individual State situations and needs.

Since beginning to receive line-item funding for CWD in FY 2003, APHIS-VS has been providing assistance to State wildlife agencies and tribes through cooperative agreements to address the disease in free-ranging deer and elk. This funding has covered surveillance testing for some 90,000 hunter-killed and targeted animals in the 2002–03 and the 2003–04 hunting seasons. Similar numbers were projected for 2004–05 and 2005–06. All 50 States participated in the first 2 years of the program, and 47 States requested and received funding in FY 2005. Funding is distributed through a tiered system based on risk of disease developed in consultation with the International Association of Fish and Wildlife Agencies. In addition to individual tribal assistance, an agreement with the Native American Fish and Wildlife Society funds five regional CWD tribal biologists to assist tribes with CWD activities.

TABLE 11. **Number of CWD-positive farmed cervid herds, by State, 1997–2005**

State	1997–2004	2005	Total (1997–2005)
Colorado	12	2	14
Kansas	1	—	1
Minnesota	2	—	2
Montana	1	—	1
Nebraska	4	1	5
New York	—	2	2
Oklahoma	1	—	1
South Dakota	7	—	7
Wisconsin	6	1	7
Total	34	6	40

Disease Status—In FY 2005, 15,628 farmed cervids were tested for CWD as compared to more than 15,000 animals in FY 2004 and more than 12,000 in FY 2003. From 1997 through 2005, CWD had been found in 32 farmed elk herds and 8 farmed deer herds in 9 States (table 11).

Of the 40 positive herds identified as of December 31, 2005, 6 (4 in Colorado and 2 in Wisconsin) remained under State quarantine and 33 had been depopulated. The quarantine was lifted from one herd that underwent rigorous surveillance for more than 5 years with no further evidence of disease.

Challenges—The key challenges in managing CWD result from the fact that cervids fall under multiple jurisdictions. In 2002, at the request of Congress, an interagency group was convened to develop a management plan to assist States, Federal agencies, and Native American tribes in managing CWD in captive and wild herds. Currently, this plan is implemented by State and Federal agencies, as budgets permit. A progress report on the implementation of the plan was completed and presented to Congress in May 2004.

Additional challenges are related to the difficulties associated with testing wild cervids. High sample throughput and more rapid test technology were needed to meet the needs of wildlife agencies. By expanding its contract group of State and university laboratories, NVSL now has 26 laboratories approved to conduct CWD testing. In addition, the Center for Veterinary Biologics has approved four CWD antigen test kits based on enzyme-linked immunosorbent assay (ELISA), allowing faster testing and greater throughput for surveillance testing of wild cervids.

Johne's Disease in Cattle

Disease and Program History—Bovine paratuberculosis (Johne's disease) is caused by the bacterium *Mycobacterium avium* subspecies *paratuberculosis* (MAP). In addition to cattle and other ruminants, many species of domestic and wild animals worldwide have been diagnosed with Johne's disease. Clinical signs of Johne's disease include weight loss, diarrhea, and decreased milk production.

In 1993, USAHA proposed a Johne's disease herd-certification program, but the program was not adopted because of the costs associated with testing all animals in a herd and other issues. In 1997, the USAHA's national Johne's disease working group appointed a committee to design a more affordable and flexible program based on sound scientific knowledge. The result was the U.S. Voluntary Johne's Disease Herd Status Program for cattle. Instead of trying to certify herds free of Johne's disease, the program provides minimum requirements to identify low-risk herds. These guidelines were used as a model for the Uniform Program Standards of the Voluntary Bovine Johne's Disease Control Program (VBJDCP) approved by VS in 2002 and were updated in 2005 (see <http://www.aphis.usda.gov/vs/nahps/johnes/johnes-umr.pdf>).

Current Program—The VBJDCP is a cooperative State–Federal–industry effort administered by States and supported by the Federal Government and industry. The program's objective is to provide national standards for controlling Johne's disease. The program has three basic elements:

1. Educating producers about the cost of Johne's disease and providing information about management strategies that prevent, control, or eliminate it;
2. Working with producers to establish good management strategies on their farms; and
3. Testing and classifying herds to help separate test-positive herds from test-negative herds. Herd classification is determined by the number and years of testing for MAP in the herd.

The goal of the VBJDCP is to reduce the spread of MAP to noninfected herds and decrease disease prevalence in infected herds.

Program Status: 2004–05—Forty-seven States participate fully in the VBJDCP. More than 1,600 herds are enrolled in the test-negative component of the program. More than 6,400 herds have enrolled in the Johne's disease control program (table 12).

There are 46 States with laboratories approved for Johne's disease serology testing, and 30 States have laboratories approved for MAP fecal culture or DNA testing. In 2005, these laboratories conducted 697,264 enzyme-linked immunosorbent assay (ELISA) tests and 105,685 fecal cultures.

Challenges—Increasing producer participation in the VBJDCP is difficult for several reasons. Because firm data on the true economic costs of the disease are unavailable, many producers are reluctant to spend large amounts of money without knowing the benefits. Additionally, discrepant test results can be confusing and become a deterrent for producers not familiar with the disease and testing issues.

TABLE 12. **Johne's disease control program statistics, 2000–05**

Number of . . .	2000	2001	2002	2003	2004	2005
States in full compliance with VBJDCP	NA	NA	22	35	43	47
Herds in Johne's control programs	1,952	1,925	3,248	3,268	6,189	6,448
Johne's test-negative herds	390	514	631	543	972	1,632
ELISA tests performed	359,601	342,045	592,350	480,586	673,299	697,264
Cultures performed	44,961	43,218	98,094	96,222	101,786	105,685

Trichinae in Swine

Disease and Program History—In the mid-1980s, three factors provided a powerful rationale for developing industry-supported programs to improve food safety in the U.S. pork industry. First, the prevalence of *Trichinella* in U.S. swine had reached such a low level (less than 1 percent) that disease-free status could be envisioned. Second, U.S. pork industry leaders recognized that international markets were closed to U.S. pork products because of the inaccurate perception that U.S.-produced pork had a comparatively high risk of harboring *Trichinella spiralis*. Finally, the development of a rapid, ELISA-based diagnostic test provided a relatively inexpensive tool that could be used for verification testing in a control program.

In the United States, the prevalence of *T. spiralis* in pigs has dropped sharply because of changes in swine-production practices. The National Animal Health Monitoring System's (NAHMS) 1990 National Swine Survey and Swine '95 study reported *T. spiralis* infection rates in the United States of 0.16 percent and 0.013 percent, respectively. The NAHMS Swine 2000 study reported a 0.007-percent infection rate. Because modern pork-production systems have all but eliminated trichinae as a food-safety risk, alternatives to individual carcass testing to demonstrate that pork is free of *T. spiralis* were explored via trichinae pilot programs.

Current Program—The U.S. Trichinae Certification Program (USTCP), initiated as a pilot program in 1997, is based on scientific knowledge of *T. spiralis* epidemiology and numerous studies demonstrating how specific "good production practices" can prevent pigs' exposure to this zoonotic parasite. The program is consistent with recommended methods for control of *Trichinella* in domestic pigs, as described by the International Commission on Trichinellosis.

Three USDA agencies (APHIS, the Food Safety and Inspection Service [FSIS], and the Agricultural Marketing Service [AMS]) collaborate to verify that certified pork-production sites manage and produce pigs according to the requirements of the program's "good production practices." USDA also verifies the identity of pork from the certified production unit through slaughter and processing.

Production sites participating in the USTCP may be certified as "trichinae safe" if sanctioned production practices are followed. The onfarm certification mechanism establishes a process for ensuring the quality and safety of animal-derived food products from farm through slaughter and is intended to serve as a model for the development of other onfarm quality and safety initiatives.

Uniform program standards detailing the requirements of this certification program have been developed, and additional Federal regulations in support of the program are being developed. The completion of the pilot phase described here will lead to implementation of a federally regulated program throughout the United States.

Program pilot sites (swine nurseries and growers or finishers) are located in Colorado, Illinois, Iowa, Kansas, Minnesota, Missouri, Oklahoma, and South Dakota, but site enrollment continues. States were selected based on their willingness to participate and on market locations.

Program Status: 2002–05—On the basis of risk factors related to swine exposure to *T. spiralis,* an objective audit that could be applied to pork-production sites was developed for onfarm production practices. USDA regulates the audits to ensure that program standards are met and certifies that specified good production practices are in place and maintained on the audited pork-production sites. The onfarm audit includes aspects of farm management, biosecurity, feed and feed storage, rodent control programs, and general hygiene.

In the pilot study, objective measures of these good production practices were obtained through review of production records and an inspection of production sites. Production site audits were performed by veterinarians trained in auditing procedures, *Trichinella* risk-factor identification, and *Trichinella* good production practices. From 2000 to 2005, more than 500 audits have been completed on farms, and a great majority of these have indicated compliance with the good production practices as defined in the program. These compliant sites were granted status as "enrolled" or "certified" in the program (see table 13 for 2002–05 data).

Program sites will be audited on a regular status-determined schedule as established by official standards of the pilot USTCP. USDA oversees the auditing process by qualifying program auditors and by conducting random spot audits. Spot audits verify that the program's good production practices are maintained between scheduled audits and ensure that the audit process is conducted with integrity and consistency across the program.

Early in the pilot study, an ELISA was conducted on meat-juice samples collected at slaughter to perform verification testing of swine raised on certified sites. Verification testing entailed random testing of a statistically valid sample of swine from trichinae-certified production sites. The entire certified population delivered annually to the slaughter plant was used to determine the total number of samples needed. This testing was performed to verify that swine coming from trichinae-certified production sites were free of *Trichinella.* Trained laboratory technicians at the slaughter plant performed the early-stage verification testing. Verification testing of 11,713 swine from farms

TABLE 13. **Numbers of veterinarians trained in audit procedures and *Trichinella* good production practices, and site audits conducted, 2002–05**

	2002	2003	2004	2005
Newly trained and qualified accredited veterinarians	7	7	25	4
Site audits performed	200	81	82	60

in the pilot USTCP resulted in 11,712 negatives and 1 positive by ELISA. The one positive ELISA result was determined to be a false positive when a 5-gram sample of diaphragm from the carcass was tested by artificial digestion.

The program calls for swine slaughter facilities to segregate pigs and edible pork products originating from certified sites from pigs and edible pork products received from noncertified sites. This process is verified by FSIS. Swine slaughter facilities processing pigs from certified sites are responsible for conducting verification testing to confirm the trichinae-free status of pigs originating from certified production sites. On a regular basis, statistically valid samples of pigs from certified herds are tested at slaughter to verify that practices to reduce onfarm trichinae-infection risks are working. This process verification testing is performed using a USDA-approved tissue or blood-based postmortem test and is regulated by AMS.

Challenges—The program's current challenge is the approval process and publication of the USDA regulation that will establish trichinae certification as an official USDA voluntary program for onfarm risk-mitigation certification in the U.S. pork industry.

Swine Health Protection Inspection Program

Disease and Program History—The Swine Health Protection Act, Public Law 96–468, serves to regulate food waste and ensure that all food waste fed to swine is properly treated to kill disease organisms. Raw meat is one of the primary media through which numerous infectious or communicable diseases of swine can be transmitted—especially exotic animal diseases such as foot-and-mouth disease, African swine fever, classical swine fever, and swine vesicular disease.

Current Program—In accordance with Federal regulations, food waste may be fed to swine only if it has been treated to kill disease organisms. Treatments must be made at facilities possessing valid permits issued by VS or by the chief agricultural or animal health official of the State (if the State permits feeding food waste to swine). In 2005, 24 States prohibited feeding food waste to swine; 26 States and Puerto Rico allowed and issued permits to operate garbage treatment facilities. Licensed operations must follow regulations regarding the handling and treatment of garbage, facility standards (rodent control, equipment disinfection), cooking standards, and recordkeeping. In addition, licensed operations are required to allow Federal and State inspections.

Program Status—During FY 2005, there were on average 2,557 licensed food-waste cooking and feeding premises in the United States (table 14). During the year, 9,631 routine inspections were made on licensed premises in States that permitted the treatment and feeding of food waste to swine.

Because of increased awareness and threats of potential incursions of foreign animal diseases, most States increased efforts to ensure that all food-waste feeders were properly licensed. To this end, 28,845 searches for nonlicensed food-waste feeders were made by field personnel. Through these efforts, 101 nonlicensed feeders were found; information about the disposition of these cases was not available at press time.

TABLE 14. **Statistics on licensing of facilities feeding food waste to swine, 2004 and 2005**

Number	FY 2004	FY 2005
States allowing food-waste feeding[1]	30	26
Licensed premises	2,757	2,557
Routine inspections	12,723	9,631
Searches for nonlicensed feeders	25,422	28,845
Nonlicensed feeders found	239	101

[1] Puerto Rico also allowed food-waste feeding.